Statistics

Department Information

- **Department Chair:**
  Rhonda Magel, Ph.D.
- **Department Location:**
  221 Morrill Hall
- **Department Email:**
  ndsu.stats@ndsu.edu
- **Department Web Site:**
- **Application Deadline:**
  Application deadline is March 15 for international students and applicants who would like an opportunity for an assistantship if available.
- **Credential Offered:**
  Ph.D., M.S., Certificate
- **Test Requirement:**
  GRE (recommended)
- **English Proficiency Requirements:**
  TOEFL ibt 79; IELTS 6.5; Duolingo 105

The Department of Statistics offers programs leading to a Doctor of Philosophy (Ph.D.) in Statistics, a Master of Science (M.S.) degree in Applied Statistics, and certificates in Statistics (for non-majors) and Big Data Applied Statistics Analysis. The program is flexible enough to create a plan based on individual prior experience and in accord with professional goals.

During the first year of the program, master’s and doctoral students are strongly encouraged to meet with each faculty member to discuss possible research topics. The student should select a supervisory committee by the end of the first year.

Graduate certificates in Statistics for non-majors and Big Data Applied Statistics Analysis are also available.

**Graduate Certificates**

- B.S. or equivalent degree from an accredited university,
- Knowledge of College Algebra

**Master’s Program in Applied Statistics**

In addition to the Graduate College requirements ([http://catalog.ndsu.edu/graduate/admission-information/](http://catalog.ndsu.edu/graduate/admission-information/)), the applicant must:

- Have had at least one year of calculus,
- Have had at least one course in statistics, and
- Have had at least one programming language

**Joint Master’s Program in Computer Science and Statistics**

To be admitted with full status into the M.S. program in computer science and statistics, the applicant must satisfy the admission requirements for both the M.S. program in computer science and the M.S. program in applied statistics.

**Ph.D. Program in Statistics**

In addition to the Graduate College requirements, the applicant must have an M.S. degree in statistics or related area. Students not holding a master’s degree in statistics or a closely related field will not be admitted to the Ph.D. program in statistics. These students must first apply to the M.S. program in applied statistics and complete the M.S. degree.
**Ph.D. Program in Statistics with emphasis in Sports Statistics**

In addition to the Graduate College requirements, the applicant must have an M.S. degree in statistics or related area and some knowledge or interest in sports.

**Financial Assistance**

Teaching assistantships are available. To be considered for an assistantship, the application must be complete with the Graduate College no later than March 15.

**Statistics Certificate (for non-majors)**

- Students with little or no prior knowledge of statistics, STAT 725 Applied Statistics must to be the first course taken. No credit will be given for STAT 725 for the certificate if it is not the first course taken.
- Students cannot use both STAT 661 Applied Regression Models and STAT 726 Applied Regression and Analysis of Variance towards the certificate. STAT 726 is recommended.
- Students cannot use both STAT 670 Statistical SAS Programming and STAT 671 Introduction to the R Language towards the certificate.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 725</td>
<td>Applied Statistics (if taken, must be the first course taken for the certificate)</td>
<td></td>
</tr>
</tbody>
</table>

**Required Courses**

- STAT 726
- or STAT 661

- Applied Regression and Analysis of Variance
- Applied Regression Models

- STAT 670
- or STAT 671

- Statistical SAS Programming
- Introduction to the R Language

**Choose from the following:**

- STAT 650
- STAT 660
- STAT 662
- STAT 663
- STAT 664
- STAT 665
- STAT 669
- STAT 672
- STAT 673
- STAT 677
- STAT 678
- STAT 711
- STAT 712
- STAT 713
- STAT 714
- STAT 730
- STAT 732
- STAT 761
- STAT 762
- STAT 764
- STAT 767
- STAT 768
- STAT 770
- STAT 772
- STAT 774
- STAT 775
- STAT 777
- STAT 778
- STAT 780
- STAT 786

- Stochastic Processes
- Applied Survey Sampling
- Introduction to Experimental Design
- Nonparametric Statistics
- Discrete Data Analysis
- Meta-Analysis Methods
- Introduction to Biostatistics
- Time Series
- Actuarial Statistical Risk Analysis
- Introductory Survival and Risk Analysis I
- Introductory Survival and Risk Analysis II
- Basic Computational Statistics using R
- Applied Statistical Machine Learning
- Introduction to Data Science
- Statistical Big Data Visualization
- Biostatistics
- Introduction to Bioinformatics
- Advanced Regression
- Messy Data Analysis
- Multivariate Methods
- Probability and Mathematical Statistics I
- Probability and Mathematical Statistics II
- Survival Analysis
- Computational Statistics
- Generalized Linear Models
- Using Statistics in Sports
- Multivariate Theory
- Modern Probability Theory
- Asymptotics, Bootstrap, and Other Resampling Plans
- Advanced Inference
### Big Data Applied Statistics Analysis Certificate

This certificate serves graduate students and working professionals by providing summer online coursework in Big Data Applied Statistics Analysis. Analytics professionals are in demand in this era of big data. Students will learn how to visualize and use statistical learning algorithms to explore big data.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 712</td>
<td>Applied Statistical Machine Learning</td>
<td>3</td>
</tr>
<tr>
<td>STAT 711</td>
<td>Basic Computational Statistics using R</td>
<td>3</td>
</tr>
<tr>
<td>STAT 713</td>
<td>Introduction to Data Science</td>
<td>3</td>
</tr>
<tr>
<td>STAT 714</td>
<td>Statistical Big Data Visualization</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total Credits</strong></td>
<td><strong>12</strong></td>
<td></td>
</tr>
</tbody>
</table>

### Master of Science in Applied Statistics

The program for the M.S. degree in applied statistics requires 32 semester credits with an overall GPA of 3.0 or higher. An oral defense of a research-based thesis or paper is required.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Complete a set of core courses</strong> with a grade of B or better, including</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STAT 661</td>
<td>Applied Regression Models</td>
<td>3</td>
</tr>
<tr>
<td>STAT 662</td>
<td>Introduction to Experimental Design</td>
<td>3</td>
</tr>
<tr>
<td>STAT 764</td>
<td>Multivariate Methods</td>
<td>3</td>
</tr>
<tr>
<td>or STAT 774</td>
<td>Generalized Linear Models</td>
<td></td>
</tr>
<tr>
<td>STAT 767</td>
<td>Probability and Mathematical Statistics I</td>
<td>3</td>
</tr>
<tr>
<td>STAT 768</td>
<td>Probability and Mathematical Statistics II</td>
<td>3</td>
</tr>
<tr>
<td><strong>Successfully complete two 1-credit practicums in consulting. Each statistical practicum will be listed as STAT 794</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Complete an additional 9-12 hours (depends on number of research hours) of course work selected from the following courses:</strong></td>
<td><strong>9-12</strong></td>
<td></td>
</tr>
<tr>
<td>STAT 660</td>
<td>Applied Survey Sampling</td>
<td></td>
</tr>
<tr>
<td>STAT 663</td>
<td>Nonparametric Statistics</td>
<td></td>
</tr>
<tr>
<td>STAT 664</td>
<td>Discrete Data Analysis</td>
<td></td>
</tr>
<tr>
<td>STAT 669</td>
<td>Introduction to Biostatistics</td>
<td></td>
</tr>
<tr>
<td>STAT 670</td>
<td>Statistical SAS Programming</td>
<td></td>
</tr>
<tr>
<td>STAT 671</td>
<td>Introduction to the R Language</td>
<td></td>
</tr>
<tr>
<td>STAT 672</td>
<td>Time Series</td>
<td></td>
</tr>
<tr>
<td>STAT 673</td>
<td>Actuarial Statistical Risk Analysis</td>
<td></td>
</tr>
<tr>
<td>STAT 677</td>
<td>Introductory Survival and Risk Analysis I</td>
<td></td>
</tr>
<tr>
<td>STAT 678</td>
<td>Introductory Survival and Risk Analysis II</td>
<td></td>
</tr>
<tr>
<td>STAT 730</td>
<td>Biostatistics</td>
<td></td>
</tr>
<tr>
<td>STAT 732</td>
<td>Introduction to Bioinformatics</td>
<td></td>
</tr>
<tr>
<td>STAT 770</td>
<td>Survival Analysis</td>
<td></td>
</tr>
<tr>
<td>STAT 775</td>
<td>Using Statistics in Sports</td>
<td></td>
</tr>
<tr>
<td>STAT 786</td>
<td>Advanced Inference</td>
<td></td>
</tr>
<tr>
<td>STAT 796</td>
<td>Special Topics</td>
<td></td>
</tr>
<tr>
<td>STAT 851</td>
<td>Bayesian Statistical Inference</td>
<td></td>
</tr>
<tr>
<td>STAT 859</td>
<td>Applied Spatial Statistics</td>
<td></td>
</tr>
<tr>
<td>STAT 798</td>
<td>Master's Thesis</td>
<td></td>
</tr>
<tr>
<td><strong>Total Credits</strong></td>
<td><strong>32</strong></td>
<td></td>
</tr>
</tbody>
</table>
or STAT 797

Master’s Paper

Must have 15 hours of 700-800 level courses.

*If one of these courses has been taken at the undergraduate level, another graduate level course should be substituted. STAT 725 Applied Statistics and STAT 726 Applied Regression and Analysis of Variance will not be counted for this degree program.

- A plan of study must be submitted at least one semester prior to graduation.
- Pass a written comprehensive exam. This exam consists of two sections. Exam 1 covers STAT 767 Probability and Mathematical Statistics I and STAT 768 Probability and Mathematical Statistics II. Exam 2 covers STAT 661 Applied Regression Models, STAT 662 Introduction to Experimental Design and STAT 764 Multivariate Methods or STAT 774 Generalized Linear Models. Exam 1 is two hours and Exam 2 is three hours. These exams are offered during approximately the fifth week of each semester. A maximum of two attempts is allowed.
- Complete and successfully defend the research thesis or paper.

M.S. Degree in Computer Science and Statistics

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 661</td>
<td>Applied Regression Models</td>
<td>3</td>
</tr>
<tr>
<td>STAT 671</td>
<td>Introduction to the R Language</td>
<td>3</td>
</tr>
<tr>
<td>STAT 669</td>
<td>Introduction to Biostatistics</td>
<td>3</td>
</tr>
<tr>
<td>STAT 772</td>
<td>Computational Statistics</td>
<td>3</td>
</tr>
<tr>
<td>STAT 732</td>
<td>Introduction to Bioinformatics</td>
<td>3</td>
</tr>
</tbody>
</table>

One additional graduate course in statistics, not including STAT 725 Applied Statistics or STAT 726 Applied Regression and Analysis of Variance

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCI 713</td>
<td>Software Development Processes</td>
<td>3</td>
</tr>
<tr>
<td>CSCI 724</td>
<td>Survey of Artificial Intelligence</td>
<td>3</td>
</tr>
<tr>
<td>CSCI 732</td>
<td>Introduction To Bioinformatics</td>
<td>3</td>
</tr>
<tr>
<td>CSCI 765</td>
<td>Introduction To Database Systems</td>
<td>3</td>
</tr>
</tbody>
</table>

Two additional graduate level courses in computer science.

Master’s Thesis or Master’s Paper Research Credits

Total Credits 42

Ph.D. Degree in Statistics

The Ph.D. degree requires an additional 30 credits of course work and 30 hours in research beyond the M.S. degree.

All students must:

1. Complete a set of core courses with a grade of B or better including STAT 661, 662, 767, 768, and 764 or 774. Most of these courses will be completed during your M.S. degree. Without permission, a maximum of two of the courses can be used to count on your plan of study.
2. Complete an additional 30 semester credits of statistics courses at the 600- to 800-level (does not include STAT 711, 712, 713, 714, 725 or 726). At least 15 credits must be at the 700- to 800-level.
3. Students must take STAT 786, STAT 764, and STAT 774 if not taken at the M.S. level.
4. Upon approval by the adviser and supervisory committee, up to 9 hours may be taken in Mathematics or Computer Science. It is recommended that a student have knowledge of real analysis at some level such as MATH 650 Real Analysis I and MATH 750 Analysis.
5. Pass a written comprehensive exam. This exam consists of two sections. Exam 1 covers STAT 767 and STAT 768. Exam 2 covers STAT 661, STAT 662 and STAT 764 or STAT 774. Exam 1 is two hours and Exam 2 is three hours. These exams are offered during approximately the fifth week of each semester (fall and spring). A maximum of two attempts is allowed.
6. STAT 899 research credits can not be taken during the first two semester in the graduate program at NDSU. Summer does not count as a semester.
7. Submit your Plan of Study to the Graduate College at least one month prior to your oral preliminary examination, per Graduate College policy.
8. Submit a research proposal and pass an oral exam on the proposal and related topics at least one semester prior to defending your dissertation.
9. Complete and successfully defend the research dissertation.
*Some of these requirements may be satisfied upon admittance into the program with an already existing M.S. degree in Statistics.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 661</td>
<td>Applied Regression Models</td>
<td>3</td>
</tr>
<tr>
<td>STAT 662</td>
<td>Introduction to Experimental Design</td>
<td>3</td>
</tr>
<tr>
<td>STAT 764</td>
<td>Multivariate Methods</td>
<td>3</td>
</tr>
<tr>
<td>or STAT 774</td>
<td>Generalized Linear Models</td>
<td></td>
</tr>
<tr>
<td>STAT 767</td>
<td>Probability and Mathematical Statistics I</td>
<td>3</td>
</tr>
<tr>
<td>STAT 768</td>
<td>Probability and Mathematical Statistics II</td>
<td>3</td>
</tr>
<tr>
<td>Additional statistics courses, not including STAT 725 or STAT 726</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>If not taken at the M.S. level, student must take STAT 764, STAT 774, STAT 786.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STAT 899</td>
<td>Doctoral Dissertation</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>60</strong></td>
</tr>
</tbody>
</table>

Bong-Jin Choi, Ph.D.
University of South Florida, 2014
Field: Computational Statistics, Machine Learning, Biostatistics, Public Health Research, Big Data Analysis

Ron Degges, Ph.D.
North Dakota State University, 2011
Field: Sampling, Regression Analysis

Rhonda Magel, Ph.D.
University of Missouri-Rolla, 1982
Field: Nonparametrics, Inference Under Order Restrictions, Regression

Megan Orr, Ph.D.
Iowa State University, 2012
Field: Biostatistics, Gene Expression Analysis, High-Dimensional Data, Analysis and Multiple Testing

Gang Shen, Ph.D.
Purdue University, 2009
Field: Mathematical Statistics, Asymptotic Theory, Bayesian Analysis, Change-Point Problem

Mingao Yuan, Ph.D.
Indiana University-Purdue University, 2018
Field: Network Analysis, Big Data Analysis, Statistical Machine Learning