

# Statistics - BS/MS Integrated Program

**Statistics** is a scientific discipline by which statisticians assist other scientists and researchers in making informed decisions in the face of uncertainty. Statisticians use skills in a variety of areas to solve problems. The application of statistics is the embodiment of the scientific method.

The Master of Science in Statistics is an applied statistics degree that prepares outstanding students for successful and productive careers. The graduate curriculum is designed to equip students with decision-making skills necessary for successful careers as professional statisticians. Although a firm foundation in theoretical statistics is provided, most of the courses are applied in nature, offering approaches to the solution of important real-world problems.

Twenty to twenty-five students are currently enrolled in the master's program in statistics. Full-time students should complete the master's program in two years.

## Admission Requirements

Applicants must have a bachelor's degree from an accredited US university or equivalent, with a minimum 3.3 undergraduate GPA. We also require two methods courses beyond introductory statistics, a calculus-based statistical theory course, differential, integral, and multivariate calculus courses, and a linear algebra course. You must have a B- or higher in each course.

\*\*\*A math minor is recommended.

## Profile of Admitted Students Fall 2013

MEAN GPA: 3.79

MEAN GRE: V - 160, Q -162, W - 4.0

## Masters Degree Requirements

- Thesis or Project
  - o Thesis Option (30): minimum 24 coursework hours plus 6 thesis hours (Stat 699R)
  - o Project Option (33): minimum 30 coursework hours plus 3 project hours (Stat 698R)
- Required courses: Stat 535, 536, 624, 641, 642, and 9 hours of 600-level statistics courses
- Comprehensive written examination covering Stat 535, 536, 641, 642
- B- or better in each class with a cumulative 3.0 GPA in all MS degree classes

## 100% Post graduation Placement \*

### Employment (66% ):

Zions Bank  
Monsanto Co.  
Pacific Northwest National Laboratory  
Overtock.com  
W.L. Gore  
University of Utah School of Medicine  
The Church of Jesus Christ of Latter-Day Saints  
The RBL Group  
Intermountain Healthcare  
Coventry Healthcare  
Goldma Sach  
Adobe

### Doctoral Degree (34% ):

Duke  
Texas A&M  
UNC-Chapel Hill  
North Carolina State  
U.C. Santa Cruz  
The Ohio State  
Virginia Tech  
University of Arizona  
University of Nebraska  
University of Michigan  
University of Utah Medical School

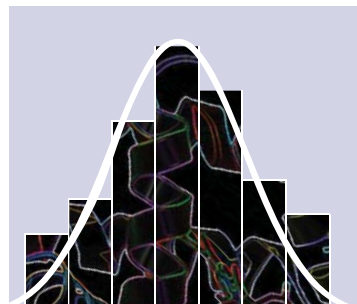
\*last three years

## To Apply

Application forms are available online at <http://www.byu.edu/gradstudies/admissions>. As part of the application process, applicants must submit three recommendation letters, a letter of intent, official GRE scores, official TOEFL scores for international students, and payment of all university application fees. All applications must be submitted before the February 1 deadline for Fall admission, and students must agree to live according to BYU standards of personal conduct as stated in the Honor Code.

## Financial Assistance

The department has limited funds to supplement students' financial resources. All admitted students receive teaching or research assistantships. Some students will receive full-tuition awards.



# Required Courses

## **STAT 535 Applied Linear Models**

Analysis of full-rank, model, over-parameterized model, cell means model, unequal subclass frequencies, and missing and fused cells. Estimability issues, diagnostics.

## **STAT 536 Modern Regression Methods**

Weighted least squares, measurement error models, robust regression, nonlinear regression, local regression, generalized additive models, tree-structured regression.

## **STAT 624 Statistical Computation**

Fundamental numerical methods used by statisticians, programming concepts, efficient use of software available for statisticians, simulation studies.

## **STAT 641 Probability Theory & Mathematical Statistics 1**

Axioms of probability; combinatorics; random variables, densities and distributions; expectation; independence; joint distributions; conditional probability; inequalities; derived random variables; generating functions; limit theorems; convergence results.

## **STAT 642 Probability Theory & Mathematical Statistics 2**

Introduction to statistical theory, principles of sufficiency and likelihood; point and interval estimation, maximum likelihood, Bayesian inference, hypothesis testing, Neyman-Pearson lemma, likelihood ratio tests, asymptotic results including delta method, exponential family

## **Graduate Electives:**

### **STAT 538 Survival Analysis**

Basic concepts of survival analysis, hazard functions, types of censoring, Kaplan-Meier estimates, Logrank tests, proportional hazard models, examples drawn from clinical and epidemiological literature.

### **STAT 545 Stochastic Processes**

Conditional expectation and probabilities, Markov chains; solutions using time reversible chains; modeling using hidden Markov chains; exponential waiting time; Poisson processes; Brownian motion with approximations.

## **STAT 631 Advanced Experimental Design**

Response surface methods; mixture designs; optimal designs; fractions of two-level, three level, and mixed-level factorials; analysis of experiments with complex aliasing; robust parameter designs.

## **STAT 635 Mixed Model Methods**

Fixed effects, random effects, repeated measures; non-independent data, general covariance structures, estimation methods.

## **STAT 637 Generalized Linear Models**

Generalized linear models framework, binary data, polytomous data, log-linear models.

## **STAT 643 Theory of Linear Models**

Random vectors, multivariate normal distribution, quadratic forms distribution, full-rank and non-full-rank linear models, hypothesis testing, random predictors, estimability, Bayesian topics, mixed and/or generalized linear models.

## **STAT 651 Bayesian Methods**

Basic Bayesian inference, conjugate and non-conjugate analyses, Markov Chain Monte Carlo Methods, hierarchical modeling, convergence diagnostics.

## **STAT 666 Multivariate Statistical Methods**

Inference about mean vectors and covariance matrices, multivariate analysis of variance and regression, canonical correlation, discriminate analysis, cluster analysis, principal component analysis, factor analysis.

## **While not required, we recommend these Undergraduate courses to expand your career opportunities:**

SAS programming (STAT 124, 224)

STAT 435 Nonparametric Statistical Methods

STAT 462 Quality Control and Industrial Statistics

STAT 466 Introduction to Reliability

STAT 531 Experimental Design

# Department Research Interests

Research emphases include Bayesian methods, environmental and spatial statistics, reliability of industrial and computing processes, statistical genetics and bioinformatics, mixed models and longitudinal data, data mining, chemometrics, actuarial methods, design and analysis of experiments, and statistical computation. In addition to these general areas, more specific research interest for individual faculty are listed on their web pages

**Berrett, Candace**, Assistant professor. PhD, Ohio State University, 2010. Spatial and Space-time Statistics; Bayesian Modeling, Categorical Data, Applications to the Environmental Sciences

**Blades, Natalie J.**, Associate Professor. PhD, Johns Hopkins University, 2003. Infectious Disease Epidemiology; Ordinal Data Models

**Christensen, William F.**, Professor. PhD, Iowa State University, 1999. Environmental and Spatial Statistics; Multivariate Analysis, Pollution Source Apportionment; Climate and Paleoclimate; Applications of Statistics in Politics and Law

**Dahl, David B.**, Professor. PhD university of Wisconsin-Madison, 2004. Bayesian non-parametrics: model-based clustering; random partition models; protein structure prediction, bioinformatics; and statistical computing

**Engler, David A.**, Associate Professor. PhD, Harvard University, 2007. Model Assessment in High-Dimensional Data Settings; Time Series, Applications in Finance and Environmental Science

**Fellingham, Gilbert W.**, Professor. PhD, University of Washington, 1990. Bayesian Nonparametrics; Bayesian Hierarchical Models; Applications in Sports, Human Performance, and Health

**Grimshaw, Scott D.**, Professor. PhD, Texas A&M University, 1989. Data Science; Process Monitoring

**Hartman, Brian M.**, Assistant Professor. PhD, Texas A&M University, 2012. Bayesian methods and their applications in actuarial science and risk; Storm damage prediction for electric utilities; Healthcare claims severity modeling; Loss reserving

**Heaton, Matthew J.**, Assistant professor. PhD, Duke University, 2011. Spatio-temporal Statistics, Environmental Impacts, Uncertainty Quantification, Statistics in Epidemiology, Bayesian Modeling.

**Lawson, John S.**, Professor. PhD, Polytechnic Institute of New York, 1984. Design and Analysis of Experiments; Reliability Engineering; Statistical Process Control

**Page, Garritt L.**, Assistant Professor, PhD Rice University, 2008. (Non) Parametric Bayesian Methods; Hierarchical Modeling; Spatial Statistics Mixtures; Statistics in Sports; Statistics in Education

**Reese, C. Shane.**, Professor. PhD, Texas A & M University, 1999. Bayesian Hierarchical Models; Bayesian Optimal Experimental Design; Sports Statistics; Reliability; Computer Experiments; Applications of Statistics to National Security Issues; Environmental Statistics

**Richardson, Robert A.** Assistant Professor, PhD, University of California Santa Cruz 2015. Spatio-temporal data analysis; Bayesian non-parametrics; Stochastic differential equations; Actuarial and financial models

**Scott, Del T.** Professor, PhD, Pennsylvania State University, 1977. Statistical Computing; Categorical Data Analysis; Linear Models; Graphical Analysis.

**Tass, E. Shannon.**, Associate Professor, PhD Rice University, 2008. Biostatistics; Statistical Application in Medicine, Health, and Wildlife; Spatial Statistics and Climate

**Tolley, H. Dennis.**, Professor. PhD, University of North Carolina, 1974. Actuarial methods in Health, Statistical Methods in Analytic Chemistry



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