Statistics

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 to more than one requirement.

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.

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

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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
2017-2018 Undergraduate Catalog

Statistics Minor

Required Minor: None

Required for Minor

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<td>Calculus II</td>
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</tr>
<tr>
<td>STAT 354</td>
<td>Concepts of Probability and Statistics</td>
<td>4</td>
</tr>
<tr>
<td>STAT 450</td>
<td>Regression Analysis</td>
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</tr>
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<td>Sample Survey, Design and Analysis</td>
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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.
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 distributions, estimation, one and two samples hypothesis tests, correlation, simple and multiple linear regressions.
Prerequisite: MATH 112 with grade of “C” (2.0) or better

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, estimation, one and two samples hypotheses tests, correlation, simple and multiple linear regression.
Prerequisite: MATH 122 with C or better or consent

Fall, Spring, Summer

STAT 356 (3) 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, Graeco-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

Required General Education

Required for Minor

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Fall, Spring, Summer

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Prerequisite: MATH 122 with C or better or consent

Fall, Spring, Summer

STAT 356 (3) 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.
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Spring

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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.