Statistics, B.A.

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

To declare the statistics major, students should schedule an appointment with a statistics major advisor prior to attaining senior standing (86 credits).

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/#requirementsforundergraduatetestudytext) section of the Guide.

<table>
<thead>
<tr>
<th>General Education</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breadth—Humanities/Literature/Arts: 6 credits</td>
<td></td>
</tr>
<tr>
<td>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</td>
<td></td>
</tr>
<tr>
<td>Breadth—Social Studies: 3 credits</td>
<td></td>
</tr>
<tr>
<td>Communication Part A &amp; Part B *</td>
<td></td>
</tr>
<tr>
<td>Ethnic Studies *</td>
<td></td>
</tr>
<tr>
<td>Quantitative Reasoning Part A &amp; Part B *</td>
<td></td>
</tr>
</tbody>
</table>

* 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.

Bachelor of Arts Degree Requirements

Mathematics Complete the University General Education Requirements for Quantitative Reasoning A (QR-A) and Quantitative Reasoning B (QR-B) coursework.

Foreign Language • Complete the fourth unit of a foreign language; OR • Complete the third unit of a foreign language and the second unit of an additional foreign language.

L&S Breadth • 12 credits of Humanities, which must include 6 credits of literature; and • 12 credits of Social Science; and • 12 credits of Natural Science, which must include one 3+ credit Biological Science course and one 3+ credit Physical Science course.

Liberal Arts and Science Coursework Complete at least 108 credits.

Depth of Intermediate/Advanced work 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 • 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

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 221</td>
<td>Calculus and Analytic Geometry I</td>
<td>5-10</td>
</tr>
<tr>
<td>MATH 171 &amp; MATH 217</td>
<td>Calculus with Algebra and Trigonometry I and Calculus with Algebra and Trigonometry II</td>
<td>5-10</td>
</tr>
<tr>
<td>MATH 275</td>
<td>Topics in Calculus</td>
<td>5</td>
</tr>
</tbody>
</table>

College of Letters & Science Degree Requirements: Bachelor of Arts (B.A.)

Students pursuing a bachelor of arts 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 a bachelor of arts or a bachelor of science curriculum.
Calculus 2 (Complete one):  
MATH 222 Calculus and Analytic Geometry 2  
MATH 276 Topics in Calculus II  
Calculus 3 (Complete one):  
MATH 234 Calculus–Functions of Several Variables  
MATH 375 Topics in Multi-Variable Calculus and Linear Algebra  
Linear Algebra (Complete one):  
MATH 340 Elementary Matrix and Linear Algebra  
MATH 320 Linear Algebra and Differential Equations  
MATH 341 Linear Algebra  
MATH 376 Topics in Multi-Variable Calculus and Differential Equations  
Total Credits 16-25

COMPUTER PROGRAMMING

Code    Title                      Credits
Complete one: 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 302 Accelerated Introduction to Statistical Methods  
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  
or STAT 240 Introduction to Data Modeling I  
STAT 303 R for Statistics I  
Statistical Models: 6-7
STAT 333 Applied Regression Analysis  
or STAT 340 Introduction to Data 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  
Inference: 3
STAT/MATH 310 Introduction to Probability and Mathematical Statistics II  

Electives: 15
STAT 304 R for Statistics II  
STAT 305 R for Statistics III  
STAT 327 Learning a Statistical Language  
STAT 349 Introduction to Time Series  
STAT 351 Introductory Nonparametric Statistics  
STAT 360 Topics in Statistics Study Abroad  
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 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/MATH 309 Introduction to Computational Statistics  
STAT/MATH 475 Introduction to Combinatorics  
STAT/COMP SCI/ MATH 471 Introduction to Computational Statistics  
STAT/COMP SCI/ I SY E/MATH 525 Linear Optimization  
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  

Total Credits 31-33

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  
- 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 3.500 University GPA, and must have completed STAT 302, STAT/MATH 309, and STAT 333 (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:

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

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/MATH 309, STAT/MATH 310, STAT 311, STAT 312, STAT 327, STAT 333, STAT 340, STAT 349, STAT 351, STAT 360, STAT 411, STAT 421, STAT/M E 424, STAT/MATH 431, STAT 433, STAT 443, STAT 451, STAT 453, STAT 456, STAT 461, STAT/COMP SCI 471, STAT/COMP SCI/MATH 475, STAT 479, STAT 575, STAT/I SY E/MATH/OTM 632, STAT/B M I 641, STAT/B M I 642 and STAT 699.
examination: satisfied the following requirements with course credit or via placement
University with a minimum of 30 advanced standing credits, and have
and specific preparation. Students should ideally be entering the
A three-year degree is feasible for students with a variety of backgrounds
DEPARTMENTAL EXPECTATIONS
they might forgo in pursuit of a three-year graduation plan.

post-graduation plans (careers, graduate school, etc.), and opportunities
early as possible to discuss feasibility, appropriate course sequencing,
interested in graduating in three years should meet with an advisor as
depending on their individual preparation and circumstances. Students
three-year plans may vary considerably from student to student,
courses and approved examinations, and individual interests.

Three-year plans may vary considerably from student to student,
developed by the student and advisor(s). Students should
leverage the academic skills learned in their major, certificates, and
opportunities they might forgo in pursuit of a three-year graduation plan.

THREE-YEAR PLAN

SAMPLE THREE-YEAR PLAN
This Sample Three-Year Plan is a tool to assist students and their
courses that they might forgo in pursuit of a three-year graduation 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

Three-year plans may vary considerably from student to student,

KEPT

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

DEPARTMENTAL EXPECTATIONS
A three-year degree is feasible for students with a variety of backgrounds
and specific preparation. Students should ideally be entering the

Code
MATH 221
MATH 222
STAT 301
or STAT 302
or STAT 324
or STAT 371
or STAT 240

Title
Calculus and Analytic Geometry 1
Calculus and Analytic Geometry 2
Introduction to Statistical Methods
Accelerated Introduction to Statistical Methods
Introductory Applied Statistics for Engineers
Introductory Applied Statistics for the Life
Introduction to Data Modeling I

Credits
5
4
3
3
3
3
1

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,

First Year

Fall
Consider Honors in the
Major
MATH 234
COMP SCI 200 or 220
Communications A
Social Science Breadth
Elective

Credits
1
4
3-4
3
3
3

Spring
STAT 303
STAT 333 or 340
3-4 MATH 320, 340, or 341
3
3
3

Credits
1
3-4
3

Second Year

Fall
STAT/MATH 309
STAT/M/E 424
Communications B
Physical Science Breadth
Social Science Breadth

Credits
3
3
3
3
3

Spring
STAT/E 310
3 STAT Elective course
3 Literature Breadth
3 Biological Science Breadth
3 Elective

Credits
1
3
3
3
3

Third Year

Fall
STAT Elective course
STAT Elective course
Humanities Breadth
Physical Science Breadth
Social Science Breadth

Credits
3
3
3
3
3

Spring
3 STAT Elective course
3 STAT Elective course
3 Literature Breadth
3 Biological Science Breadth
3 Elective

Credits
3
3
3
3
3

Total Credits 120

Total Credits 90

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
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 Ph.D.) 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.,
aricultural, 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
SuccessWorks at the College of Letters & Science helps students
leverage the academic skills learned in their major, certificates, and
liberal arts degree; explore and try out different career paths; participate
in internships; prepare for the job search and/or graduate school applications; and network with professionals in the field (alumni and employers). In short, SuccessWorks helps students in the College of Letters & Science discover themselves, find opportunities, and develop the skills they need for success after graduation.

SuccessWorks can also assist students in career advising, résumé and cover letter writing, networking opportunities, and interview skills, as well as course offerings for undergraduates to begin their career exploration early in their undergraduate career.

Students should set up their profiles in Handshake (https://careers.ls.wisc.edu/handshake/) to take care of everything they need to explore career events, manage their campus interviews, and apply to jobs and internships from 200,000+ employers around the country.

- SuccessWorks (https://careers.ls.wisc.edu/)
- Set up a career advising appointment (https://careers.ls.wisc.edu/make-an-appointment/)
- INTER-LS 210 L&S Career Development: Taking Initiative (1 credit, targeted to first- and second-year students)—for more information, see Inter-LS 210: Career Development, Taking Initiative (https://careers.ls.wisc.edu/inter-ls-210-career-development-taking-initiative/)
- INTER-LS 215 Communicating About Careers (3 credits, fulfills Com B General Education Requirement)
- Handshake (https://careers.ls.wisc.edu/handshake/)
- Learn how we're transforming career preparation: L&S Career Initiative (http://ls.wisc.edu/lsci/)

### PEOPLE

Professors J. Zhu (chair), Ane, Chappell, Chien, Keles, Larget, Loh, Newton, Shao, Y. Wang, Yandell, C. Zhang, Z. Zhang; Associate Professor Rohe; Assistant Professors Cisewski-Kehe, Garcia Trillos, Kang, Levin, Patel, Raschka, Raskutti, Sankaran, M. Wang, A Zhang