

## STATISTICS

### Statistics

College of Science, Engineering, & Technology  
Department of Mathematics & Statistics  
273 Wissink Hall • 507-389-1453  
Web site: [www.mnsu.edu/dept/mathstat/](http://www.mnsu.edu/dept/mathstat/)

Chair: Ernest Boyd

Larry Pearson, Mezbahur Rahman, Deepak Sanjel

Statistics in this department is designed to provide a basic theoretical background for statistical inference and some techniques and practice in applying the theory. Courses in statistics would be useful for anyone as a tool in another area of study or as preparation for more advanced study of statistics. Many students choose statistics as an option in their general education or take statistics as a requirement for their major. The Department of Statistics also offers both a major and a minor in statistics.

The major provides a background in statistics, mathematics, and computer science to enable students to pursue a career in business, industry, or actuarial science as well as to pursue advanced study in statistics. The major is organized into 3 tracks to allow an emphasis in applied mathematics, computer science, or biological science. A well prepared student can expect to complete the major in four years. The minor gives students a basic core of statistics that would compliment majors in many areas by providing a thorough grounding in basic statistical principles, methods of data analysis, and a knowledge base to assist in understanding statistical procedures applied to a variety of disciplines.

A student must be admitted to a major to be permitted to take 300- and 400-level courses. Admission is granted by the department. In addition to minimum university admission requirements of: a minimum of 32 earned semester credit hours and a minimum cumulative GPA of 2.00, students must complete 10 credits in mathematics and statistics counting towards the Major with a 2.5 GPA.

#### STATISTICS MAJOR

##### Required for Major (76 credits):

STAT	154	Elementary Statistics (3)
STAT	354	Concepts of Probability and Statistics (3)
STAT	357	Sample Survey and Design (3)
STAT	358	Categorical Data Analysis (3)
STAT	359	Nonparametric Methods (3)
STAT	450	Regression Analysis (3)
STAT	451	Experimental Designs (3)
STAT	492	Statistics Capstone Experience (3 )
MATH	455	Theory of Statistics I (4) <b>OR</b>
STAT	455	Theory of Statistics I (4)
MATH	456	Theory of Statistics II (4) <b>OR</b>
STAT	456	Theory of Statistics II (4)
MATH	121	Calculus I (4)
MATH	122	Calculus II (4)
MATH	223	Calculus III (4)
MATH	247	Linear Algebra I (4)
CS	110	Computer Science I (4)
CS	111	Computer Science II (4)
CS	230	Intelligent Systems (4)

Choose one of the following options:

##### Applied Mathematics Track (minimum of 16 credits from the following list):

MATH	290	Foundations of Mathematics (4)
MATH	321	Ordinary Differential Equations (4)
MATH	375	Introduction to Discrete Mathematics (4)
MATH	422	Partial Differential Equations (4)
MATH	425	Mathematical Modeling (4)
MATH	470	Numerical Analysis I (4)
MATH	471	Numerical Analysis II (4)

##### Computer Science Track (minimum of 16 credits from the following list):

CS	210	Data Structures (4)
CS	220	Machine Structures and Programming (3)
CS	320	Computer Architecture (3)
CS	340	Concepts of Database Management Systems (3 )
CS	350	Network Architectures (3)
CS	370	Concepts of Programming Language (3)
CS	433	Data Mining/Machine Learning (3)
MATH	470	Numerical Analysis I (4)
MATH	471	Numerical Analysis II (4)

##### Biological Science Track (minimum of 16 credits from the following list):

BIOL	105	General Biology I (4)
BIOL	211	Genetics (4)
BIOL	320	Cell Biology (4)
BIOL	479	Molecular Biology (4)

#### STATISTICS MINOR

##### Required for Minor (20-21 credits):

MATH	121	Calculus I (4)
MATH	122	Calculus II (4)
STAT	354	Concepts of Probability and Statistics (3)
STAT	450	Regression Analysis (3)
STAT	451	Experimental Designs (3)
Choose one course from the following:		
STAT	357	Sample Survey and Design (3)
STAT	358	Categorical Data Analysis (3)
STAT	359	Nonparametric Methods (3)
STAT	455	Theory of Statistics I (4)

#### POLICIES/INFORMATION

**GPA Policy.** Statistics minors must earn a grade of "C" or better in all courses applied to the minor.

**P/N Grading Policy.** All 300- and 400-level courses are offered for grade only with the exception of STAT 498 and STAT 499 which are available for both P/N and letter grade.

**Credit by examination.** Will not be approved for courses in which a student has already received a grade.

**Credit Limitation.** A student may not receive credit for STAT 354 after completing MATH 455 or STAT 455.

#### COURSE DESCRIPTIONS

##### STAT 154 (3) Elementary Statistics

Basic descriptive measures of data, elementary probability concepts and their relation to statistical inference, tests of hypotheses and confidence intervals. An appropriate preparation for more advanced statistics courses in any area.

Pre: Must achieve a score of 18 or better on the MnSCU Math Readiness Test, or have achieved an ACT Math subscore of 19 or higher, or successful completion of MATH 098.

Fall, Spring  
GE-4

##### STAT 354 (3) Concepts of Probability & Statistics

This is a calculus-based course covering introductory level topics of probability and statistics. It is designed to meet the needs of both the practitioner and the person who plans further in-depth study. Topics include probability, random variables and probability distributions, joint probability distributions, statistical inference (both estimation and hypothesis testing), analysis of variance, regression, and correlation. Same as MATH 354.

Pre: MATH 122 with "C" or better or consent  
Fall, Spring

---

## STATISTICS

---

### **STAT 357 (3) Sample Survey and Design**

Random sampling, systematic sampling methods including stratified random sampling, cluster sampling and two-stage sampling, ratio estimation, regression, and population size estimation.

Pre: MATH 354 / STAT 354 or STAT 154 with "C" or better or consent  
ALT-Fall

### **STAT 358 (3) Categorical Data Analysis**

Forms of multivariate analysis for discrete data, two dimensional tables, models of independence, log linear models, estimation of expected values, model selection, higher dimensional tables, logit models and incompleteness.

Pre: MATH 354 / STAT 354 or STAT 154 with "C" or better or consent  
ALT-Fall

### **STAT 359 (3) Nonparametric Methods**

Derivation and usage of nonparametric statistical methods, applications in count and rank data, analysis of variance for ranked data, statistical quality control.

Pre: MATH 354 / STAT 354 or STAT 154 with "C" or better or consent

### **STAT 450 (3) Regression Analysis**

Simple and multiple regression, correlation, analysis of variance and covariance.

Pre: MATH 354 / STAT 354 or STAT 455 with "C" or better or consent  
ALT-Spring

### **STAT 451 (3) Experimental Designs**

Completely randomized, block, fractional factorial, incomplete block, split-plot, Latin squares, expected mean squares, response surfaces, confounding, fixed effects and random effects models.

Pre: MATH 354 / STAT 354 or STAT 455 with "C" or better or consent  
ALT-Spring

### **STAT 455 (4) Theory of Statistics I**

A mathematical approach to statistics with derivation of theoretical results and of basic techniques used in applications. Includes probability, continuous probability distributions, multivariate distributions, functions of random variables, central limit theorem and statistical inference. Same as MATH 455.

Pre: MATH 223 with "C" or better or consent  
Fall

### **STAT 456 (4) Theory of Statistics II**

A mathematical approach to statistics with derivation of theoretical results and of basic techniques used in applications, including sufficient statistics, additional statistical inference, theory of statistical tests, inferences about normal models and nonparametric methods. Same as MATH 456.

Pre: MATH 455 / STAT 455 with "C" or better or consent

### **STAT 488 (1-3) Seminar**

The study of a particular topic primarily based upon recent literature. May be repeated for credit on each new topic.

### **STAT 491 (1-4) In-Service**

A course designed to upgrade the qualifications of persons on-the-job. May be repeated for credit on each new topic.

### **STAT 492 (3) Statistics Capstone Experience**

This course is designed to allow undergraduate students an opportunity to integrate their statistics experiences by engaging each student in working on problems in applied or theoretical statistics.

Pre: STAT 357, STAT 358, STAT 359, STAT 450 (at least two of these)  
Spring

### **STAT 495 (1-4) Selected Topics**

A course in an area of statistics not regularly offered. May be repeated for credit on each new topic.

### **STAT 498 (1-12) Internship**

Provides a student the opportunity to gain expertise and experience in a special field under the supervision of a qualified person.

### **STAT 499 (1-4) Individual Study**

Independent individual study under the guidance and direction of a faculty member. Special arrangements must be made with an appropriate faculty member. May be repeated for credit of each new topic.