

# MTH - Applied Statistics Graduate Program

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*Applied Statistics Program*  
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The Master of Science in Applied Statistics Program provides a deeper and broader incorporation of statistics than the undergraduate program, emphasizing its multidisciplinary nature. For example, coursework in the UW-La Crosse program includes data mining and other application-oriented courses. The Applied Statistics Graduate Program involves research experience that allows students to work first hand with regional business partners or other programs on campus. The program aims to foster "life-long learning through collaboration, innovation, and discovery" and to "prepare students to take their place in a constantly changing world community" in concordance with the UW-La Crosse Mission.

Career opportunities and opportunities for promotion in the field of statistics are greater for those with advanced degrees. The Wisconsin Department of Workforce Development lists a master's degree as the typical education level for entry as a statistician. Furthermore, the *U.S. Bureau of Labor Statistics Occupational Outlook Handbook* projects a national 34% growth for the occupation of statistician from 2014-2024, which is much faster than the average growth for most occupations. Growth is expected to result from more widespread use of statistical analysis to make informed business, healthcare, and policy decisions. Demand for statisticians is also expected to increase in the pharmaceutical industry, as an aging U.S. population will encourage companies to develop new treatments and medical technologies.

Therefore, the objectives of the program are to prepare students for employment as an applied statistician in government, industrial, commercial or private sectors, or entrance into a doctoral program in statistics, biostatistics, environmental statistics, or other programs that make heavy use of statistics.

The M.S. in Applied Statistics Program curriculum is comprised of 30 credits. Students entering the M.S. in Applied Statistics Program must have a B.S. or B.A. degree from an accredited institution and must have taken at least three semesters of calculus and at least one semester of probability/statistics.

## Program length

The Master of Science (M.S.) in Applied Statistics Program is typically a two-year program. The program length is based on how long the required UWL coursework would take to complete for a full-time student who does not need to complete any prerequisite coursework. Program length may be extended if students attend part-time (if approved by program) or due to the requirements of an individual student's plan of coursework, research or capstone project.

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## Graduate degree

- Applied statistics - MS (<http://catalog.uwlax.edu/graduate/programrequirements/appliedstatistics/appliedstatistics-ms/>)
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## Courses

STAT 505 Cr.3

### Statistical Methods

A survey of statistical methods from the point of view of how these methods are implemented with a standard statistics software package. Topics include descriptive statistics, graphical methods, tests of location, goodness of fit, simple and multiple regression, design of experiments, ANOVA, multiple comparisons, chi-square tests. Both parametric and nonparametric methods are treated. Computer use is an integral part of the course. Prerequisite: grade of "C" or better in STAT 145 or STAT 245. Offered Occasionally.

STAT 441/541 Cr.3

### Mathematical Statistics I

Review of discrete and continuous random variables. Moment generating functions, multivariate probability distributions, marginal and conditional probability distributions, functions of random variables, order statistics, Central Limit Theorem, point estimation and confidence intervals. This course is taught largely at an undergraduate level. Graduate students have additional course requirements/expectations. Prerequisite: grade of "C" or better in STAT 245 and MTH 208. Offered Fall.

STAT 442/542 Cr.3

### Mathematical Statistics II

Methods of estimating, including method of moments and maximum likelihood. Sufficient statistics, hypothesis testing, power of tests, likelihood ratio tests and introduction to regression and analysis of variance. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Prerequisite: grade of "C" or better in MTH 308 or MTH 309; grade of "C" or better in STAT 541. Offered Spring.

STAT 443/543 Cr.3

### Categorical Data Analysis

This course is an introduction to categorical data analysis covering summaries and inference for categorical response and count data, analysis of contingency tables, generalized linear models for binary and count data, logistic regression, multcategory logit models, and log-linear models for contingency tables with an emphasis on applications and implementation using computer software. This course is taught largely at an undergraduate level. Graduate students have additional course requirements/expectations. Prerequisite: grade of "C" or better in STAT 345. Offered Fall - Even Numbered Years.

STAT 544 Cr.3

### Environmental Statistics

This course is an introduction to common statistical methods used for environmental applications. Topics include spatial statistics, time series analysis, environmental monitoring and impact assessment, and integrated population modeling. This course is application driven and includes an introduction to computer programming in R. This course is taught largely at an undergraduate level. Graduate students have additional course requirements/expectations Prerequisite: BIO 519 or GEO 505. Offered Spring - Odd Numbered Years.

STAT 445/545 Cr.3

### Correlation and Regression Analysis

This course is an introduction to simple linear regression, multiple regression, polynomial regression. Inferences, appropriateness of model, model diagnostics/adequacy, difficulties in the application of models are discussed. A computer package is used. Course participants are involved with hands-on statistical applications and consulting. This course is taught largely at an undergraduate level. Graduate students have additional course requirements/expectations. Prerequisite: grade of "C" or better in STAT 345. Offered Fall.

STAT 446/546 Cr.3

**Analysis of Variance and Design of Experiments**

This course is an introduction to single factor, multiple factor, and randomized block designs in analysis of variance. Inferences, appropriateness of model, model diagnostics/adequacy, difficulties in the application of models are discussed. Design or structure of an experiment is discussed. A computer package is used. Course participants are involved with hands-on statistical applications and consulting. This course is taught largely at an undergraduate level. Graduate students have additional course requirements/expectations. Prerequisite: grade of "C" or better in STAT 345. Offered Spring.

STAT 447/547 Cr.3

**Nonparametric Statistics**

This course is an introduction to the theory and procedures for using distribution-free methods in data analysis. Standard procedures, such as the Wilcoxon tests, Kruskal-Wallis, Kolmogorov-Smirnov, nonparametric confidence intervals, regression analysis, and powers of the tests are included. Computer programs are used when appropriate. This course is taught largely at an undergraduate level. Graduate students have additional course requirements/expectations. Prerequisite: grade of "C" or better in STAT 345. Offered Spring - Even Numbered Years.

STAT 448/548 Cr.3

**Operations Research**

This introductory course applies mathematics/statistics to management decision making. Included are methods of optimizing systems, decision analysis, simulation, and reliability. Various programming techniques are introduced with the computer used as a tool where appropriate. This course is taught largely at an undergraduate level. Graduate students have additional course requirements/expectations. Prerequisite: grade of "C" or better in STAT 245. Offered Occasionally.

STAT 449/549 Cr.3

**Applied Multivariate Statistics**

This course is an introduction to applied multivariate statistical methods covering multivariate analysis of variance, multivariate analysis of covariance, repeated measures design, factor analysis, principle component analysis, cluster analysis, discriminate analysis, and multivariate regression. Course participants are involved with hands-on statistical applications. This course is taught largely at an undergraduate level. Graduate students have additional course requirements/expectations. Prerequisite: grade of "C" or better in STAT 345. Offered Fall - Odd Numbered Years.

STAT 452/552 Cr.1

**Introduction to SAS**

This course will provide students with an introduction to the statistical software SAS. Students will learn the syntax that is necessary to write SAS code to perform basic statistical techniques, including data manipulation, graphical displays, and common statistical inference procedures. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Prerequisite: STAT 505 or STAT 543 or STAT 545 or STAT 546 or STAT 547 or STAT 549. Pass/Fail grading. Offered Winter.

STAT 496/596 Cr.1-3

**Special Topics in Statistics**

Special topics in statistics not covered by regular courses taught in this department. The particular topic is decided by the instructor. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Repeatable for credit - maximum six. Consent of instructor. Offered Occasionally.

STAT 762 Cr.3

**Bayesian Statistics**

This course will introduce students to Bayesian statistical inference. It covers a discussion of subjective probability and assessment, Bayes' rule, Bayesian inference for one and two parameter problems, Bayesian testing and model diagnostics, Bayesian computation (Markov Chain Monte Carlo, Metropolis-Hastings, and Gibbs Sampling), hierarchical Bayesian methods, and model comparisons. Prerequisite: STAT 345; STAT 441/541. Offered Spring - Odd Numbered Years.

STAT 763 Cr.3

**Survey of Modern Statistical Software**

This course exposes students to a variety of software packages that are relevant to the field of statistics. Advantages and disadvantages of the software for performing various common statistical procedures will be highlighted. Prerequisite: admission to the graduate applied statistics program. Offered Spring - Even Numbered Years.

STAT 764 Cr.3

**Statistical Learning**

Students will learn the process of extracting useful information from large data sets using techniques from data mining and machine learning from a statistical point of view, including methods for classification, association, and clustering. Method selection, computer implementation, and interpretation of results are the focus of the course. May also be referred to as predictive analytics. Prerequisite: STAT 345. Offered Fall - Even Numbered Years.

STAT 766 Cr.3

**Biostatistics**

This course aims to provide students an enriched knowledge regarding the theory and applications of statistics in the health sciences. This course will include a discussion of general techniques and concepts such as relative risk, odds ratio, attributable risk, hazard models, survival analysis, and other related topics. This course will use statistical software to facilitate computations in data analysis. Prerequisite: STAT 445/545 or STAT 446/546 or concurrent enrollment. Offered Fall - Odd Numbered Years.

STAT 796 Cr.1-6

**Graduate Project in Applied Statistics**

In this course, students generate professional quality solutions to a problem selected for a graduate project under the direction of a faculty member. Repeatable for credit - maximum six. Prerequisite: concurrent enrollment in one of the following: STAT 543, STAT 545, STAT 546, STAT 547, STAT 549, STAT 762, STAT 763, STAT 764, or STAT 766. Consent of instructor. Pass/Fail grading. Offered Fall, Spring.

STAT 798 Cr.1-3

**Independent Study**

Directed readings or presentation of material not available in formal departmental courses under the supervision of a faculty member. Registration by consent of supervising faculty member and department chair. Repeatable for credit - maximum six. Consent of instructor. Offered Occasionally.

STAT 799 Cr.1-6

**Master's Thesis**

Independent research on a problem selected for a thesis under the direction of a faculty member. Repeatable for credit - maximum 12. Maximum of six credits per semester. Prerequisite: at least nine graduate credits from STAT 543, STAT 545, STAT 546, STAT 547, STAT 549, STAT 762, STAT 763, STAT 764, STAT 766. Consent of instructor. Pass/Fail grading. Offered Fall, Spring, Summer.