STATISTICS

Overview of Statistics

The curriculum in liberal arts and sciences with a major in statistics is designed to prepare students for (1) statistics positions in business, industry or commerce, nonprofit institutions, and in state or federal government; and (2) graduate study in statistics. Positions include the following types of work: statistical design, data visualization, analysis and interpretation of experiments and surveys; data processing and analysis using modern computation facilities and statistical computing systems; application of statistical principles and methods in commercial areas such as finance, insurance, industrial research, technology, marketing, manufacturing, sports analytics, quality control, and nonprofit organizations, such as institutions involved in health care or medical research.

Given the application of statistical work to a broad range of fields, students majoring in statistics often obtain at least a minor in a field of application. Some common minors earned by statistics majors are Economics (http://catalog.iastate.edu/collegeofliberalartsandsciences/economics/#undergraduateminortext), General Business (http://catalog.iastate.edu/collegeofbusiness/), and Mathematics (http://catalog.iastate.edu/collegeofliberalartsandsciences/mathematics/#undergraduateminortext). Students preparing for positions in data analysis should consider a minor or certificate in Data Science (http://catalog.iastate.edu/collegeofliberalartsandsciences/datascience/#overviewtext). Students preparing for a career in the field of actuarial science should consider a certificate in Actuarial Science (http://catalog.iastate.edu/collegeofbusiness/actuarialscience/#certificatetext). Students intending to pursue graduate study in Statistics are strongly advised to complete at least a minor in Mathematics (https://catalog.iastate.edu/collegeofliberalartsandsciences/mathematics/#undergraduateminortext) including credit in MATH 4140 Analysis I.

Many Statistics majors earn an additional major or degree in a field of application or in Mathematics. Your academic advisor can assist you in developing your course of study including other majors.

Student Learning Outcomes

Students completing the undergraduate degree in statistics should have a broad understanding of the discipline of statistics. Upon graduation, students should be able to:

- Design observational studies and experiments in order to efficiently collect data to help answer questions about science, technology, and society.
- Analyze data arising from observational studies and experiments in order to help answer questions about the world around them.
- Use modern statistical computing to aid in the collection and analysis of data.
- Explain and apply the mathematical and theoretical basis for probability and statistical inference to help answer questions about the world around them.
- Effectively communicate statistical findings using oral, visual and written formats.
- Effectively respond to ethical issues associated with data collection, data analysis, and communication of statistical findings.

Undergraduate Major

The requirements for the undergraduate major in statistics are:

STAT 1100	Orientation in Statistics	1
STAT 2010	Introduction to Statistical Concepts and Methods	4
STAT 3010	Intermediate Statistical Concepts and Methods	4
STAT 3410	Introduction to the Theory of Probability and Statistics I	4
STAT 3420	Introduction to the Theory of Probability and Statistics II	4
STAT 4710	Introduction to Experimental Design	3
STAT 4750	Introduction to Multivariate Data Analysis	3
STAT 4840	Computer Processing of Scientific Data	3
STAT 4860	Introduction to Statistical Computing	3
A minimum of 6 credits from the following:		
STAT 3610	Statistical Quality Assurance	
STAT 4720	Introduction to Time Series	
STAT 4730	Introduction to Survey Sampling	
STAT 4740	Introduction to Bayesian Data Analysis	
STAT 4760	Introduction to Spatial Data Analysis	
STAT 4770	Introduction to Categorical Data Analysis	
STAT 4780	Introduction to Stochastic Process Models	
STAT 4820	Regression for Social and Behavioral Research	
STAT 4830	Empirical Methods for the Computational Sciences	
Completion of one of the following options:		
Option I		
MATH 1650	Calculus I	
MATH 1660	Calculus II	
MATH 2650	Calculus III	
Option II		
MATH 1650	Calculus I	
MATH 1660H	Calculus II: Honors	
MATH 2650H	Calculus III: Honors	
Credit in one of the following:		

MATH 2070	Matrices and Linear Algebra
MATH 3170	Theory of Linear Algebra
Credit in one of the following:	
COMS 1270	Introduction to Computer Programming
COMS 2070	Fundamentals of Computer Programming
COMS 2270	Object-oriented Programming
Credit in one of the following:	
COMST 2110	Interpersonal Communication
SPCM 2120	Fundamentals of Public Speaking
Credit in one of the following (with a grade of C- or higher):	
ENGL 3020	Business Communication
ENGL 3020H	Business Communication: Honors
ENGL 3140	Technical Communication
ENGL 3140H	Technical Communication: Honors

As majors in the College of Liberal Arts and Sciences, Statistics students must meet College of Liberal Arts and Sciences (http://catalog.iastate.edu/collegeofliberalartsandsciences/#lascollegerequirementstext) and University-wide requirements (http://catalog.iastate.edu/collegescurricula/) for graduation in addition to those stated above for the major.

LAS majors require a minimum of 120 credits, including a minimum of 45 credits at the 3000/4000 level. You must also complete the LAS world language requirement and career proficiency requirement.

Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (http://www.registrar.iastate.edu/courses/div-ip-guide.html) for a list of approved courses. Discuss with your advisor how the two courses that you select can be applied to your graduation plan.

Statistics, B.S.

Freshman

Fall	Credits	Spring	Credits
ENGL 1500	3	MATH 1660 or 1660H	4
LIB 1600	1	STAT 2010	4
STAT 1100	1	Social Science Choice	3
MATH 1650	4	Humanities Choice	3
Humanities Choice	3		
Natural Science Choice	4		
	16		**14**

Sophomore

Fall	Credits	Spring	Credits
STAT 3010	4	STAT 4710	3
MATH 2650 or 2650H	4	MATH 2070 or 3170	3-4
ENGL 2500	3	Computer Science Choice	3
Natural Science Choice	4	Humanities Choice	3
LAS 2030	1	Social Science Choice	3
	16		**15-16**

Junior

Fall	Credits	Spring	Credits
STAT 3410	4	STAT 3420	4
STAT 4840	3	STAT 4860	3
SPCM 2120 or COMST 2110	3	Social Science Choice	3
World Language/Elective	4	World Language/Elective	4
		Elective	1
	14		**15**

Senior

Fall	Credits	Spring	Credits
STAT 4750	3	Statistics Choices	6
ENGL 3020 or 3140	3	Electives	9
Humanities Choice	3		
Electives	6		
	15		**15**

Total Credits: 120-121

Undergraduate Minor

The department offers a minor in statistics which may be earned by satisfying the following requirements:

- Credit in one introductory level course in statistics, chosen from the following list: STAT 1010, STAT 1040, STAT 2010, STAT 2260, STAT 2310, STAT 3050, STAT 3220, STAT 3300.
- Credit in one intermediate level course in statistics, chosen from the following list: STAT 3010, STAT 3260.
- At least 9 additional credits in statistics courses, chosen from the following list: STAT 3410, STAT 3420, STAT 3470, STAT 3610, STAT 4710, STAT 4720, STAT 4730, STAT 4740, STAT 4750, STAT 4760, STAT 4770, STAT 4780, STAT 4820, STAT 4830, STAT 4840, STAT 4860.

Courses selected to satisfy the minor must include at least 9 credits that are not used to meet any other department, college or university requirement other than the credit requirement for graduation and credit requirement for courses numbered 3000 or above.

Courses selected to satisfy the minor must include at least 6 credits in courses numbered 3000 and above taken at ISU with a grade of C or higher.

Graduate Study

The department offers graduate programs leading to both Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) degrees with a major in statistics. Graduate work leading to a minor in statistics is available for students majoring in other programs, at both the M.S. and Ph.D. levels. The Ph.D. degree is also offered as a co-major with other graduate programs. The department participates in inter-disciplinary graduate programs in Bioinformatics and Computational Biology, Ecology and Evolutionary Biology, Genetics, Human Computer Interaction, Nutritional Sciences, and Wind Energy Science, Engineering, and Policy.

Graduates of the M.S. program have an understanding of basic statistical theory and methods. Elective courses in the M.S. program provide an opportunity for students to emphasize particular areas of statistical methods or application in their program. Students complete a minimum of 34 semester credits, including work on a capstone project resulting in a written creative component under the direction of an individual major professor and presented in a final oral examination.

Graduates of the Ph.D. program in statistics have studied advanced theory and methods and have demonstrated the ability to conduct independent research resulting in an original contribution to the discipline. Candidates for the Ph.D. degree in statistics complete a minimum of 72 semester credits, including at least 18 credits given for research activity, pass an oral preliminary examination, and submit a written dissertation containing original research that is defended in a final oral examination. Dissertation research is typically conducted in close collaboration with a major professor and usually results in publishable material. The department does not offer specific program tracks or areas of emphasis, but the diversity of elective courses and research areas of faculty allow students to tailor their individual programs to reflect areas of particular interest.

Graduates of co-major Ph.D. programs in statistics and an applied scientific discipline have mastered basic statistical theory and have studied advanced methodology. Students complete a minimum of 72 semester credits for courses in statistics and the chosen scientific discipline. Students conduct research that is a combination of statistical methodology and the scientific discipline. Co-major professors work with the student to prepare for an oral preliminary examination and conduct research leading to a single dissertation project that produces an original contribution to at least one of the two disciplines that is defended in a final oral examination.

Graduates of co-major Ph.D. programs in statistics and an area of theoretical mathematics have mastered basic statistical methods and have studied advanced statistical theory. Students complete a minimum of 72 semester credits. Co-major professors assist the student in preparing a dissertation that represents original research that makes a contribution at the interface of statistical theory and a sub-discipline of mathematics. The dissertation is defended in a final oral examination.