STATISTICS

Overview of Statistics

The curriculum in liberal arts and sciences with a major in statistics is designed to prepare students for (1) entry level statistics positions in business, industry or commerce, nonprofit institutions, and in state or federal government; (2) graduate study in statistics. Entry-level 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, marketing, manufacturing, sports analytics, and quality control and in nonprofit organizations such as large health study institutions.

Given the application of statistical work to a broad range of fields, all students majoring in statistics are advised to obtain at least a minor in a field of application. Some common minors earned by statistics majors are Economics (http://catalog.iastate.edu/previouscatalogs/2022-2023/collegeofliberalartsandsciences/economics/#undergraduateminortext), General Business (http://catalog.iastate.edu/previouscatalogs/2022-2023/collegeofbusiness/), and Mathematics (http://catalog.iastate.edu/previouscatalogs/2022-2023/collegeofliberalartsandsciences/mathematics/#undergraduateminortext). Students preparing for positions in data analysis should consider a minor or certificate in Data Science (http://catalog.iastate.edu/previouscatalogs/2022-2023/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/previouscatalogs/2022-2023/collegeofbusiness/actuarialscience/#certificatetext). Students intending to do 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 414 Analysis I.

Many Statistics majors earn a second 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 the world around them.
- 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 110	Orientation in Statistics	1
STAT 201	Introduction to Statistical Concepts and Methods	4
STAT 301	Intermediate Statistical Concepts and Methods	4
STAT 341	Introduction to the Theory of Probability and Statistics I	4
STAT 342	Introduction to the Theory of Probability and Statistics II	4
STAT 471	Introduction to Experimental Design	3
STAT 475	Introduction to Multivariate Data Analysis	3
STAT 484	Computer Processing of Scientific Data	3
STAT 486	Introduction to Statistical Computing	3
A minimum of 6 credits from the following:		
STAT 361	Statistical Quality Assurance	
STAT 472	Introduction to Time Series	
STAT 473	Introduction to Survey Sampling	
STAT 474	Introduction to Bayesian Data Analysis	
STAT 476	Introduction to Spatial Data Analysis	
STAT 477	Introduction to Categorical Data Analysis	
STAT 478	Introduction to Stochastic Process Models	
STAT 482	Regression for Social and Behavioral Research	
STAT 483	Empirical Methods for the Computational Sciences	
Completion of one of the following options:		
Option I		
MATH 165	Calculus I	
MATH 166	Calculus II	
MATH 265	Calculus III	
Option II		
MATH 165	Calculus I	
MATH 166H	Calculus II, Honors	

MATH 265H	Calculus III, Honors	

Credit in one of the following:

MATH 207	Matrices and Linear Algebra	
MATH 317	Theory of Linear Algebra	

Credit in one of the following:

COM S 107	Windows Application Programming	
COM S 127	Introduction to Computer Programming	
COM S 207	Fundamentals of Computer Programming	
COM S 227	Object-oriented Programming	

Credit in one of the following:

COMST 211	Interpersonal Communication	
SP CM 212	Fundamentals of Public Speaking	

Credit in one of the following (with a grade of C- or higher):

ENGL 302	Business Communication	
ENGL 302H	Business Communication: Honors	
ENGL 314	Technical Communication	
ENGL 314H	Technical Communication: Honors	

In addition to the above coursework, students earning the B.S. in Statistics must complete the Curriculum in Liberal Arts and Sciences (http://catalog.iastate.edu/previouscatalogs/2022-2023/collegeofliberalartsandsciences/#lascollegerequirementstext).

Statistics, B.S.

Freshman

Fall	Credits	Spring	Credits
ENGL 150	3	MATH 166 or 166H	4
LIB 160	1	STAT 201	4
STAT 110	1	Social Science Choice	3
MATH 165	4	Humanities Choice	3
Humanities Choice	3		
Natural Science Choice	4		
	16		**14**

Sophomore

Fall	Credits	Spring	Credits
STAT 301	4	STAT 471	3
MATH 265 or 265H	4	MATH 207 or 317	3-4
ENGL 250	3	Computer Science Choice	3
Natural Science Choice	4	Humanities Choice	3
		Social Science Choice	3
	15		**15-16**

Junior

Fall	Credits	Spring	Credits
STAT 341	4	STAT 342	4
STAT 484	3	STAT 486	3
SP CM 212 or COMST 211	3	Social Science Choice	3
World Language/Elective	4	World Language/Elective	4
Elective	2	Elective	2
	16		**16**

Senior

Fall	Credits	Spring	Credits
STAT 475	3	Statistics Choices	6
ENGL 302 or 314	3	Electives	9
Humanities Choice	3		
Electives	6		
	15		**15**

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 101, STAT 104, STAT 201, STAT 226, STAT 231, STAT 305, STAT 322, STAT 330.
- Credit in one intermediate level course in statistics, chosen from the following list: STAT 301, STAT 326.
- At least 9 additional credits in statistics courses, chosen from the following list: STAT 341, STAT 342, STAT 347, STAT 361, STAT 471, STAT 472, STAT 473, STAT 474, STAT 475, STAT 476, STAT 477, STAT 478, STAT 482, STAT 483, STAT 484, STAT 486.

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 300 or above.

Courses selected to satisfy the minor must include at least 6 credits in courses numbered 300 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.