STATISTICS, BS

Modern statistics is an exciting subject that affects most aspects of modern living. It has been developed to deal rationally and objectively with the uncertainty that accompanies variation in phenomena as highly complex as the interplay of the many factors that affect our environment. It derives vitality in coping with practical problems arising in all fields of scientific activity, including the social, business, biological, agricultural, medical, natural, and engineering sciences. Investigators' efforts to learn about a specific phenomenon, be it the response of a patient to a certain medical treatment or the effectiveness of a particular instructional program on a student's learning, are impacted by the presence of natural variation. The field of statistics is concerned with valid and efficient ways to learn more about these phenomena in the presence of such variation. It is an inductive science in which information is extracted from sample data in order to draw inferences. This process most often involves planning experiments or designing studies to ensure that valid answers to questions are obtained from the sample.

HOW TO GET IN

HOW TO GET IN

To declare the statistics major, students should schedule an appointment with a statistics major advisor prior to attaining senior standing (86 credits). Information regarding major declaration and how to schedule an appointment is available on the major webpage (https://stat.wisc.edu/undergraduate-statistics-major/).

Students must have a 2.000 GPA on coursework counting in the major, and a 2.000 GPA on any upper-level work in the major completed prior to declaration. No specific coursework must be completed to declare.

REQUIREMENTS

UNIVERSITY GENERAL EDUCATION REQUIREMENTS

All undergraduate students at the University of Wisconsin–Madison are required to fulfill a minimum set of common university general education requirements to ensure that every graduate acquires the essential core of an undergraduate education. This core establishes a foundation for living a productive life, being a citizen of the world, appreciating aesthetic values, and engaging in lifelong learning in a continually changing world. Various schools and colleges will have requirements in addition to the requirements listed below. Consult your advisor for assistance, as needed. For additional information, see the university Undergraduate General Education Requirements (http://guide.wisc.edu/undergraduate/#requirementsforundergraduatestudytext) section of the *Guide*.

General Education	• Breadth—Humanities/Literature/Arts: 6 credits • Breadth—Natural Science: 4 to 6 credits, consisting of one 4- or 5-credit course with a laboratory component; or two courses providing a total of 6 credits • Breadth—Social Studies: 3 credits • Communication Part A & Part B * • Ethnic Studies * • Quantitative Reasoning Part A & Part B *

* The mortarboard symbol appears before the title of any course that fulfills one of the Communication Part A or Part B, Ethnic Studies, or Quantitative Reasoning Part A or Part B requirements.

COLLEGE OF LETTERS & SCIENCE DEGREE REQUIREMENTS: BACHELOR OF SCIENCE (BS)

Students pursuing a Bachelor of Science degree in the College of Letters & Science must complete all of the requirements below. The College of Letters & Science allows this major to be paired with either the Bachelor of Arts or the Bachelor of Science degree requirements.

BACHELOR OF SCIENCE DEGREE REQUIREMENTS

Mathematics	Complete two courses of 3+ credits at the Intermediate or Advanced level in MATH, COMP SCI, or STAT subjects. A maximum of one course in each of COMP SCI and STAT subjects counts toward this requirement.
Language	Complete the third unit of a language other than English.
L&S Breadth	Complete: • 12 credits of Humanities, which must include at least 6 credits of Literature; and • 12 credits of Social Science; and • 12 credits of Natural Science, which must include 6 credits of Biological Science and 6 credits of Physical Science.
Liberal Arts and Science Coursework	Complete at least 108 credits.
Depth of Intermediate/Advanced Coursework	Complete at least 60 credits at the Intermediate or Advanced level.
Major	Declare and complete at least one major.
Total Credits	Complete at least 120 credits.
UW-Madison Experience	Complete both: • 30 credits in residence, overall, and • 30 credits in residence after the 86th credit.
Quality of Work	• 2.000 in all coursework at UW–Madison • 2.000 in Intermediate/Advanced level coursework at UW–Madison

NON–L&S STUDENTS PURSUING AN L&S MAJOR

Non–L&S students who have permission from their school/college to pursue an additional major within L&S only need to fulfill the major requirements. They do not need to complete the L&S Degree Requirements above.

REQUIREMENTS FOR THE MAJOR

MATHEMATICS

Code	Title	Credits
Calculus 1 (Complete one):		**5-10**
MATH 221	Calculus and Analytic Geometry 1 [1]	
MATH 171 & MATH 217	Calculus with Algebra and Trigonometry I and Calculus with Algebra and Trigonometry II [1]	
Calculus 2		
MATH 222	Calculus and Analytic Geometry 2 [1]	4
Calculus 3 (Complete one):		**4-5**
MATH 234	Calculus--Functions of Several Variables [1]	
MATH 376	Topics in Multi-Variable Calculus and Differential Equations	
Linear Algebra (Complete one):		**3-5**
MATH 340	Elementary Matrix and Linear Algebra	
MATH 320	Linear Algebra and Differential Equations	
MATH 341	Linear Algebra	
MATH 375	Topics in Multi-Variable Calculus and Linear Algebra	
Total Credits		**16-24**

COMPUTER PROGRAMMING

Code	Title	Credits
Complete one of:		**3-4**
COMP SCI 200	Programming I	
COMP SCI 220	Data Science Programming I	
COMP SCI 300	Programming II	
COMP SCI 320	Data Science Programming II	
COMP SCI 400	Programming III	
COMP SCI 412	Introduction to Numerical Methods	
Total Credits		**3-4**

STATISTICS

Code	Title	Credits
Introductory Statistics & Basic Statistical Language:		**4-5**
STAT 240	Data Science Modeling I	
or STAT 301	Introduction to Statistical Methods	
or STAT 324	Introductory Applied Statistics for Engineers	
or STAT 371	Introductory Applied Statistics for the Life Sciences	
STAT 303	R for Statistics I	
Statistical Models:		**6-7**
STAT 333	Applied Regression Analysis	
or STAT 340	Data Science Modeling II	
STAT/M E 424	Statistical Experimental Design	
Probability (Complete one):		**3**
STAT/MATH 309	Introduction to Probability and Mathematical Statistics I	
STAT 311	Introduction to Theory and Methods of Mathematical Statistics I	
STAT/MATH 431	Introduction to the Theory of Probability	
MATH 531	Probability Theory	
Inference:		**3**
STAT/MATH 310	Introduction to Probability and Mathematical Statistics II	
Electives:		**15**
Students will complete a total of 15 credits of electives with a maximum of 6 credits from the domain electives		
Core Electives		*9-15*
STAT 304	R for Statistics II	
STAT 305	R for Statistics III	
STAT 349	Introduction to Time Series	
STAT 351	Introductory Nonparametric Statistics	
STAT 360	Topics in Statistics Study Abroad	
STAT 405	Data Science Computing Project	
STAT 411	An Introduction to Sample Survey Theory and Methods	
STAT 421	Applied Categorical Data Analysis	
STAT 433	Data Science with R	
STAT 443	Classification and Regression Trees	
STAT 436	Statistical Data Visualization	
STAT 451	Introduction to Machine Learning and Statistical Pattern Classification	
STAT 453	Introduction to Deep Learning and Generative Models	
STAT 456	Applied Multivariate Analysis	
STAT 461	Financial Statistics	
STAT/ COMP SCI 471	Introduction to Computational Statistics	
STAT 479	Special Topics in Statistics [2]	
STAT 575	Statistical Methods for Spatial Data	
STAT/I SY E/ MATH/OTM 632	Introduction to Stochastic Processes	
STAT/B M I 641	Statistical Methods for Clinical Trials	
STAT/B M I 642	Statistical Methods for Epidemiology	
STAT 679	Special Topics in Statistics [2]	
Domain Electives		*0-6*
ACT SCI 653	Advanced Short-Term Actuarial Modeling	
ACT SCI 654	Regression and Time Series for Actuaries	
COMP SCI/E C E/ M E 532	Matrix Methods in Machine Learning	

COMP SCI/ E C E 561	Probability and Information Theory in Machine Learning
ECON 570	Fundamentals of Data Analytics for Economists
GEN BUS 656	Machine Learning for Business Analytics
GEOG 560	Advanced Quantitative Methods
I SY E 521	Machine Learning in Action for Industrial Engineers
MATH 635	An Introduction to Brownian Motion and Stochastic Calculus
SOC 362	Statistics for Sociologists III
SOC 375	Introduction to Mathematical Sociology
STAT/COMP SCI/ MATH 475	Introduction to Combinatorics
STAT/COMP SCI/ I SY E/MATH 525	Linear Optimization
Total Credits	**40-54**

RESIDENCE & QUALITY OF WORK

- 2.000 GPA in all STAT and major courses
- 2.000 GPA on 15 Upper-Level Major credits, taken In Residence [3]
- 15 credits in STAT courses, taken on the UW-Madison campus

HONORS IN THE MAJOR

Students may declare Honors in the Statistics Major in consultation with the Statistics major advisor(s). To be admitted to the Honors Program in Statistics, students must have declared Statistics, must have a 3.3 University GPA, and must have completed and an Introductory Statistics Course (STAT 240, STAT 301, STAT 324 or STAT 371), STAT/MATH 309, and STAT 333 or STAT 340 (or other courses with the approval of the advisor) with a GPA of 3.500 or higher in these three classes.

HONORS IN THE STATISTICS MAJOR: REQUIREMENTS

To earn Honors in the Major in Statistics, students must satisfy both the requirements for the major (above) and the following additional requirements:

- Earn a 3.300 University GPA
- Earn a 3.500 GPA for all STAT courses
- Complete two STAT major courses (excluding 699) for a total of 6 Honors credits (http://honors.ls.wisc.edu/SiteContent.aspx?prev=1&id=370) ***or*** complete 18 total credits of electives in the major where 12-18 credits come from the core elective category and 0-6 credits from the domain elective category
- STAT 681 -STAT 682, for a total of 6 credits, under the supervision of a member of the Statistics faculty or 6 credits of pre-approved research credits outside of the Statistics Department.

FOOTNOTES

1. A grade of C or higher is required for this course to meet the requirement.
2. STAT 479 and STAT 679 can be repeated for elective credit when enrolled for different topics.
3. Courses that are considered Upper-Level in the major are STAT 303, STAT 304, STAT 305, STAT/MATH 309,MATH 531 STAT/MATH 310, STAT 311, STAT 312, STAT 333, STAT 340, STAT 349, STAT 351, STAT 360, STAT 405, STAT 411, STAT 421, STAT/M E 424, STAT/MATH 431,STAT 433, STAT 436, STAT 443, STAT 451, STAT 453, STAT 456, STAT 461, STAT/COMP SCI 471, STAT 479, STAT/I SY E/MATH/OTM 632, STAT/B M I 641, STAT/B M I 642, STAT 699, ACT SCI 653, ACT SCI 654, COMP SCI/E C E/M E 532, COMP SCI/E C E 561, ECON 570, GEN BUS 656, GEOG 560, I SY E 521, MATH 635, SOC 362, SOC 375, STAT/COMP SCI/MATH 475, STAT/COMP SCI/I SY E/MATH 525.

UNIVERSITY DEGREE REQUIREMENTS

Total Degree	To receive a bachelor's degree from UW–Madison, students must earn a minimum of 120 degree credits. The requirements for some programs may exceed 120 degree credits. Students should consult with their college or department advisor for information on specific credit requirements.
Residency	Degree candidates are required to earn a minimum of 30 credits in residence at UW–Madison. "In residence" means on the UW–Madison campus with an undergraduate degree classification. “In residence” credit also includes UW–Madison courses offered in distance or online formats and credits earned in UW–Madison Study Abroad/Study Away programs.
Quality of Work	Undergraduate students must maintain the minimum grade point average specified by the school, college, or academic program to remain in good academic standing. Students whose academic performance drops below these minimum thresholds will be placed on academic probation.

LEARNING OUTCOMES

LEARNING OUTCOMES

1. Frame a scientific question with the appropriate mode of data analysis, to analyze such data correctly, and to summarize and interpret the results in a useful manner. Master a number of key statistical techniques, certainly including significance testing, goodness-of-fit testing, and regression analysis, which are common tools in analyzing data. This will include a careful checking of assumptions that underlie the techniques.
2. Design experiments/studies – in conjunction with scientists proposing the study – that will lead in an efficient manner to the collection of data that can be properly analyzed. Design studies with multiple factors taking variable reduction techniques into account. Interpret and critique designs they encounter in analyzing data.
3. Use tools from mathematical statistics and probability to assess the quality of point estimators, confidence intervals, and hypothesis tests.

Demonstrate the skills to connect methods of application to their theoretical underpinnings.

4. Use a statistical language (with emphasis on R) to manipulate data and perform exploratory data analysis using basic statistical methods. Write structured R programs using conditional expressions, loops, and functions and to use regular expressions to extract data from text and make high-level visualizations.
5. Evaluate critically articles that use statistical argumentation. Assess whether or not the statistical arguments have been developed properly and the conclusions are reliable. If the arguments are not properly developed, they will be able to provide specific evidence for this.

FOUR-YEAR PLAN

SAMPLE FOUR-YEAR PLAN

This Sample Four-Year Plan is a tool to assist students and their advisor(s). Students should use it—along with their DARS report, the Degree Planner, and Course Search & Enroll tools—to make their own four-year plan based on their placement scores, credit for transferred courses and approved examinations, and individual interests. As students become involved in athletics, honors, research, student organizations, study abroad, volunteer experiences, and/or work, they might adjust the order of their courses to accommodate these experiences. Students will likely revise their own four-year plan several times during college.

First Year

Fall	Credits	Spring	Credits
Communication A	3	MATH 222	4
MATH 221	5	COMP SCI 200 or 220	3-4
Foreign Language	4	Ethnic Studies course	4
Physical Science Breadth	3	Foreign Language	4
	15		**15**

Second Year

Fall	Credits	Spring	Credits
MATH 234	4	STAT 303	1
Introductory Statistics course	3-4	STAT 333 or 340	3-4
Communications B	3	MATH 320, 340, or 341	3
Social Science Breadth	3	INTER-LS 210	1
Humanities Breadth	3	Biological Science Breadth	3
		Literature Breadth	3
	16		**14**

Third Year

Fall	Credits	Spring	Credits
STAT/MATH 309	3	STAT/MATH 310	3
STAT/M E 424	3	STAT elective course	3
Social Science Breadth	6	Literature Breadth	3
Humanities Breadth	3	Social Science Breadth	3
		Elective	3
	15		**15**

Fourth Year

Fall	Credits	Spring	Credits
STAT elective course	6	STAT elective course	6
Elective	9	Elective	9
	15		**15**

Total Credits 120

THREE-YEAR PLAN

SAMPLE THREE-YEAR PLAN

This Sample Three-Year Plan is a tool to assist students and their advisor(s). Students should use it —along with their DARS report, the Degree Planner, and Course Search & Enroll tools — to make their own three-year plan based on their placement scores, credit for transferred courses and approved examinations, and individual interests.

Three-year plans may vary considerably from student to student, depending on their individual preparation and circumstances. Students interested in graduating in three years should meet with an advisor as early as possible to discuss feasibility, appropriate course sequencing, post-graduation plans (careers, graduate school, etc.), and opportunities they might forgo in pursuit of a three-year graduation plan.

DEPARTMENTAL EXPECTATIONS

A three-year degree is feasible for students with a variety of backgrounds and specific preparation. Students should ideally be entering the University with a minimum of 30 advanced standing credits, and have satisfied the following requirements with course credit or via placement examination:

Code	Title	Credits
MATH 221	Calculus and Analytic Geometry 1	5
MATH 222	Calculus and Analytic Geometry 2	4
STAT 301	Introduction to Statistical Methods	3
or STAT 324	Introductory Applied Statistics for Engineers	
or STAT 371	Introductory Applied Statistics for the Life Sciences	
or STAT 240	Data Science Modeling I	

- 3-4 units of foreign language
- At least 3 credits of L&S Breadth (Humanities, Social Science, Biological Science, or Physical Science)

First Year

Fall	Credits	Spring	Credits
MATH 234	4	STAT 303	1
COMP SCI 200 or 220	3-4	STAT 333 or 340	3-4
Communications A	3	MATH 320, 340, or 341	3
Social Science Breadth	3	Ethnic Studies	3
Elective	3	Humanities Breadth	3
		Elective	3
	16		**16**

Second Year

Fall	Credits	Spring	Credits
STAT/MATH 309	3	STAT/MATH 310	3
STAT/M E 424	3	STAT Elective course	3
Communications B	3	Literature Breadth	3
Physical Science Breadth	3	Biological Science Breadth	3

Social Science Breadth	3 INTER-LS 210	1
	15	**13**

Third Year

Fall	Credits	Spring	Credits
STAT Elective course	3	STAT Elective course	3
STAT Elective course	3	STAT Elective course	3
Humanities Breadth	3	Literature Breadth	3
Physical Science Breadth	3	Biological Science Breadth	3
Social Science Breadth	3	Elective	3
	15		**15**

Total Credits 90

ADVISING AND CAREERS

ADVISING AND CAREERS

LOOKING FOR STATISTICS ADVISING?

Students who are interested in statistics academic advising for the statistics major should visit the Undergraduate Statistics Advising (https://stat.wisc.edu/undergraduate-statistics-major/) website or contact the advisor group by email: advising@stat.wisc.edu.

SO WHAT CAN YOU DO WITH A STATISTICS MAJOR AFTER YOU GRADUATE?

Well-trained statisticians are in strong demand and have excellent employment prospects. Statisticians work in industry and business, in government, and in universities and other research institutions.

In most cases, an undergraduate major in statistics can find employment as a quantitative analyst or other "generalist" position. A number of our graduates have been successful following this path. However, in most cases, positions aimed at "professional statisticians" require a master's (or PhD) degree. As a professional statistician, typical employment in industry might be as a statistical consultant to biologists, engineers, and/or other scientists in a research and development branch of a large company.

The single, best place to look for statistics jobs is the American Statistical Association Career Center (http://www.amstat.org/ASA/Your-Career/home.aspx). Consult with a statistics undergraduate advisor about the best fit for you.

Statistical training is seen as very desirable in many other areas (e.g., agricultural, biological, engineering, and social sciences, business, and economics) where the primary activity may not be statistics. In view of this, statistics may often be a strong choice for a second or additional major.

L&S CAREER RESOURCES

Every L&S major opens a world of possibilities. SuccessWorks (https://successworks.wisc.edu/) at the College of Letters & Science helps students turn the academic skills learned in their major, certificates, and other coursework into fulfilling lives after graduation, whether that means jobs, public service, graduate school or other career pursuits.

In addition to providing basic support like resume reviews and interview practice, SuccessWorks offers ways to explore interests and build career skills from their very first semester/term at UW all the way through graduation and beyond.

Students can explore careers in one-on-one advising, try out different career paths, complete internships, prepare for the job search and/or graduate school applications, and connect with supportive alumni and even employers in the fields that inspire them.

- SuccessWorks (https://careers.ls.wisc.edu/)
- Set up a career advising appointment (https://successworks.wisc.edu/make-an-appointment/)
- Enroll in a Career Course (https://successworks.wisc.edu/career-courses/) - a great idea for first- and second-year students:
  - INTER-LS 210 L&S Career Development: Taking Initiative (1 credit)
  - INTER-LS 215 Communicating About Careers (3 credits, fulfills Comm B General Education Requirement)
- Learn about internships and internship funding (https://successworks.wisc.edu/finding-a-job-or-internship/)
  - INTER-LS 260 Internship in the Liberal Arts and Sciences
- Activate your Handshake account (https://successworks.wisc.edu/handshake/) to apply for jobs and internships from 200,000+ employers recruiting UW-Madison students
- Learn about the impact SuccessWorks has on students' lives (https://successworks.wisc.edu/about/mission/)

PEOPLE

PEOPLE

A full listing of the Statistics faculty, including affiliated faculty and links to webpages, can be found on the departmental website (https://stat.wisc.edu/people-main-faculty/).

FACULTY

- Cecile Ane, Professor, Statistics and Botany
- Joshua Cape, Assistant Professor, Statistics
- Peter Chien, Professor, Statistics
- Jessi Cisewski-Kehe, Assistant Professor, Statistics
- Sameer Deshpande, Assistant Professor, Statistics
- Nicolas Garcia Trillos, Assistant Professor, Statistics
- Yinqiu He, Assistant Professor, Statistics
- Hyunseung Kang, Assistant Professor, Statistics
- Sunduz Keles, Professor, Statistics & Biostatistics and Medical Informatics
- Bret Larget, Professor, Statistics
- Keith Levin, Assistant Professor, Statistics
- Wi-Yin Loh, Professor, Statistics
- Michael Newton, Professor, Statistics & Biostatistics and Medical Informatics
- Vivak Patel, Assistant Professor, Statistics
- Alejandra Quintos, Assistant Professor, Statistics
- Sebastian Raschka, Assistant Professor, Statistics
- Garvesh Raskutti, Associate Professor, Statistics
- Karl Rohe, Professor, Statistics
- Kris Sankaran, Assistant Professor, Statistics
- Jun Shao, Professor, Statistics
- Miaoyan Wang, Assistant Professor, Statistics
- Yazhen Wang, Chair and Professor, Statistics
- Brian Yandell, Professor, Statistics

- Chunming Zhang, Professor, Statistics
- Zhengjun Zhang, Professor, Statistics
- Yiqiao Zhong, Assistant Professor, Statistics
- Jun Zhu, Professor, Statistics