Statistics, Ph.D.

Requirements

The Doctor of Philosophy program in statistics requires a minimum of 76 s.h. of graduate credit, including work completed for the M.S. degree.

The Graduate College requires a minimum g.p.a. of 3.00 to graduate with a Ph.D. degree; however, the Department of Statistics and Actuarial Science requires a higher g.p.a. of at least 3.40 to earn the Ph.D. in statistics. This includes all courses used to meet degree requirements plus additional courses that are relevant to a student’s program.

Ph.D. students complete required coursework, including four courses in one of four concentration areas: actuarial science/financial mathematics, biostatistics, data science, or probability/mathematical statistics (see “Concentration Areas” below for area descriptions and course lists). They may take coursework or seminars in other departments to relate an area of specialization to other fields of knowledge, to acquire the ability to use electronic digital computing equipment, or to learn non-English language skills necessary for reading scientific journals and communicating with scholars in other languages.

Ph.D. Qualifying Procedure

Students enter the Ph.D. program in one of two tracks.

Statistics: After successfully passing both the M.S. final examination in statistics and the creative component (in exceptional cases, a student may petition to go through the Ph.D. qualifying procedure early), a student who will choose either biostatistics, data science, or probability/mathematical statistics as the selected concentration area, can request, by notifying the director of graduate studies, to go through the Ph.D. qualifying procedure. Upon this request, the faculty evaluate the student’s body of work and assess the student’s potential for research. The body of work will include the M.S. final examination in statistics, the creative component, and coursework. This evaluation and assessment results in one of three decisions—the student is officially admitted into the Ph.D. program; the student must reapply to go through the Ph.D. qualifying procedure after accumulating a larger body of work for evaluation; or the student is not admitted into the Ph.D. program.

Actuarial Science: After successfully passing the M.S. final examination in actuarial science (in exceptional cases, a student may petition to go through the Ph.D. qualifying procedure early), a student who will choose actuarial science/financial mathematics as the selected concentration area, can request, by notifying the director of graduate studies, to go through the Ph.D. qualifying procedure. Upon this request, the faculty evaluate the student’s body of work and assess the student’s potential for research. The body of work will include the M.S. final examination in actuarial science, professional examinations passed, and course work. This evaluation and assessment results in one of two decisions—the student is officially admitted into the Ph.D. program in the actuarial science/financial mathematics concentration area, or the student is not admitted into the Ph.D. program.

Students complete the program by passing the Ph.D. final (comprehensive) examination and writing and defending a dissertation. Students usually complete the program three years after earning the M.S. degree.

A plan of study that does not conform to the requirements described below but is of high quality may be approved by the director of graduate studies.

The Ph.D. with a major in statistics requires the following coursework.

Required Coursework

Actuarial Science/Financial Mathematics Concentration Area

Actuarial science/financial mathematics emphasizes the theory of actuarial science, finance, and risk management. It is excellent preparation for academic positions in universities that offer actuarial science programs and for positions in the insurance, pension, and financial industries.

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<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tr>
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<tr>
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<td>3</td>
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<td>ACTS:4180</td>
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<td>Statistical Inference I-II (for well-prepared students)</td>
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<td>Mathematical Statistics I-II</td>
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<td>STAT:7100</td>
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<td>STAT:7101</td>
<td>Advanced Inference II</td>
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<td>STAT:7300</td>
<td>Foundations of Probability I</td>
<td>3</td>
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managing reproducible data analysis workflows, and
develop new methods for visualizing and modeling data,
from data. This concentration area prepares students to
and application of techniques for working with and learning
The data science track emphasizes the theory, methodology,
and longitudinal data analysis. It prepares students for
methods, such as survival analysis, categorical data analysis,
Biostatistics emphasizes exposure to various biostatistical
Concentration Area

Biostatistics Concentration Area
Biostatistics emphasizes exposure to various biostatistical
Bivariate Data Analysis
Multivariate Data Analysis

Statistics, Ph.D.

Longitudinal Data Analysis
High-Dimensional Data
Health Data
for Biomedical and Public
Statistical Machine Learning
Causal Inference
Survival Data Analysis
Analysis of Categorical Data
Statistics
Environmental and Spatial
Computing in Statistics
Applied Statistics I
Statistical Inference I
Statistical Inference II
Statistical Consulting
Probability and Stochastic
Processes I
Readings in Statistics (two
consecutive enrollments)

And all of these:
STAT:5090
STAT:5100
STAT:5101
STAT:5200/
IGPI:5199
STAT:5201
STAT:5400/
IGPI:5400
STAT:6220
STAT:6300
STAT:6990

And all of these:
STAT:5120
STAT:7100
STAT:7101
STAT:7200
STAT:7300
STAT:7400/
IGPI:7400
STAT:7990

At least four of these, with at least one numbered
7000 or above:
STAT:6530/
IGPI:6530
STAT:7510/
BIOS:7410
STAT:7570/
BIOS:7210/
IGPI:7210
BIOS:6650/
IGPI:6650
BIOS:6720
BIOS:7240
BIOS:7310/
IGPI:7310

Data Science Concentration Area
The data science track emphasizes the theory, methodology,
and application of techniques for working with and learning
from data. This concentration area prepares students to
develop new methods for visualizing and modeling data,
managing reproducible data analysis workflows, and
collaborating with scientists and other data stakeholders. It
is excellent preparation for students interested in academic,
industrial, or government positions that involve data
visualization, modeling, and analysis.

Statistics, Ph.D.

Probability/Mathematical Statistics
Concentration Area
Probability/mathematical statistics emphasizes a broad, solid
foundation in techniques and underpinnings of mathematical
statistics. Its focus on breadth and depth is intended to
produce well-rounded, knowledgeable scholars. It is excellent
preparation for academic positions in mathematical statistics
and industrial or government positions that require broadly
trained statisticians with a strong understanding of statistical
theory.

Code Title Hours
STAT:5090 ALPHA Seminar 1
STAT:5100 Statistical Inference I 3
STAT:5101 Statistical Inference II 3
STAT:5200/ IGPI:5199 Applied Statistics I 4
STAT:5201 Applied Statistics II 3
STAT:5400/ IGPI:5400 Computing in Statistics 3
STAT:6220 Statistical Consulting 3
STAT:6300 Probability and Stochastic Processes I 3
STAT:6990 Readings in Statistics (two consecutive enrollments) 2

And all of these:
STAT:4580/ IGPI:4580 Data Visualization and Data Technologies 3
STAT:5120 Mathematical Methods for Statistics 3

And all of these:
STAT:5120 Advanced Inference I 3
STAT:7200 Linear Models 4
STAT:7400/ IGPI:7400 Advanced Inference II 3
STAT:7500 Statistical Machine Learning 3
STAT:7990 Reading Research 18

Seminars chosen from STAT:7190, STAT:7290, and STAT:7390 2

At least four of these, with at least one numbered 7000 or above:
STAT:6530/ IGPI:6530 Environmental and Spatial Statistics 3
STAT:6560 Applied Time Series Analysis 3
STAT:6970 Topics in Statistics 3
STAT:7101 Advanced Inference II 3
STAT:7300 Foundations of Probability I 3
STAT:7510/ BIOS:7410 Analysis of Categorical Data 3
STAT:7520 Bayesian Analysis 3
STAT:7560 Time Series Analysis 3

Probability/Mathematical Statistics
Concentration Area
Probability/mathematical statistics emphasizes a broad, solid
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statistics. Its focus on breadth and depth is intended to
produce well-rounded, knowledgeable scholars. It is excellent
preparation for academic positions in mathematical statistics
and industrial or government positions that require broadly
trained statisticians with a strong understanding of statistical
theory.

Code Title Hours
STAT:5090 ALPHA Seminar 1
**Final Examination**

Students typically take the Ph.D. final (comprehensive) examination at the beginning of the third year of graduate study, during the week before fall classes begin. Students who do not succeed the first time they take the exam may repeat it once. Ordinarily, this second opportunity to pass the exam will occur one year later, during the week before fall classes begin. However, a student who performs well on one area of the exam but not the other may, in consultation with their advisor and the director of graduate studies, petition the department to move up their second opportunity to the week before the next spring semester's classes begin. The department's decision on whether to grant this petition will take into account any extenuating circumstances.

The comprehensive examination consists of a written core examination and an oral examination in two of the following four areas:

- **statistical inference (topics in STAT:5100 Statistical Inference I, STAT:5101 Statistical Inference II, and STAT:7100 Advanced Inference I);**
- **linear models (topics in STAT:7200 Linear Models);**
- **probability (topics in STAT:6300 Probability and Stochastic Processes I and STAT:7300 Foundations of Probability I); and**

Students in the actuarial science/financial mathematics concentration area have the option of taking only one of the four examinations listed above and an actuarial science/financial mathematics examination designed by their advisor and approved by the director of graduate studies.

**Committee**

Upon passing the Ph.D. final examination, the candidate chooses a committee of at least five members, which is approved by the advisor. At least four of the faculty members must be University of Iowa tenure-track faculty members. At least two of the faculty members must be from the major department (defined as faculty members who hold any appointment in the major department), and University of Iowa tenure-track faculty members.

The department may request the Graduate College dean's permission to replace one of the five committee members with a recognized scholar of professorial rank from another academic institution.

**Prospectus**

Within 18 months of passing the Ph.D. final exam, the candidate should present a written and oral prospectus to the committee. The prospectus describes the problems the student is considering for the thesis, relevant background material, ideas for solving the problems, and any preliminary results. Failure to successfully complete the prospectus within 24 months of passing the Ph.D. final exam will jeopardize the continuation of a student's financial support.

**Admission**

Applicants must meet the admission requirements of the Graduate College; see the Manual of Rules and Regulations on the Graduate College website.

**Financial Support**

Funds are available to help support outstanding Ph.D. applicants. Fellowships, teaching assistantships, and research assistantships provide an attractive stipend plus tuition at the resident rate and tuition scholarships for students who are appointed at least one-quarter time. In most cases, full tuition waivers are granted.

Students who wish to be considered for financial assistance for their third year in the program should request to go through the Ph.D. qualifying process no later than the spring semester of their second year.

**Career Advancement**

Statistics and probability are vital to many fields, so the demand for well-trained statisticians is strong. Statisticians work in medicine, engineering, law, public policy making, marketing, manufacturing, engineering, agriculture, varied social and natural sciences, and numerous other areas.

The program prepares students for careers in research, applications, and teaching. To learn more about job
opportunities, see ASA JobWeb on the American Statistical Association website.

The Pomerantz Career Center offers multiple resources to help students find internships and jobs.