

Department of Statistics

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FACULTY

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Information is needed to solve the many problems of today's world. How much information? What kind? After it is obtained, what must be done with it? Statisticians are trained to help answer these questions. Early admission into the Statistics Department will allow students to plan their programs so that the math and statistics prerequisites can be taken in the proper sequence.

The department offers BA, BS, MA and PhD degrees with a major in Statistics. A minor is also available.

Major Program Requirements - Statistics

Students are encouraged to supplement their work in statistics with courses from areas such as economics, biology, accounting, finance, marketing, management, psychology, sociology, engineering, agriculture and atmospheric science. In addition, students must complete all degree, college and University graduation requirements, including University general education.

Credit for beginning courses:

- A student may not receive credit toward an undergraduate degree for more than one of STAT 1200, 1300 and 1400.
- A student may not receive credit toward an undergraduate degree for more than one of STAT 2500 and 2530.
- Subject to the above restrictions, a student may receive a maximum of 4 credits toward an undergraduate degree for any combination of STAT 1200, 1300, 1400, 2200, 2500 and 2530.
- A student may not receive credit toward an undergraduate degree for any statistics course numbered 2999 or below if a statistics course numbered 4000 or above was successfully completed prior to or concurrent with the course in question. Exceptions may be approved at the discretion of the department.

Options

Students may pursue either a BA or a BS degree. For both degrees, students may pursue either a traditional track or an applied track. Students who are interested in graduate study in statistics are strongly encouraged to follow the traditional track.

Major core requirements - Bachelor of Arts

Mathematics courses

Traditional track

MATH 1500: Analytical Geometry & Calculus I
MATH 1700: Calculus II
MATH 2300: Calculus III
MATH 4140: Matrix Theory

Applied track

MATH 1500: Analytic Geometry & Calculus I OR
MATH 1300: Finite Mathematics and MATH 1320:
Elements of Calculus

6 additional credits in statistics (beyond those used to fulfill the statistics requirements of the degree) or approved statistically-oriented courses; must be numbered 4000 or above and may not include STAT 4050: Connecting Statistics to Middle and Secondary Schools

Statistics Courses

Both tracks

STAT 4970: Senior Seminar
18 additional credits offered by the department, at least 15 of which must be numbered 3000 or above and may not include STAT 4050: Connecting Statistics to Middle and Secondary Schools or more than 3 credits of STAT 4999: Departmental Honors in Statistics

Computing Courses

Both tracks

CS1040: Introduction to Problem Solving and Programming OR
CS1050: Algorithm Design and Programming I

Major core requirements - Bachelor of Science

Mathematics courses

Traditional track

MATH 1500: Analytical Geometry & Calculus I
MATH 1700: Calculus II
MATH 2300: Calculus III
MATH 4140: Matrix Theory

Applied Track

MATH 1500: Analytic Geometry & Calculus I OR
MATH 1300: Finite Mathematics and MATH 1320:
Elements of calculus

6 additional credits in statistics courses (beyond those used to fulfill the statistics requirements of the degree) or approved statistically-oriented courses; must be numbered 4000 or above

Statistics courses

Both tracks

STAT 4970: Senior Seminar
18 additional credits offered by the department, at least 15 of which must be numbered 3000 or above and may not include STAT 4050: Connecting Statistics to Middle and Secondary Schools

Computing courses

Both tracks

CS1040: Introduction to Problem Solving
Programming or
CS1050: Algorithm Design and Programming I and
3 additional credits in computer science or other approved computing courses (STAT 4110: Statistical Software and Data Analysis may be used as part of this requirement if it is not counted in statistics group above.)

Professional writing courses

ENGLSH 2030: Professional Writing

Foreign language option for students pursuing a BS degree

Students pursuing the BS degree may elect to take an alternative to a foreign language. Such students must complete no fewer than 12 upper-class credits that are not from the parent department, are not normally required of departmental majors and do not appear elsewhere in the area of concentration. This program must be carefully planned to form a coherent unit and must be approved by the director of undergraduate studies.

The following are examples of foreign language alternatives:

- mathematical sciences
- biological sciences
- behavioral sciences
- physical sciences
- business
- engineering

Minor in Statistics

A minor in statistics requires a minimum of 15 credits in statistics courses numbered 3000 or above. The courses used to complete the minor must be chosen in consultation with the director of undergraduate studies and must include at least one of the following:

- STAT 3500: Introduction to Probability and Statistics II
- STAT 4710: Introduction to Mathematical Statistics
- STAT 4750: Introduction to Probability Theory

A maximum of 3 of the 15 credits may be in:

- STAT 4002: Topics in Statistics or
- STAT 4085: Problems in Statistics for Undergraduates

Departmental Honors

To be admitted to the undergraduate honors program in the Department of Statistics, a student must have completed at least 12 of the 21 credits of statistics courses required for the major, have a grade-point average of at least 3.25 in all completed statistics courses, and identify a faculty member from the department who agrees to supervise the student's honors research project.

In order to receive the departmental honors designation, students who have been accepted into the program must graduate with a grade-point average of at least 3.25 in statistics courses, prepare a senior thesis based on their honors project, and present the results of the thesis in a departmental colloquium or other public forum approved by their mentor. They also must earn a grade of B or better in 3 credits of STAT 4999.

Sample Eight-Semester Programs

Bachelor of Arts with a major in Statistics

Check the *Undergraduate Catalog* for prerequisites of courses.

Fall I	Winter I
+MATH 1160 3	MATH 1500 5
+ENGLSH 1000 3	CS 1040 3
+Bio/phys science lab 5	+Foreign language II 5
+Foreign language I 5	+American history or government 3
Total..... 16	Total 16

Fall II
MATH 1700 5
STAT 2500 3
+Foreign language III 3
+WI elective..... 3
Total..... 14

Fall III
MATH 4140 3
+Hum/fine arts elective... 3
+Soc science elective 3
STAT 4510 3
Elective 3
Total..... 15

Fall IV
STAT 4750 3
+Hum/fine arts elective... 3
Electives 9
Total..... 15

Winter II
MATH 2300 3
STAT 3500 3
+Behav science elective ... 3
+Hum/fine arts elective 3
+Soc science elective 3
Total 15

Winter III
+Behav sci elective 3
+Hum/fine arts elective 3
STAT 4530..... 3
STAT 4110 3
Elective..... 3
Total 15

Winter IV
STAT 4760 3
+STAT 4970 3
Electives 8
Total 14

Bachelor of Science with a major in Statistics

Check the *Undergraduate Catalog* for prerequisites of courses.

Fall I
+MATH 1160 3
+ENGLSH 1000 3
+Hum/fine arts elective... 3
+American history of government 3
Elective 3
Total..... 15

Fall II
MATH 1700 5
STAT 2500 3
ENGLSH 2030 3
+Hum/fine arts elective... 3
Elective 3
Total..... 17

Fall III
MATH 4140 3
STAT 4510 3
Electives 6
*Foreign language..... 3 substitute
Total..... 15

Fall IV
STAT 4750 3
Electives 8
*Foreign language..... 3 substitute
Total..... 14

Winter I
MATH 1500 5
CS 1040 3
+Soc/behav science elec... 3
+Bio/phys science lab 5
Total 16

Winter II
MATH 2300 3
STAT 3500 3
+Hum/fine arts elective 3
+WI elective 3
Elective..... 3
Total 15

Winter III
STAT 4530 3
STAT 4110 3
+Soc/behav science elective 3
*Foreign language substitute 3
Elective..... 3
Total 15

Winter IV
STAT 4760 3
+STAT 4970 3
Electives 4
Total 10

* Courses used as area in lieu of foreign language
 + Course meets University General Education and/or campus requirements.

STATISTICS COURSES

STAT 1200—Introductory Statistical Reasoning (3). Statistical concepts and critical reasoning needed to evaluate conclusions based on quantitative information in health studies, opinion polls, etc. Students may not receive credit if they have received or are concurrently receiving credit for a higher numbered course offered by the Statistics Department. Prerequisite: grade in C range or better in Math 1100, 1120, 1160 or 1180 or exemption from college algebra by examination.

STAT 1300—Elementary Statistics (3). Collection, presentation of data; averages; dispersion; introduction to statistical inference, correlation and regression. Students may not receive credit if they have received or are concurrently receiving credit for another course offered by the Statistics Department. Prerequisite: grade in C range or better in MATH 1100, 1120, 1160, or 1180 or exemption from college algebra by examination.

STAT 1300H—Elementary Statistics - Honors (3). Collection, presentation of data; averages; dispersion; introduction to statistical inference, correlation and regression. Students may not receive credit if they have received or are concurrently receiving credit for another course offered by the Statistics Department. Prerequisite: grade in C range or better in MATH 1100, 1120, 1160, or 1180 or exemption from college algebra by examination. Honors eligibility required.

STAT 1400—Elementary Statistics for Agriculture (3). Designed for students studying agriculture and related fields. Descriptive statistics, probability, estimation, hypothesis testing, correlation and regression. Students may not receive credit if they have received or are concurrently receiving credit for another course offered by the Statistics Department.

STAT 2200—Introductory Statistical Methods (1). Designed to upgrade the curriculum of Statistics 1200 or 1300 or 1400 to the level of Statistics 2500. Students may not receive credit for Statistics 2200 if they have completed a course from the Department of Statistics numbered 2500 or higher. Prerequisites: grade in C range or better in STAT 1200, 1300, or 1400.

STAT 2500—Introduction to Probability and Statistics I (3). Designed primarily for students in College of Business. Descriptive statistics, probability, random variables, sampling distributions, estimation, confidence intervals, hypothesis tests. Prerequisite: grade of C- or better in MATH 1300, 1320, 1400 or 1500.

STAT 2530—Statistical Methods in Natural Resources (3). Statistical methods, with emphasis on applications to natural resources and including computer exercises. Prerequisite: a college-level computing course and a grade in the C range or better in MATH 1100, 1120, 1160, or 1180.

STAT 3500—Introduction to Probability and Statistics II (3). Continuation of 2500. Coverage of additional topics including: Regression; model building; ANOVA; nonparametric methods; use of a statistical computer package. Prerequisite: grade in the C range of STAT 2200, 2500, 2530, or concurrent enrollment in STAT 2200.

STAT 4002—Topics in Statistics-Biological/Physical/Mathematics(cr.arr.) Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Repeatable with departmental consent. Prerequisites: junior standing and instructor's consent.

STAT 4050—Connecting Statistics to Middle and Secondary Schools (3). Primarily for middle and secondary mathematics education majors. Uses standards-based curricular materials to demonstrate connections between college-level statistics and content taught in middle and secondary schools. No credit toward a graduate degree in statistics. Prerequisite: an introductory course in statistics or MATH 2320 or instructor's consent.

STAT 4085—Problems in Statistics for Undergraduates (1-3). Independent investigations. Reports on approved topics. Prerequisite: instructor's consent.

STAT 4110—Statistical Software and Data Analysis (3). Programming with major statistical packages emphasizing data management techniques and statistical analysis for regression, analysis of variance, categorical data, descriptive statistics, non-parametric analyses, and other selected topics. Prerequisite: STAT 3500, 7070, 4710/7710, 4760/7760, or instructor's consent.

STAT 4150—Applied Categorical Data Analysis (3). The study of statistical models and methods used in analyzing categorical data. The use of computing is emphasized and calculus is not required. No credit for students who have previously completed STAT 4830. No credit toward a graduate degree in statistics. Prerequisites: STAT 3500, 7070, 4710/7710, or 4760/7760 or instructor's consent.

STAT 4210—Applied Nonparametric Methods (3). Statistical methods when the functional form of the population is unknown. Applications emphasized. Comparisons with parametric procedures. Goodness of-fit, chi-square, comparison of several populations, measures of correlation. Prerequisite: STAT 3500, 7070, 4710/7710, 4760/7760, or instructor's consent.

STAT 4250—Quality Control (3). Statistical control charts, economic design of control charts, acceptance sampling, pareto chart, and other graphical procedures, Deming philosophy, Taguchi methods. Prerequisites: STAT 3500, 7070, 4710/7710, 4760/7760, or instructor's consent.

STAT 4310—Sampling Techniques (3). Theory of probability sampling designs. Unrestricted random sampling. Stratified sampling. Cluster sampling. Multistage or subsampling. Ratio estimates. Regression estimates. Double sampling. Prerequisites: STAT 3500, 7070, 4710/7710, 4760/7760, or instructor's consent.

STAT 4350—Operations Research (3). Study of mathematical and statistical models employed in operations research. Prerequisites: STAT 3500, 7070, 4710/7710, 4760/7760, or instructor's consent.

STAT 4410—Biostatistics (3). Study of statistical techniques for the design and analysis of clinical trials, laboratory studies and epidemiology. Topics include randomization, power and

sample size calculation, sequential monitoring, carcinogenicity bioassay and case-cohort designs. Prerequisite: STAT 3500, 7070, 4710/7710, 4760/7760, or instructor's consent.

STAT 4450—Applied Statistical Methods for Bioinformatics (3). Random variables; Point estimation; Multiple t-test; Likelihood principle; Analysis of variance; Probabilistic methods for sequence modeling; Gene expression analysis; Protein structure prediction; Genome analysis; Hierarchical clustering and Gene classification. Prerequisites: STAT 3500, 7070, 4710/7710, 4760/7760, or instructor's consent.

STAT 4510—Regression and Correlation Analysis (3). Measurement of relationships among variables including multiple regression, partial correlation, and some nonparametric methods. Prerequisites: Prerequisites: STAT 3500, 7070, 4710/7710, 4760/7760, or instructor's consent.

STAT 4530—Analysis of Variance (3). Study of analysis of variance and related modeling techniques for cases with fixed, random, and mixed effects. Exposure to designs other than completely randomized designs including factorial arrangements, repeated measures, nested, and unequal sample size designs. Prerequisite: STAT 3500, 7070, 4710/7710, 4760/7760, or instructor's consent.

STAT 4540—Experimental Design (3). Examination and analysis of modern statistical techniques applicable to experimentation in social, physical or biological sciences. Prerequisites: STAT 4530/7530 or instructor's consent.

STAT 4710—Introduction to Mathematical Statistics (3). (same as Mathematics 4315). Introduction to theory of probability and statistics using concepts and methods of calculus. Prerequisites: MATH 2300 or instructor's consent. No credit for MATH 4315.

STAT 4750—Introduction to Probability Theory (3). (same as Mathematics 4320). Probability spaces; random variables and their distributions; repeated trials; probability limit theorems. Prerequisites: MATH 2300 or instructor's consent.

STAT 4760—Statistical Inference (3). (same as Mathematics 4520). Sampling; point estimation; sampling distribution; tests of hypotheses; regression and linear hypotheses. Prerequisite: STAT 4750/7750.

STAT 4810—Nonparametric Methods (3). A first course in Non-parametric statistical methods based on ranks. Both theory and application are emphasized. Two-sample problems. K-sample problems. Tests for independence. Contingency tables. Goodness-of-fit tests. Prerequisite: STAT 4710/7710 or 4760/7760 or instructor's consent.

STAT 4830—Categorical Data Analysis (3). Discrete distributions, frequency data, multinomial data, chi-square and likelihood ratio tests, logistic regression, log linear models, rates, relative risks, random effects, case studies. Prerequisites: STAT 4710/7710 or 4760/7760 or instructor's consent.

STAT 4850—Introduction to Stochastic Processes (3). Study of random processes selected from: Markov chains, birth and death processes, random walks, Poisson processes,

renewal theory, Brownian motion, Gaussian processes, white noise, spectral analysis, applications such as queuing theory, sequential tests. Prerequisite: STAT 4750/7750 or instructor's consent.

STAT 4870—Time Series Analysis (3). A study of univariate and multivariate time series models and techniques for their analyses. Emphasis is on methodology rather than theory. Examples are drawn from a variety of areas including business, economics and soil science. Prerequisites: STAT 4710/7710 or 4760/7760 or instructor's consent.

STAT 4890—Bayesian Data Analysis and Statistical Computation (3). Bayes formulas, choices of prior, empirical Bayesian methods, hierarchical Bayesian methods, statistical computation, Bayesian estimation, model selection, predictive analysis, applications, Winbugs software. Prerequisites: STAT 4710/7710 or 4760/7760 or instructor's consent.

STAT 4970—Senior Seminar (3). A capstone course required of and open only to senior statistics majors. Students will participate in statistical consulting, attend colloquia, and review articles in professional journals. Writing of reports will be emphasized. Prerequisite: senior statistics major and 12 completed hours of statistics courses or instructor's consent.

STAT 4999—Departmental Honors in Statistics (1-3). Special work for Honors candidates in statistics. May be repeated for credit.