

STATISTICS BS AND MINOR

Statistics

College of Science, Engineering, & Technology
Department of Mathematics & Statistics
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Website: www.cset.mnsu.edu/dept/mathstat/

Chair: Charles Waters

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Statistics is the mathematical science of studying and learning from data. Statisticians acquire, organize, analyze, present and draw inferences from data. Inferences about a population are communicated with measures of likelihood. Statistical analysis is used in a variety of disciplines to communicate uncertainties for the purpose of making informed decisions. Applications of statistics are all around us such as in weather forecasting, surveys, quality control, market demand, causality, and effectiveness of treatments, to name only a few.

The Department offers a major and minor in statistics. The major provides a sufficient 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 4 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 complement 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.

Academic Map/Degree Plan at www.mnsu.edu/programs/#All

POLICIES/INFORMATION

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 or higher.

Contact the College of Science, Engineering and Technology Student Relations Office for application procedures.

GPA Policy. Statistics majors and minors must earn a grade of "C" (2.0) or better in all courses applied to the major or minor.

Course Application Policy. Within each major or minor, no course may be applied to more than one requirement.

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. 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 or MATH 354 after completing MATH 455 or STAT 455.

Policy: Students seeking enrollment in Math 112: College Algebra or Math 201: Elements of Mathematics must demonstrate readiness to succeed in the course through one of the following means:

1. ACT mathematics sub-score of 22 or higher, or
2. ACCUPLACER Intermediate Algebra Test score of 60 or higher

Students not meeting one of these requirements are placed in Math 098: Intermediate Algebra.

Students seeking enrollment in courses beyond those listed above must demonstrate readiness to succeed in the course through one of the following means: ACT score, SAT score, ACCUPLACER score(s), or satisfactory completion (i.e. grade of C or better) of pre-requisite coursework, according to the chart below.

Course	Minimum ACT/SAT Math Subscore		Minimum Accuplacer Intermediate Algebra Score		Minimum Accuplacer College Level Math Score		Minimum Accuplacer Calculus Readiness Score		Course Prerequisites
Math 112	22/520	OR	60		N/A		N/A	OR	Successful Completion of Math 098
Math 113	22/520	OR	60	AND	84		N/A	OR	Math 112 with "C" or better
Math 115	23/530	OR	60	AND	96		N/A	OR	Math 98 and permission from Dept. Chair
Math 121	24/550	OR	60	AND	84	AND	21	OR	Math 115 or both Math 112 and 113 with "C" or better
Math 130	23/530	OR	60	AND	84		N/A	OR	Math 112 or Math 115 with a "C" or better
Math 181	23/530	OR	60	AND	84		N/A	OR	Math 112 or Math 115 with a "C" or better
Math 201	22/520	OR	60		N/A		N/A	OR	Successful Completion of Math 098
Stat 154	19/460	OR	60		N/A		N/A	OR	Successful Completion of Math 098, 112, 115, or 121

Students who earned an SAT Math score of 530 or higher are eligible to place in MATH 112 as a minimum. Please contact the Department of Mathematics & Statistics for further placement information when using SAT scores.

Students who earned a Minnesota Comprehensive Assessment (MCA) score of 1158 or higher are eligible to place in Math 112 as a minimum. An earned MCA score of 1148 or higher is eligible to place in STAT 154. Please contact the Department of Mathematics & Statistics for further placement information when using MCA scores.

Procedures: Students may substitute for the above requirements based on documentation of:

1. equivalent or higher scores on standardized college admissions tests, such as SAT quantitative scores, that report a separate mathematics sub-score within two calendar years;
2. successful completion of equivalent prior post-secondary education, such as course transfer evaluations or Cambridge International Examinations; or
3. enrollment exclusively in non-credit courses or programs.

Students requesting such substitutions should submit the documentation to the Chair of the Department of Mathematics and Statistics for evaluation. The evaluation will be based on nationally accepted concordances between the testing instruments and/or courses. The Chair of the Department of Mathematics and Statistics or designee should respond in writing to student requests within three weeks of receiving them.

Procedure for Waiver

1. Students not meeting the requirements for enrollment in Math 112, Math 201 or Stat 154 may request a waiver to this policy.
2. Written requests for waivers to the policy must be submitted to the Chair of the Department of Mathematics and Statistics, and should include evidence of alternate means of demonstrating readiness for college algebra including but not limited to:
 - a. High school or recent post-secondary coursework which would indicate adequate preparation (transcripts or other records which include course titles, levels and grades are acceptable), or

- b. Verification of extenuating circumstances which may have affected performance on previous exams.
3. Requests for waivers should be submitted by the following deadlines:
 - a. August 5th for fall semester enrollment,
 - b. December 1st for spring semester enrollment, and
 - c. May 1st for summer session enrollment.
4. The Chair of the Department of Mathematics and Statistics or designee should respond in writing to student requests within three weeks of receiving them.
5. Students whose initial requests are denied may submit a written appeal to the Dean of the College of Science, Engineering and Technology. The Dean should respond in writing, with a copy to the Chair of the Department of Mathematics and Statistics.
6. The Dean's decision is the final step in this appeal process.

Policy Rationale: The purpose of the policy is to place students in a course that is developmentally appropriate to help ensure their long term success. Data suggests students not meeting these guidelines have a higher likelihood of having to repeat a course.

STATISTICS BS

Degree completion = 120 credits

Required General Education

MATH 121 Calculus I (4)

Major Common Core

IT	210	Fundamentals of Programming (4)
IT	214	Fundamentals of Software Development (4)
IT	340	Introduction to Database Systems (4)
MATH	122	Calculus II (4)
MATH	223	Calculus III (4)
MATH	247	Linear Algebra I (4)
STAT	154	Elementary Statistics (4)
STAT	354	Concepts of Probability and Statistics (4)
STAT	450	Regression Analysis (3)
STAT	451	Design and Analysis of Experiments (3)
STAT	455	Theory of Statistics I (4)
STAT	456	Theory of Statistics II (4)
STAT	457	Sample Survey, Design and Analysis (3)
STAT	458	Categorical Data Analysis (3)
STAT	459	Nonparametric Methods (3)
STAT	492	Statistics Capstone Experience (3)

Major Emphasis: Applied Mathematics Track

(choose a 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)

Major Emphasis: Information Technology Track

(choose a minimum of 16 credits from the following list)

IT	310	Data Structures & Algorithms (4)
IT	320	Machine Structures and Operating Systems (4)
IT	350	Information Security (4)
IT	360	Introduction to Data Communication and Networking (4)
IT	380	Systems Analysis and Design (4)
MATH	470	Numerical Analysis I (4)
MATH	471	Numerical Analysis II (4)

Major Emphasis: Biological Science Track

(choose a 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)

Required Minor: None

Major Emphasis: Actuarial Track

(Minimum 16 credits from the following list) FINA 480 may substitute for FINA 467

FINA	362	Business Finance (3)
FINA	460	Investments (3)
FINA	467	Insurance and Risk Management (3)
MATH	460	Actuarial Applications in Probability (3)
MATH	461	Mathematical Theory of Interest (4)

Required Minor: None

STATISTICS MINOR

Required for Minor

MATH	121	Calculus I (4)
MATH	122	Calculus II (4)
STAT	354	Concepts of Probability and Statistics (4)
STAT	450	Regression Analysis (3)
STAT	451	Design and Analysis of Experiments (3)
(choose one course from the following)		
STAT	455	Theory of Statistics I (4)
STAT	457	Sample Survey, Design and Analysis (3)
STAT	458	Categorical Data Analysis (3)
STAT	459	Nonparametric Methods (3)

COURSE DESCRIPTIONS

STAT 154 (4) Elementary Statistics

An introduction to statistical concepts and methods that is applicable to all disciplines. Topics include descriptive measures of data, probability and probability distributions, statistical inference, tests of hypotheses, confidence intervals, correlation, linear regression, and analysis of variance. The use of statistical software will be emphasized. Prerequisite: Satisfy Placement Table in this section, or MATH 098 with grade of P. Fall, Spring, Summer
GE-4

STAT 221 (3) Applied Probability and Statistics for Engineers

An introduction to statistics with emphasis on the applied probability models used in Science and Engineering. Topics covered include samples, probability, probability distributions, estimation, one and two samples hypotheses tests, correlation, simple and multiple linear regressions. Prerequisite: MATH 112 with grade of "C" (2.0) or better
Spring

STAT 354 (4) Concepts of Probability & Statistics

A calculus based introduction to probability and statistics. Topics include probability, random variables, probability distributions (discrete and continuous), joint probability distributions (discrete and continuous), statistical inference (both estimation and hypothesis testing), confidence intervals for distribution of parameters and their functions, sample size determinations, analysis of variance, regression, and correlation. This course meets the needs of the practitioner and the person who plans further study in statistics. Same as MATH 354.

Prerequisite: MATH 122 with C or better or consent

Fall, Spring, Summer

STAT (3) 356 Introduction to Programming in SAS

Introduction to basic programming techniques: creating DATA and PROC statements, libraries, functions, programming syntax, and formats. Descriptive and Inferential statistics in SAS. Emphasis is placed on using these tools for statistical analyses. Working with arrays, loop and SAS macro.

Prerequisite: STAT 154 or instructor's approval

On Demand

STAT 398 (0) CPT: Co-Operative Experience

Curricular Practical Training: Co-Operative Experience is a zero-credit full-time practical training experience for one summer and on adjacent fall or spring term. Special rules apply to preserve full-time student status. Please contact an advisor in your program for complete information.

Prerequisite: At least 60 credits earned; in good standing; instructor permission; co-op contract; other prerequisites may also apply.

Fall, Spring, Summer

STAT 450 (3) Regression Analysis

Simple and multiple linear regression, model adequacy checking and validation, identification of outliers, leverage and influence, polynomial regression, variable selection and model building strategies, nonlinear regression, and generalized linear regression. Prerequisite: MATH 354 / STAT 354 or STAT 455 with "C" (2.0) or better or consent
Spring

STAT 451 (3) Design and Analysis of Experiments

Randomized complete block design, Latin squares design, Graco- Latin squares design, balanced incomplete block design, factorial design, fractional factorial design, response surface method, fixed effects and random effects models, nested and split plot design.

Prerequisite: MATH 354 / STAT 354 or STAT 455 with "C" (2.0) or better or consent
Fall

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.

Prerequisite: MATH 223 with "C" (2.0) 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.

Prerequisite: MATH 455, STAT 455 with "C" (2.0) or better or consent
Spring

STAT 457 (3) Sample Survey, Design and Analysis

Sampling distributions: means and variances. Bias, robustness and efficiency. Random sampling, systematic sampling methods including stratified random sampling, cluster sampling and two-stage sampling, ratio, regression, and population size estimation. Suitable statistical software is introduced, for example, MATLAB, R, SAS, etc.

Prerequisite: MATH 354, STAT 354 or STAT 154 with "C" (2.0) or better or consent
Fall (Even Years)

STAT 458 (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, logistic models and incompleteness. Logistic regression. Suitable statistical software is introduced, for example, MATLAB, R, SAS, etc.

Prerequisite: MATH 354, STAT 354 or STAT 154 with "C" (2.0) or better or consent
Fall (Odd Years)

STAT 459 (3) Nonparametric Methods

Derivation and usage of nonparametric statistical methods in univariate, bivariate, and multivariate data. Applications in count, score, and rank data, analysis of variance for ranked data. Nonparametric regression estimation. Suitable statistical software is introduced, for example, MATLAB, R, SAS, etc.

Prerequisite: MATH 354, STAT 354 or STAT 154 with "C" (2.0) or better or consent
Spring (Even Years)

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.

Prerequisite: STAT 457, STAT 458, STAT 459, 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.