STATISTICS (STAT)

200 Level Courses

STAT 250: Introductory Statistics I. 3 credits.
Elementary introduction to statistics. Topics include descriptive statistics, probability, and estimation and hypothesis testing for means and proportions. Statistical software used for assignments. Offered by Statistics. May not be repeated for credit.

Mason Core: Quantitative Reasoning

Recommended Prerequisite: High school algebra.

Schedule Type: Lecture

STAT 260: Introduction to Statistical Practice. 3 credits.
Data-oriented introduction to fundamental concepts and methods of applied statistics. Topics include: exploratory data analysis; sampling and principles of experimental design; sampling distributions; confidence intervals and tests for one and two sample means and proportions; analysis of contingency tables; simple linear regression; and correlation. Extensive use of statistical software. Intended primarily for students in the Statistics Bachelor's program. Offered by Statistics. Limited to two attempts.

Registration Restrictions:
Required Prerequisites: MATH 113\(^\text{C}\), 115\(^\text{C}\) or 124\(^\text{C}\).
\(^\text{C}\) May be taken concurrently.
\(^\text{C}\) Requires minimum grade of C.

Students with the terminated from VSE major attribute may not enroll.

Schedule Type: Lecture

300 Level Courses

STAT 334: Introduction to Probability Models and Simulation. 3 credits.
Introduction to basic probability and principles of simulation. Emphasis is placed on formulation of models and simulation applications to statistical methodology. Topics include: basic probability rules, counting methods, discrete and continuous probability spaces, independence, conditional probability, expectation, variance, and limit theorems. Distributions covered include the binomial, hypergeometric, Poisson, normal, Gamma, Beta, multinomial, and bivariate normal. Intended primarily for students in the Statistics Bachelor's program. Offered by Statistics. Limited to two attempts.

Registration Restrictions:
Required Prerequisites: STAT 260\(^\text{C}\) and (MATH 114\(^\text{C}\), 116\(^\text{C}\) or 124\(^\text{C}\)).
\(^\text{C}\) Requires minimum grade of C.

Students with the terminated from VSE major attribute may not enroll.

Schedule Type: Lecture

STAT 344: Probability and Statistics for Engineers and Scientists I. 3 credits.
Introduction to probability with applications to electrical and computer engineering, operations research, information technology, and economics. Basic concepts of probability, conditional probability, random variables and moments, specific probability distributions, multivariate distributions, moment-generating functions, limit theorems, and sampling distributions. Offered by Statistics. Limited to two attempts.

Registration Restrictions:
Required Prerequisites: (MATH 213\(^\text{C}\) or 215\(^\text{C}\)).
\(^\text{C}\) Requires minimum grade of C.

Students with the terminated from VSE major attribute may not enroll.

Schedule Type: Lecture

STAT 346: Probability for Engineers. 3 credits.
Introduction to probability with applications to electrical and computer engineering, operations research, information technology, and economics. Basic concepts of probability, conditional probability, random variables and moments, specific probability distributions, multivariate distributions, moment-generating functions, limit theorems, and sampling distributions. Offered by Statistics. Limited to two attempts.

Registration Restrictions:
Required Prerequisites: (MATH 213\(^\text{C}\) or 215\(^\text{C}\)).
\(^\text{C}\) Requires minimum grade of C.

Students with the terminated from VSE major attribute may not enroll.

Schedule Type: Lecture

STAT 350: Introductory Statistics II. 3 credits.
Further examination of statistics and data analysis with an emphasis on applications. Inference for comparing multiple samples, experimental design, analysis of variance and post-hoc tests. Simple linear, multiple and logistic regression. Analysis of contingency tables and categorical data. A statistical computer package is used for data analysis. Offered by Statistics. Limited to two attempts.

Registration Restrictions:
Required Prerequisites: STAT 250\(^\text{C}\) or 260\(^\text{C}\).
\(^\text{C}\) Requires minimum grade of C.

Students with the terminated from VSE major attribute may not enroll.

Schedule Type: Lecture

STAT 354: Probability and Statistics for Engineers and Scientists II. 3 credits.
Multivariate probability distributions, variable transformations, regression, analysis of variance, contingency tables, and nonparametric methods. Applications to quality control, acceptance sampling, and reliability. Offered by Statistics. Limited to two attempts.

Registration Restrictions:
Required Prerequisites: STAT 334\(^\text{C}\) or 344\(^\text{C}\) or (STAT 346\(^\text{C}\) and (STAT 250\(^\text{C}\) or 260\(^\text{C}\))).
\(^\text{C}\) Requires minimum grade of C.

Students with the terminated from VSE major attribute may not enroll.

Schedule Type: Lecture

STAT 356: Statistical Theory. 3 credits.
Introduction to the mathematical theory of statistical inference, emphasizing inference for standard parametric families of distributions. Topics include: properties of estimators; Bayes and maximum likelihood estimation; sufficient statistics; properties of test of hypotheses; most powerful and likelihood-ratio tests; and distribution theory for common
statistics based on normal distributions. Offered by Statistics. Limited to two attempts.

Registration Restrictions:
Required Prerequisite: STAT 346\textsuperscript{C}.
\textsuperscript{C} Requires minimum grade of C.

Students with the terminated from VSE major attribute may not enroll.

Schedule Type: Lecture

STAT 362: Introduction to Computer Statistical Packages. 3 credits.
Use of computer packages in statistical analysis of data. Topics include data entry, checking, and manipulation, and use of computer statistical packages for regression and analysis of variance. Offered by Statistics. Limited to two attempts.

Registration Restrictions:
Required Prerequisites: STAT 250\textsuperscript{C}, 260\textsuperscript{C} or BUS 310\textsuperscript{C}.
\textsuperscript{C} Requires minimum grade of C.

Students with the terminated from VSE major attribute may not enroll.

Schedule Type: Lecture

400 Level Courses

STAT 435: Analysis of Experimental Data. 3 credits.
Second course in statistics intended to assist with analysis of data from educational research and the social, natural, and life sciences. Topics include sample surveys, contingency tables, linear and multiple regression, analysis of variance, nonparametric tests, and multivariate methods. Various statistical packages will be used. Offered by Statistics. Limited to two attempts.

Registration Restrictions:
Required Prerequisites: STAT 250\textsuperscript{C}, 260\textsuperscript{C} or 344\textsuperscript{C}.
\textsuperscript{C} Requires minimum grade of C.

Students with the terminated from VSE major attribute may not enroll.

Schedule Type: Lecture

STAT 455: Experimental Design. 3 credits.
Introduces problems and techniques inherent in design of experiments, which refers to planning an experiment so that collected data can be analyzed by statistical methods. Covers the two aspects to any experimental problem: the design itself and the analysis of the resulting data. Examples from numerous disciplines in the sciences and the humanities are discussed. Data analysis is emphasized. Offered by Statistics. Limited to two attempts.

Registration Restrictions:
Required Prerequisites: STAT 350\textsuperscript{C}, 354\textsuperscript{C} or 435\textsuperscript{C}.
\textsuperscript{C} Requires minimum grade of C.

Students with the terminated from VSE major attribute may not enroll.

Schedule Type: Lecture

STAT 456: Applied Regression Analysis. 3 credits.
Introduces regression concepts and techniques as synthesis of theory, methods, and applications. Emphasis on understanding assumptions of the regression model, how to validate a selected model, when and how regression might be useful in different application areas, and interpreting output from statistical software packages. Topics include: multiple regression model fitting, logistic regression, and time series analysis. Data analysis is emphasized. Offered by Statistics. Limited to two attempts.

Registration Restrictions:
Required Prerequisites: STAT 350\textsuperscript{C}, 354\textsuperscript{C}, 435\textsuperscript{C} or BUS 310\textsuperscript{C}.
\textsuperscript{C} Requires minimum grade of C.

Students with the terminated from VSE major attribute may not enroll.

Schedule Type: Lecture

STAT 460: Introduction to Biostatistics. 3 credits.
Focuses on biostatistical aspects of design and analysis of biomedical studies, including epidemiologic observational studies and randomized clinical trials. Topics include randomization principle, confounding, ethics in human experimentation, methods of randomization, stratification, primary outcome analyses, covariate-adjusted analyses, epidemiologic measures, and sample size and power computation. Offered by Statistics. Limited to two attempts.

Recommended Prerequisite: Working knowledge of SAS.

Registration Restrictions:
Required Prerequisites: STAT 350\textsuperscript{C}, 354\textsuperscript{C} or 435\textsuperscript{C}.
\textsuperscript{C} Requires minimum grade of C.

Students with the terminated from VSE major attribute may not enroll.

Schedule Type: Lecture

STAT 462: Applied Multivariate Statistics. 3 credits.
Introduces a variety of multivariate statistical methods as aids to analyzing and interpreting large data sets. These methods will have general applications across a wide range of disciplines. Topics include: principal components analysis, cluster analysis, discriminant analysis, multi-dimensional scaling, correspondence analysis, and canonical correlation analysis. Extensive use of statistical software. Offered by Statistics. Limited to two attempts.

Registration Restrictions:
Required Prerequisites: STAT 350\textsuperscript{C}, 354\textsuperscript{C} or 435\textsuperscript{C}.
\textsuperscript{C} Requires minimum grade of C.

Students with the terminated from VSE major attribute may not enroll.

Schedule Type: Lecture

STAT 463: Introduction to Exploratory Data Analysis. 3 credits.
Features statistical graphics, maps and simple models used to bring out patterns in data. Introduces statistical software and addresses data access and import. Presents exploratory strategies motivating data transformations. Stresses the cognitive foundations of good graphics. Graphics include dot plots, box plots, Q-Q plots, parallel coordinate plots, scatterplot matrices and linked views. Exploration includes use of dynamic graphics. Offered by Statistics. Limited to two attempts.

Registration Restrictions:
Required Prerequisites: STAT 350\textsuperscript{C}, 354\textsuperscript{C}, 435\textsuperscript{C} or BUS 310\textsuperscript{C}.
\textsuperscript{C} Requires minimum grade of C.

Students with the terminated from VSE major attribute may not enroll.

Schedule Type: Lecture
STAT 465: Nonparametric Statistics and Categorical Data Analysis. 3 credits.
Introduction to nonparametric methods and categorical data analysis.
Topics include: tests for one-sample, two-related samples, and two
independent samples; concepts of nonparametric ANOVA; tests for
proportions; chi-squared tests, log-linear models, and contingency
tables; goodness-of-fit tests; correlation and association analysis;
nonparametric regression including logistic and Poisson regression; and
bootstrapping, jackknifing, and cross-validation. Notes: Students may
not receive credit for both STAT 465 and STAT 525. Offered by Statistics.
Limited to two attempts.

Registration Restrictions:
Required Prerequisites: STAT 350C, 354C or 435C.
\(^C\) Requires minimum grade of C.

Students with the terminated from VSE major attribute may not enroll.

Schedule Type: Lecture

STAT 472: Introduction to Statistical Learning. 3 credits.
Tools for the analysis of massive data sets. Topics include: regression,
classification trees, clustering, and support vector machines. Extensive
use of statistical software. Applications to business, finance, biology,
and other sciences and engineering. Offered by Statistics. Limited to two
attempts.

Registration Restrictions:
Required Prerequisite: STAT 456C.
\(^C\) Requires minimum grade of C.

Students with the terminated from VSE major attribute may not enroll.

Schedule Type: Lecture

STAT 474: Introduction to Survey Sampling. 3 credits.
Introduction to design and analysis of sample surveys. Sample designs
include simple random sampling; systematic sampling; and stratified,
cluster, and multistage sampling. Analytical methods include sample size
determination, ratio and regression estimation, imputation for missing
data, and non-sampling error adjustment. Practical problems encountered
in conducting a survey are discussed, such as questionnaire design.
Methods applied to case studies of actual surveys. Class project may
be required. Notes: Recommended for students of decision, information,
social sciences, and mathematics. Offered by Statistics. Limited to two
attempts.

Recommended Corequisite: STAT 362.

Registration Restrictions:
Required Prerequisites: STAT 350C, 354C or 435C.
\(^C\) Requires minimum grade of C.

Students with the terminated from VSE major attribute may not enroll.

Schedule Type: Lecture

STAT 489: Pre-Capstone Professional Development. 3 credits.
Develops skills in the areas of technical writing and oral communication.
Students will develop a historical and ethical appreciation of the field
of statistics as well as connect methods from their undergraduate
coursework to solve problems. Students will work in small groups to
develop a project proposal for STAT 490. Offered by Statistics. Limited to
two attempts.

Registration Restrictions:
Required Prerequisites: STAT 354C and 362C.
\(^C\) Requires minimum grade of C.

Enrollment limited to students with a class of Senior.

Enrollment is limited to students with a major in Statistics.

Enrollment limited to students in a Bachelor of Science degree.

Students with the terminated from VSE major attribute may not enroll.

Schedule Type: Lecture

STAT 490: Capstone in Statistics. 3 credits.
Students will synthesize methods and ideas acquired in their
undergraduate courses by working in small groups on a project and
presenting their findings in a written report and an oral presentation.
Offered by Statistics. Limited to two attempts.

Mason Core: Capstone

Registration Restrictions:
Required Prerequisite: STAT 489C.
\(^C\) Requires minimum grade of C.

Enrollment is limited to students with a major in Statistics.

Enrollment limited to students in a Bachelor of Science degree.

Students with the terminated from VSE major attribute may not enroll.

Schedule Type: Lecture

STAT 498: Independent Study in Statistics. 1-3 credits.
Directed self-study of special topics of current interest in statistics.
Notes: May be repeated if topics are substantially different. Offered by
Statistics. Limited to two attempts.

Recommended Prerequisite: 60 hours.

Registration Restrictions:
Students with the terminated from VSE major attribute may not enroll.

Schedule Type: Independent Study

STAT 499: Special Topics in Statistics. 3 credits.
Topics of special interest to undergraduates. Notes: May be repeated if
topics are substantially different. Offered by Statistics. Limited to two
attempts.

Recommended Prerequisite: 60 undergraduate credits.

Registration Restrictions:
Washington Consortium level students may not enroll.

Students with the terminated from VSE major attribute may not enroll.

Schedule Type: Lecture

500 Level Courses

STAT 501: SAS Language and Basic Procedures. 1 credit.
Introduction to the SAS Data Step and Base SAS Procedures. Preparation
for graduate students in use of SAS for other graduate courses offered
by department. Topics include observation and variable structures, data
interfaces, formats, functions, and procedures for summarizing and
displaying data. Offered by Statistics. May not be repeated for credit.
Recommended Prerequisite: Course in statistics and experience with Microsoft OS.

Registration Restrictions:
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Lecture

Introduces generating presentation-quality statistical graphics using SAS. Continued preparation beyond STAT 501 for graduate students in the use of SAS for other graduate courses offered by department. Topics include: an overview of ODS Graphics and SAS/GRAPH, graph output options, and in-depth coverage of the ODS Graphics procedures. Traditional SAS/GRAPH procedures are briefly discussed. Offered by Statistics. May not be repeated for credit.

Recommended Prerequisite: Course in statistics and working knowledge of SAS.

Registration Restrictions:
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Lecture

STAT 503: SAS Macro Language. 1 credit.
Introduction to SAS Macro Language. Continued preparation beyond STAT 501 for graduate students in use of SAS for other graduate courses offered by department. Topics include macro language processing, macro variables, defining and calling macro variables, macro quoting, macro facility error messages, and examples of efficient code using macros. Offered by Statistics. May not be repeated for credit.

Recommended Prerequisite: Course in statistics and working knowledge of SAS.

Registration Restrictions:
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Lecture

STAT 504: Introduction to SAS/IML. 1 credit.
Introduction to SAS/IML, the matrix language within the SAS environment. Topics include defining matrices, performing standard matrix operations, operating on rows and columns of a data table, and writing efficient SAS/IML programs. Offered by Statistics. May not be repeated for credit.

Recommended Prerequisite: Working knowledge of SAS and matrix algebra.

Registration Restrictions:
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Enrollment limited to students in the College of Science, Schar School of Policy and Gov or Volgenau School of Engineering colleges.

Schedule Type: Lecture

STAT 505: Introduction to R. 1 credit.
Introduction to R syntax, graphical interface, and basic operations. Preparation for graduate students in use of R for other graduate courses offered by department. Topics include import and export of data; manipulation of R object structures; function creation; package installation; and procedures for simulation, modeling, summarizing data, and producing graphics. Offered by Statistics. May not be repeated for credit.

Recommended Prerequisite: Course in statistics.

Registration Restrictions:
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Enrollment limited to students in the College of Science, Schar School of Policy and Gov or Volgenau School of Engineering colleges.

Schedule Type: Lecture

STAT 506: Introduction to SPSS. 1 credit.
Introduction to SPSS, a widely-used statistical software package in social sciences. Provides an overview of SPSS procedures for manipulating data; summarizing and displaying data; and analyzing data from a variety of experimental designs. Offered by Statistics. May not be repeated for credit.

Recommended Prerequisite: Course in statistics and experience with Microsoft OS.

Registration Restrictions:
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Enrollment limited to students in the College of Science, Schar School of Policy and Gov or Volgenau School of Engineering colleges.

Schedule Type: Lecture
STAT 515: *Applied Statistics and Visualization for Analytics*. 3 credits.
Introduces multivariate regression and random forests for modeling data. Addresses data access, variable selection and model diagnostics. Introduces foundations for visual thinking. Reviews common statistical graphics such as dot plots, box plots, q-q plots. Addresses more advanced methods such as scatterplot matrices enhanced by smoothed or density contours, and search tools for finding graphics with suggestive patterns. Notes: Course will introduce R software for analysis. A final project will involve visualization of a real data set. Offered by Statistics. May not be repeated for credit.

**Recommended Prerequisite:** STAT 250 or equivalent.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Enrollment limited to students in the College of Science, Schar School of Policy and Gov or Volgenau School of Engineering colleges.

**Schedule Type:** Lecture

STAT 517: *Experimental Design*. 3 credits.
Introduces problems and techniques inherent in design of experiments, which refers to planning an experiment so that collected data can be analyzed by statistical methods. Covers the two aspects to any experimental problem: the design itself and the analysis of the resulting data. Examples from numerous disciplines in the sciences and the humanities are discussed. Data analysis is emphasized. Notes: Students may not receive credit for both STAT 455 and STAT 517. Offered by Statistics. May not be repeated for credit.

**Registration Restrictions:**
**Required Prerequisites:** STAT 535<sup>B</sup> or 554<sup>B</sup>.
<sup>B</sup> Requires minimum grade of B.

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Enrollment limited to students in the College of Science, Schar School of Policy and Gov or Volgenau School of Engineering colleges.

**Schedule Type:** Lecture

Presents regression concepts and techniques as synthesis of theory, methods, and applications. Emphasis on understanding assumptions of the regression model, how to validate a selected model, when and how regression might be useful in different application areas, and interpreting output from statistical software packages. Topics include: multiple regression model fitting, logistic regression, and time series analysis. Data analysis is emphasized. Notes: Students may not receive credit for both STAT 456 and STAT 526. Cannot be used to satisfy requirements for MS in Statistical Science. Offered by Statistics. May not be repeated for credit.

**Registration Restrictions:**
**Required Prerequisites:** STAT 535<sup>B</sup> or 554<sup>B</sup>.
<sup>B</sup> Requires minimum grade of B.

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Enrollment limited to students in the College of Science, Schar School of Policy and Gov or Volgenau School of Engineering colleges.

**Schedule Type:** Lecture

STAT 520: *Foundations of Statistical Thinking*. 3 credits.
Provides a foundation in the key concepts underlying data analysis, statistics, and probability. Topics include research-based methods for developing statistical thinking, use of technology for learning about statistics, and structured learning activities. Statistical concepts include: distributions, measures of center and spread, sampling, sampling distribution, bivariate analysis, correlation, randomness, and law of large numbers. Notes: Cannot be used to satisfy requirements for MS in Statistical Science. Offered by Statistics. May not be repeated for credit.

**Registration Restrictions:**
**Required Prerequisites:** STAT 535<sup>B</sup> or 554<sup>B</sup>.
<sup>B</sup> Requires minimum grade of B.

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Enrollment limited to students in the College of Science, Schar School of Policy and Gov or Volgenau School of Engineering colleges.

**Schedule Type:** Lecture

STAT 525: *Nonparametric Statistics and Categorical Data Analysis*. 3 credits.
Introduction to nonparametric methods and categorical data analysis. Topics include tests for one-sample, two-related samples, and two independent samples; concepts of nonparametric ANOVA; tests for proportions; chi-squared tests, log-linear models, and contingency tables; goodness-of-fit tests; correlation and association analysis; nonparametric regression including logistic and Poisson regression; and bootstrapping, jackknifing, and cross-validation. Notes: Students may not receive credit for both STAT 456 and STAT 525. Cannot be used to satisfy requirements for MS in Statistical Science. Offered by Statistics. May not be repeated for credit.

**Registration Restrictions:**
**Required Prerequisites:** STAT 535<sup>B</sup> or 554<sup>B</sup>.
<sup>B</sup> Requires minimum grade of B.

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.
Students in a Non-Degree Undergraduate degree may not enroll.

Enrollment limited to students in the College of Science, Schar School of Policy and Gov or Volgenau School of Engineering colleges.

Schedule Type: Lecture

**STAT 535: Analysis of Experimental Data.** 3 credits. Statistical methods for analysis of experimental data from educational research and the social, natural, and life sciences. Topics include sample surveys, contingency tables, linear and multiple regression, analysis of variance, nonparametric tests, and multivariate methods. Various statistical packages will be used. Notes: Students may not receive credit for both STAT 435 and STAT 535. Cannot be used to satisfy requirements for MS in Statistical Science. Certificate program students granted credit for only one of STAT 535 or STAT 554. Offered by Statistics. May not be repeated for credit.

**Recommended Prerequisite:** STAT 250, STAT 344 or equivalent.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

**Schedule Type:** Lecture

**STAT 544: Applied Probability.** 3 credits. The axioms of probability, conditional probability, random variables and expectation, multivariate and conditional distributions, conditional expectation, order statistics, transformations, moment generating functions, special distributions, limit theorems. Offered by Statistics. May not be repeated for credit.

**Recommended Prerequisite:** MATH 213 and STAT 346, or permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Enrollment limited to students in the Volgenau School of Engineering college.

**Schedule Type:** Lecture

**STAT 554: Applied Statistics I.** 3 credits. Application of basic statistical techniques. Focus is on the problem (data analysis) rather than on the theory. Topics include descriptive statistics; exploratory data analysis; sampling distributions; one- and two-sample tests and confidence intervals for means, medians, proportions, and variances; and goodness-of-fit tests. Normal theory is introduced first with discussion of what happens when assumptions break down. Alternative robust and nonparametric techniques are presented. Notes: Certificate program students granted credit for only one of STAT 535 or 554. Offered by Statistics. May not be repeated for credit.

**Recommended Prerequisite:** STAT 346, or permission of instructor.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Enrollment limited to students in the Volgenau School of Engineering college.

**Schedule Type:** Lecture

**STAT 560: Biostatistical Methods.** 3 credits. Focuses on biostatistical aspects of design and analysis of biomedical studies, including epidemiologic observational studies and randomized clinical trials. Topics include randomization principle, confounding, ethics in human experimentation, methods of randomization, stratification, primary outcome analyses, covariate-adjusted analyses, epidemiologic measures, and sample size and power computation. Offered by Statistics. May not be repeated for credit. Equivalent to STAT 660.

**Recommended Prerequisite:** STAT 350 or STAT 354 or STAT 435; and working knowledge of SAS.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Enrollment limited to students in the College of Science, Schar School of Policy and Gov or Volgenau School of Engineering colleges.

**Schedule Type:** Lecture

**STAT 574: Survey Sampling I.** 3 credits. Design and implementation of sample surveys. Covers components of a survey; probability sampling designs to include simple random, systematic, Bernoulli, proportional to size, stratified, cluster and two-stage sampling; and ratio and regression estimators. Discusses practical problems in conducting a survey. Methods applied to case studies of actual surveys. Class project may be required. Notes: Students may not receive credit for both STAT 474 and STAT 574. Offered by Statistics. May not be repeated for credit.

**Recommended Prerequisite:** STAT 346 and a course in Statistics, or STAT 344; and working knowledge of SAS.

**Registration Restrictions:**
Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Enrollment limited to students in the Volgenau School of Engineering college.
Schedule Type: Lecture

600 Level Courses

STAT 634: Case Studies in Data Analysis. 3 credits.
Examination of a wide variety of case studies illustrating data-driven model building and statistical analysis. With each case study, various methods of data management, data presentation, statistical analysis, and report writing are compared. Offered by Statistics. May not be repeated for credit.

Recommended Prerequisite: Working knowledge of SAS.

Recommended Corequisite: STAT 654.

Registration Restrictions:
Required Prerequisite: (STAT 554B).
B- Requires minimum grade of B-.

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Lecture

STAT 652: Statistical Inference. 3 credits.
Fundamental principles of estimation and hypothesis testing. Topics include limiting distributions and stochastic convergence, sufficient statistics, exponential families, statistical decision theory and optimality for point estimation, Bayesian methods, maximum likelihood, asymptotic results, interval estimation, optimal tests of statistical hypotheses, and likelihood ratio tests. Offered by Statistics. May not be repeated for credit. Equivalent to CSI 672.

Recommended Corequisite: STAT 554.

Registration Restrictions:
Required Prerequisite: STAT 544B.
B- Requires minimum grade of B-.

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Lecture

Overview of statistical principles of modeling. Topics include methods for analyzing data based on generalized linear models and diagnostic methods for assessing the assumptions of such models. Methods covered include multiple regression, analysis of variance, simultaneous inference, logistic response models, and hierarchical log linear models for contingency tables. Offered by Statistics. May not be repeated for credit.

Registration Restrictions:
Required Prerequisite: STAT 554B.
B- Requires minimum grade of B-.

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Lecture

STAT 655: Analysis of Variance. 3 credits.
Single and multifactor analysis of variance, planning sample sizes, introduction to the design of experiments, random block and Latin square designs, and analysis of covariance. Offered by Statistics. May not be repeated for credit.

Recommended Corequisite: STAT 544.

Registration Restrictions:
Required Prerequisite: (STAT 554B).
B- Requires minimum grade of B-.

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Lecture

STAT 656: Regression Analysis. 3 credits.
Simple and multiple linear regression, polynomial regression, general linear models, subset selection, step-wise regression, and model selection. Also covered are multicollinearity, diagnostics, and model building as well as the theory and practice of regression analysis. Offered by Statistics. May not be repeated for credit. Equivalent to CSI 676.

Registration Restrictions:
Required Prerequisites: STAT 544B and 554B.
* May be taken concurrently.
B- Requires minimum grade of B-.

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Lecture

STAT 657: Nonparametric Statistics. 3 credits.
Distribution-free procedures for making inferences about one or more samples. Tests for lack of independence, association or trend, and monotone alternatives are included. Measures of association in bivariate samples and multiple classifications are discussed. Both theory and applications are covered. Students are introduced to appropriate statistical software. Offered by Statistics. May not be repeated for credit.

Registration Restrictions:
Required Prerequisites: (STAT 544B and 554B).
micromaps designs for spatial and temporal comparisons. Introduces quantitative comparisons from multiple perspectives. Features new research guidance for graphics design and reasoning. Stresses functional relationships in the presence of noise. Introduces cognitive

STAT 663: Statistical Graphics and Data Exploration I. 3 credits. Introduces statistical graphics that show distribution features and functional relationships in the presence of noise. Introduces cognitive research guidance for graphics design and reasoning. Stresses quantitative comparisons from multiple perspectives. Features new micromaps designs for spatial and temporal comparisons. Introduces R, the grammar of graphics, and dynamic graphics software. Offered by Statistics. May not be repeated for credit. Equivalent to CSI 773.

Recommended Prerequisite: A 300-level statistics course and a programming course, or permission of instructor.

Registration Restrictions: Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Recommended Corequisite: STAT 544.

Recommended Prerequisite: (STAT 544B and 554B). B- Requires minimum grade of B-.

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Lecture

STAT 668: Survival Analysis. 3 credits. Survival Analysis is a class of statistical methods for studying the occurrence and timing of events. In medical research, the events may be deaths, and the objective is to determine factors affecting survival times of patients following treatment, usually in the setting of clinical trials. Methods can also be applied to the social and natural sciences and engineering where they are known by other names (reliability, event history analysis). Concepts of censored data, time-dependent variables, and survivor and hazard functions are central. Nonparametric methods for comparing two or more groups of survival data are studied. The Cox regression model (proportional hazards model), Weibull model, and the accelerated failure time model are studied in detail. Concepts are applied to analysis of real data from major medical studies using SAS software. Offered by Statistics. May not be repeated for credit.

Recommended Prerequisite: Working knowledge of R and SAS.

Recommended Prerequisite: (STAT 544B and 554B). B- Requires minimum grade of B-.

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Lecture

STAT 665: Categorical Data Analysis. 3 credits. Analyzes cross-classified categorical data in two and higher dimensions. Topics include association tests and measures of association in two- and three-dimensional contingency tables, logistic regression, and log linear models. SAS is used extensively for data analysis. Offered by Statistics. May not be repeated for credit.

Recommended Corequisite: STAT 544.

Registration Restrictions: Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Recommended Prerequisite: (STAT 654B). B- Requires minimum grade of B-.

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Lecture

STAT 662: Multivariate Statistical Methods. 3 credits. Standard techniques of applied multivariate analysis. Topics include review of matrices, multivariate normal theory, principal components, canonical correlation, classification, factor analysis, clustering, and multidimensional scaling. Applications to data analysis. Computer implementation via a statistical package is an integral part of the course. Offered by Statistics. May not be repeated for credit.

Recommended Prerequisite: Matrix algebra, and working knowledge of SAS.

Recommended Corequisite: STAT 544.

Registration Restrictions:

Recommended Prerequisite: (STAT 554B). B- Requires minimum grade of B-.

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Lecture


Recommended Prerequisite: STAT 654B.

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Lecture

STAT 663: Statistical Graphics and Data Exploration I. 3 credits. Introduces statistical graphics that show distribution features and functional relationships in the presence of noise. Introduces cognitive research guidance for graphics design and reasoning. Stresses quantitative comparisons from multiple perspectives. Features new micromaps designs for spatial and temporal comparisons. Introduces R, the grammar of graphics, and dynamic graphics software. Offered by Statistics. May not be repeated for credit. Equivalent to CSI 773.

Recommended Prerequisite: A 300-level statistics course and a programming course, or permission of instructor.

Registration Restrictions: Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Recommended Corequisite: STAT 544.

Recommended Prerequisite: (STAT 544B and 554B). B- Requires minimum grade of B-.

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Lecture

STAT 668: Survival Analysis. 3 credits. Survival Analysis is a class of statistical methods for studying the occurrence and timing of events. In medical research, the events may be deaths, and the objective is to determine factors affecting survival times of patients following treatment, usually in the setting of clinical trials. Methods can also be applied to the social and natural sciences and engineering where they are known by other names (reliability, event history analysis). Concepts of censored data, time-dependent variables, and survivor and hazard functions are central. Nonparametric methods for comparing two or more groups of survival data are studied. The Cox regression model (proportional hazards model), Weibull model, and the accelerated failure time model are studied in detail. Concepts are applied to analysis of real data from major medical studies using SAS software. Offered by Statistics. May not be repeated for credit.

Recommended Prerequisite: Working knowledge of R and SAS.

Recommended Prerequisite: (STAT 654B). B- Requires minimum grade of B-.

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Lecture

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Recommended Corequisite: STAT 544.

Registration Restrictions: Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Recommended Prerequisite: (STAT 654B). B- Requires minimum grade of B-.

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Lecture

STAT 662: Multivariate Statistical Methods. 3 credits. Standard techniques of applied multivariate analysis. Topics include review of matrices, multivariate normal theory, principal components, canonical correlation, classification, factor analysis, clustering, and multidimensional scaling. Applications to data analysis. Computer implementation via a statistical package is an integral part of the course. Offered by Statistics. May not be repeated for credit.

Recommended Prerequisite: Matrix algebra, and working knowledge of SAS.

Recommended Corequisite: STAT 544.

Registration Restrictions:

Recommended Prerequisite: (STAT 554B). B- Requires minimum grade of B-.

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Lecture


Recommended Prerequisite: STAT 654B.

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Lecture
Students in a Non-Degree Undergraduate degree may not enroll.

**Schedule Type:** Lecture

**STAT 672: Statistical Learning and Data Analytics.** 3 credits.  
The course focuses on statistical learning theory by introducing the statistical and optimization background essential for understanding statistical learning algorithms. Also discusses applications of statistical learning algorithms to the solution of important problems in many areas of science. Offered by Statistics. May not be repeated for credit.

**Registration Restrictions:**  
**Required Prerequisites:** (STAT 544B and 554B).  
B- Requires minimum grade of B-.

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Enrollment limited to students in the College of Science, Schar School of Policy and Gov or Volgenau School of Engineering colleges.

**Schedule Type:** Lecture

**STAT 674: Survey Sampling II.** 3 credits.  
Continuation of STAT 574. Applications to case studies of actual surveys. Categorical data analysis, regression models, and domain estimation from complex sampling designs, introduction to variance estimation, weighting adjustments for nonresponse, and imputation. Offered by Statistics. May not be repeated for credit.

**Registration Restrictions:**  
**Required Prerequisite:** (STAT 574B).  
B- Requires minimum grade of B-.

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Enrollment limited to students in the College of Science, Schar School of Policy and Gov or Volgenau School of Engineering colleges.

**Schedule Type:** Lecture

**STAT 689: Topics in Statistics.** 1-3 credits.  
Special topics of interest to graduate students in statistics. Notes: May be repeated for credit when topic is different. Offered by Statistics. May be repeated within the degree for a maximum 6 credits.

**Recommended Prerequisite:** Permission of instructor; specific prerequisites vary with the nature of the topic.

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Enrollment limited to students in the College of Science, Schar School of Policy and Gov or Volgenau School of Engineering colleges.

**Schedule Type:** Lecture

**700 Level Courses**

**STAT 751: Computational Statistics.** 3 credits.  
Covers basic computationally intensive statistical methods and related methods, which would not be feasible without modern computational resources. Covers nonparametric density estimation including kernel methods, orthogonal series methods and multivariate methods, recursive methods, cross validation, nonparametric regression, penalized smoothing splines, the jackknife and bootstrapping, computational aspects of exploratory methods including the grand tour, projection pursuit, alternating conditional expectations, and inverse regression methods. Offered by Statistics. May not be repeated for credit. Equivalent to CSI 771.

**Registration Restrictions:**  
**Required Prerequisite:** STAT 652B.  
B- Requires minimum grade of B-.

Enrollment is limited to Graduate or Non-Degree level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Enrollment limited to students in the College of Science, Schar School of Policy and Gov or Volgenau School of Engineering colleges.

**Schedule Type:** Lecture

**STAT 756: Alternative Regression Methods.** 3 credits.  
Presents several modern regression methodologies that are useful in data analysis when some of the assumptions of linear regression theory fail to hold. Topics include non-linear regression, quantile regression, robust regression, and computational methods for fitting these models. Offered by Statistics. May not be repeated for credit.

**Registration Restrictions:**  
**Required Prerequisite:** (STAT 654B).  
B- Requires minimum grade of B-.

Enrollment is limited to Graduate or Non-Degree level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Enrollment limited to students in the College of Science, Schar School of Policy and Gov or Volgenau School of Engineering colleges.

**Schedule Type:** Lecture

**STAT 758: Advanced Time Series Analysis.** 3 credits.  
Mathematical modeling and methods for model identification and forecasting of nonstationary and seasonal time series data (ARIMA models), multivariate time series, and state-space models. Offered by Statistics. May not be repeated for credit.

**Registration Restrictions:**  
**Required Prerequisite:** (STAT 658B).  
B- Requires minimum grade of B-.

Enrollment is limited to Graduate or Non-Degree level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Enrollment limited to students in the College of Science, Schar School of Policy and Gov or Volgenau School of Engineering colleges.

**Schedule Type:** Lecture

**STAT 751: Computational Statistics.** 3 credits.  
Covers basic computationally intensive statistical methods and related methods, which would not be feasible without modern computational resources. Covers nonparametric density estimation including kernel methods, orthogonal series methods and multivariate methods, recursive methods, cross validation, nonparametric regression, penalized smoothing splines, the jackknife and bootstrapping, computational aspects of exploratory methods including the grand tour, projection pursuit, alternating conditional expectations, and inverse regression methods. Offered by Statistics. May not be repeated for credit. Equivalent to CSI 771.

**Registration Restrictions:**  
**Required Prerequisite:** STAT 652B.  
B- Requires minimum grade of B-.

Enrollment is limited to Graduate or Non-Degree level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Enrollment limited to students in the College of Science, Schar School of Policy and Gov or Volgenau School of Engineering colleges.

**Schedule Type:** Lecture

**STAT 756: Alternative Regression Methods.** 3 credits.  
Presents several modern regression methodologies that are useful in data analysis when some of the assumptions of linear regression theory fail to hold. Topics include non-linear regression, quantile regression, robust regression, and computational methods for fitting these models. Offered by Statistics. May not be repeated for credit.

**Registration Restrictions:**  
**Required Prerequisite:** (STAT 654B).  
B- Requires minimum grade of B-.

Enrollment is limited to Graduate or Non-Degree level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Enrollment limited to students in the College of Science, Schar School of Policy and Gov or Volgenau School of Engineering colleges.

**Schedule Type:** Lecture

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**Registration Restrictions:**  
**Required Prerequisite:** (STAT 658B).  
B- Requires minimum grade of B-.

Enrollment is limited to Graduate or Non-Degree level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Enrollment limited to students in the College of Science, Schar School of Policy and Gov or Volgenau School of Engineering colleges.

**Schedule Type:** Lecture
STAT 760: Advanced Biostatistical Methods. 3 credits.
Advanced statistical methods in the drug development process.
Provides the theoretical statistical basis for the design and analysis of
pharmaceutical clinical trials. Topics include the theory of randomization,
randomization-based inference, restricted, response-adaptive, and
covariate-adaptive randomization, the modern theory of group sequential
monitoring, statistical aspects of determination of dose-response
relationships. Offered by Statistics. May not be repeated for credit.

Recommended Prerequisite: Working knowledge of statistical
programming language.

Registration Restrictions:
Required Prerequisites: (STAT 652B and 654B).
B Requires minimum grade of B-.

Enrollment is limited to Graduate or Non-Degree level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Lecture

STAT 763: Statistical Graphics and Data Exploration II. 3 credits.
Addresses data set size and human comprehension challenges.
Introduces case and variable reduction methods, and overview
production. Incorporates cognitive science guidance. Utilizes data mining
models and visual analytic algorithms to find patterns and prioritize
graphics. Addresses applications from both information and scientific
visualization. Tracks advances in web graphics including citizen science
projects harnessing the visual power of thousands of people. Offered by
Statistics. May not be repeated for credit.

Registration Restrictions:
Required Prerequisites: (STAT 663B or 515B).
B Requires minimum grade of B-.

Enrollment is limited to Graduate or Non-Degree level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Lecture

STAT 765: Advanced Topics in Categorical Data Analysis. 3 credits.
Covers advanced techniques for categorical data analysis and the
theoretical basis for the analysis of categorical data. Topics include:
models for multinomial responses, matched pairs, repeated measures,
and ordinal data; random effects models; asymptotic theory for
parametric models; theory for maximum likelihood and alternative
estimation methods; and exact inference. Statistical software packages
are used extensively for data analysis. Offered by Statistics. May not be
repeated for credit.

Registration Restrictions:
Required Prerequisites: (STAT 652B and 665B).
B Requires minimum grade of B-.

Enrollment is limited to Graduate or Non-Degree level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Lecture

STAT 771: Spatial Data Analysis. 3 credits.
Presents analysis techniques for spatially-indexed or spatially-
correlated data that arise in many areas of science, including medicine,
transportation, and atmospheric sciences. Focus is on data analysis
rather than theory, though theory will necessarily be covered. Topics
include analysis of point patterns, trend and surface estimation, and
spatial regression. Offered by Statistics. May not be repeated for credit.

Recommended Prerequisite: Working knowledge of R and SAS.

Registration Restrictions:
Required Prerequisites: (STAT 652B and 654B).
B Requires minimum grade of B-.

Enrollment is limited to Graduate or Non-Degree level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Lecture

STAT 773: Statistical Methods for Longitudinal Data Analysis. 3 credits.
Presents modern statistical approaches to the analysis of longitudinal
data, i.e., data collected repeatedly on experimental units over time (or
other conditions). Topics include linear mixed effects models, generalized
linear models for correlated data (including generalized estimating
equations), and computational issues and methods for fitting models.
Offered by Statistics. May not be repeated for credit.

Recommended Prerequisite: Working knowledge of SAS.

Registration Restrictions:
Required Prerequisites: STAT 652B and 654B.
B Requires minimum grade of B-.

Enrollment is limited to Graduate or Non-Degree level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Lecture

Introduces high level simulations and algorithms for complex statistical
problems using C. Topics include: pointers, arrays, random number
generation, iterative numerical algorithms, sorting, matrix operation,
numerical integration and Bayesian computation, advanced data
structure for complex problems, and parallel processing. Complex
programming problems related to statistical modeling and inference are
studied. Offered by Statistics. May not be repeated for credit.

Registration Restrictions:
Required Prerequisites: STAT 652B or CSI 672B.
B Requires minimum grade of B-.

Enrollment is limited to Graduate or Non-Degree level students.

Students in a Non-Degree Undergraduate degree may not enroll.

Schedule Type: Lecture
STAT 796: Independent Studies/Directed Readings. 1-3 credits.
Reading and research on a specific topic in statistics under guidance of graduate faculty member. Offered by Statistics. May not be repeated for credit.

**Recommended Prerequisite:** Permission of instructor and department’s graduate coordinator.

**Registration Restrictions:**
Enrollment is limited to Graduate, Non-Degree or Washington Consortium level students.

- Students in a Non-Degree Undergraduate degree may not enroll.
- Enrollment limited to students in the College of Science, Schar School of Policy and Gov or Volgenau School of Engineering colleges.

**Schedule Type:** Independent Study

STAT 798: Master’s Research Project. 3 credits.
Project chosen and completed under guidance of graduate faculty member that results in acceptable technical report. Offered by Statistics. May not be repeated for credit.

**Recommended Prerequisite:** 9 graduate credits, and permission of instructor.

**Registration Restrictions:**
Enrollment is limited to Graduate or Non-Degree level students.

- Students in a Non-Degree Undergraduate degree may not enroll.
- Enrollment limited to students in the College of Science, Schar School of Policy and Gov or Volgenau School of Engineering colleges.

**Schedule Type:** Thesis

STAT 799: Master’s Thesis. 1-6 credits.
Project chosen and completed under guidance of graduate faculty member that results in acceptable technical report and oral defense. Offered by Statistics. May be repeated within the degree for a maximum 6 credits. Equivalent to SYST 799.

**Recommended Prerequisite:** 9 graduate credits, and permission of instructor.

**Registration Restrictions:**
Enrollment is limited to Graduate or Non-Degree level students.

- Students in a Non-Degree Undergraduate degree may not enroll.
- Enrollment limited to students in the College of Science, Schar School of Policy and Gov or Volgenau School of Engineering colleges.

**Schedule Type:** Thesis

800 Level Courses

STAT 871: Statistical Data Mining. 3 credits.
Covers basic concepts, computational complexity, data preparation and compression, databases and SQL, rule-based machine learning and probability, density estimation, exploratory data analysis, cluster analysis and pattern recognition, artificial neural networks, classification and regression trees, correlation and nonparametric regression, time series, and visual data mining. Offered by Statistics. May not be repeated for credit.

**Recommended Prerequisite:** STAT 554 or 663, or permission of instructor.

**Registration Restrictions:**
Enrollment is limited to Graduate level students.

**Schedule Type:** Lecture

STAT 877: Geometric Methods in Statistics. 3 credits.
Develops foundations of geometric methods for statistics. Topics include n-dimension Euclidian geometry; projective geometry; differential geometry, including curves, surfaces, and n-dimensional differentiable manifolds; and computational geometry, including computation of convex hulls, tessellations of two-, three-, and n-dimensional spaces, and finite element grid generation. Examples include applications to scientific visualization. Offered by Statistics. May not be repeated for credit. Equivalent to CSI 877.

**Recommended Prerequisite:** STAT 751 or permission of instructor.

**Registration Restrictions:**
Enrollment is limited to Graduate level students.

- Enrollment limited to students in the College of Science, Schar School of Policy and Gov or Volgenau School of Engineering colleges.

**Schedule Type:** Lecture

STAT 889: Advanced Topics in Statistics. 3 credits.
Advanced topics not occurring in regular sequence. Offered by Statistics. May be repeated within the degree for a maximum 12 credits.

**Recommended Prerequisite:** Doctoral standing and permission of instructor.

**Registration Restrictions:**
Enrollment is limited to Graduate level students.

- Enrollment limited to students in the College of Science, Schar School of Policy and Gov or Volgenau School of Engineering colleges.

**Schedule Type:** Lecture

STAT 896: Advanced Directed Reading. 3 credits.
Individualized study with a graduate faculty member in the Department of Statistics. Syllabus and grading criteria must be preapproved by the PhD in Statistical Science Program Director. Offered by Statistics. May not be repeated for credit.

**Registration Restrictions:**
Enrollment is limited to students with a major in Statistical Science.

- Enrollment limited to students in the PHD Statistical Science program.
- Enrollment is limited to Graduate level students.
- Enrollment limited to students in a Doctor of Philosophy degree.
- Enrollment limited to students in the Volgenau School of Engineering college.

**Schedule Type:** Independent Study

900 Level Courses

STAT 971: Probability Theory. 3 credits.
A rigorous measure-theoretic treatment of probability. Includes expectation, distributions, laws of large numbers and central limit
theorems for independent random variables, characteristic function methods, conditional expectations, martingales, strong and weak convergence, and Markov chains. Offered by Statistics. May not be repeated for credit. Equivalent to CSI 971.

Registration Restrictions:
Required Prerequisites: (STAT 544\textsuperscript{B} and MATH 315\textsuperscript{B}).
\textsuperscript{B} Requires minimum grade of B.

Enrollment is limited to Graduate level students.

Schedule Type: Lecture

STAT 972: Mathematical Statistics I. 3 credits.
Focuses on theory of estimation. Includes method of moments, least squares, maximum likelihood, and maximum entropy methods. Details methods of minimum variance unbiased estimation. Topics include sufficiency and completeness of statistics, Fisher information, Cramer-Rao bounds, Bhattacharyya bounds, asymptotic consistency and distributions, statistical decision theory, minimax and Bayesian decision rules, and applications to engineering and scientific problems. Offered by Statistics. May not be repeated for credit. Equivalent to CSI 972.

Registration Restrictions:
Required Prerequisites: (STAT 652\textsuperscript{B} or CSI 672\textsuperscript{B}) and (CSI 876\textsuperscript{AB}, STAT 971\textsuperscript{AB} or CSI 971\textsuperscript{AB}).
\textsuperscript{AB} May be taken concurrently.
\textsuperscript{B} Requires minimum grade of B-.

Enrollment is limited to Graduate level students.

Schedule Type: Lecture

STAT 973: Mathematical Statistics II. 3 credits.
Continuation of STAT 972/CSI 972. Concentrates on theory of hypothesis testing. Topics include characterizing decision process, simple versus simple hypothesis tests, Neyman-Pearson Lemma, uniformly most powerful tests, unbiasedness and invariance of tests, and randomized and sequential tests. Applications of testing principles made to situations in normal distribution family and other families of distributions. Offered by Statistics. May not be repeated for credit. Equivalent to CSI 973.

Registration Restrictions:
Required Prerequisites: (STAT 972\textsuperscript{B} or CSI 972\textsuperscript{B}).
\textsuperscript{B} Requires minimum grade of B-.

Enrollment is limited to Graduate level students.

Schedule Type: Lecture

STAT 990: Dissertation Topic Presentation. 1 credit.
Students put together a professional presentation of a research proposal and present it for critique to fellow students and interested faculty. Notes: May be repeated with change of research topic, but credit towards doctoral degree is given once. Offered by Statistics. May not be repeated for credit. Equivalent to CS 990, IT 990.

Recommended Prerequisite: Completion of all course requirements for PhD, or permission of instructor.

Registration Restrictions:
Enrollment is limited to Graduate level students.

Schedule Type: Research

STAT 998: Doctoral Dissertation Proposal. 1-12 credits.
Work on research proposal that forms basis for doctoral dissertation. Notes: No more than 24 credits of STAT 998 and 999 may be applied to doctoral degree requirements. Offered by Statistics. May be repeated within the degree.

Registration Restrictions:
Enrollment is limited to students with a class of Advanced to Candidacy.

Enrollment is limited to students in the College of Science, Schar School of Policy and Gov or Volgenau School of Engineering colleges.

Schedule Type: Dissertation

STAT 999: Doctoral Dissertation. 1-12 credits.
Formal record of commitment to doctoral dissertation research under direction of faculty member in statistics. Notes: No more than 24 credits of STAT 998 and 999 may be applied to doctoral degree requirements. Offered by Statistics. May be repeated within the degree.

Registration Restrictions:
Enrollment is limited to students in the College of Science, Schar School of Policy and Gov or Volgenau School of Engineering colleges.

Schedule Type: Dissertation