

# DATA SCIENCE, BS

## 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*.

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|-------------------|--|
| General Education | <ul style="list-style-type: none"> <li>• Breadth–Humanities/Literature/Arts: 6 credits</li> <li>• 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</li> <li>• Breadth–Social Studies: 3 credits</li> <li>• Communication Part A Part B *</li> <li>• Ethnic Studies *</li> <li>• Quantitative Reasoning Part A Part B *</li> </ul> |
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\* 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.

**LS 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 Advanced Coursework** Complete at least 60 credits at the Intermediate/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

Code	Title	Credits
<b>Foundational Math Courses</b>		
MATH 221	Calculus and Analytic Geometry I	5
or MATH 217	Calculus with Algebra and Trigonometry II	
MATH 222	Calculus and Analytic Geometry 2	4
<b>Total Credits</b>		<b>9</b>

Code	Title	Credits
<b>Foundational Data Science Courses</b>		
STAT 240	Data Science Modeling I	4
STAT 340	Data Science Modeling II	4
COMP SCI 220	Data Science Programming I	4
or COMP SCI 300	Programming II	
COMP SCI 320	Data Science Programming II	4
L I S 461	Data and Algorithms: Ethics and Policy (4-credit Communication B section optional)	3–4
or E C E/ I S Y E 570	Ethics of Data for Engineers	
<b>Total Credits</b>		<b>19–20</b>

Code	Title	Credits
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**Electives**

Students must complete at least one course from each of the four following categories, plus additional electives to reach the minimum credits. Additional courses taken within each category (except for linear algebra) may count towards other electives.<sup>2</sup>

**Machine Learning** 3

Complete one of the following:

COMP SCI/E C E/ Matrix Methods in Machine Learning  
M E 532

COMP SCI/E C E/ Introduction to Artificial Neural  
M E 539 Networks

COMP SCI 540 Introduction to Artificial Intelligence

GEN BUS 656 Machine Learning for Business  
Analytics

I SY E 521 Machine Learning in Action for  
Industrial Engineers

MATH 535 Mathematical Methods in Data  
Science

PHYSICS 361 Machine Learning in Physics

STAT 451 Introduction to Machine Learning  
and Statistical Pattern Classification

STAT 453 Introduction to Deep Learning and  
Generative Models

**Advanced Computing** 3

Complete one of the following:

COMP SCI 400 Programming III

COMP SCI 412 Introduction to Numerical Methods

COMP SCI/  
STAT 471 Introduction to Computational  
Statistics

COMP SCI/  
MATH 513 Numerical Linear Algebra

COMP SCI/  
MATH 514 Numerical Analysis

COMP SCI/E C E/ Introduction to Optimization  
I SY E 524

COMP SCI 544 Introduction to Big Data Systems

COMP SCI 564 Database Management Systems:  
Design and Implementation

COMP SCI 565 Introduction to Data Visualization

COMP SCI/  
B M I 576 Introduction to Bioinformatics

GEOG 573 Advanced Geocomputing and  
Geospatial Big Data Analytics

GEOG 574 Geospatial Database Design and  
Development

MATH 444 Graphs and Networks in Data  
Science

**Statistical Modeling** 3

Complete one of the following:

ECON 400 Introduction to Applied  
Econometrics

ECON 410 Introductory Econometrics

ECON 460 Economic Forecasting

GEOG 579 GIS and Spatial Analysis

I SY E 575 Introduction to Quality Engineering

STAT/MATH 309 Introduction to Probability and  
Mathematical Statistics I<sup>2</sup>

or STAT 311 Introduction to Theory and Methods of  
Mathematical Statistics I

or MATH/  
STAT 431 Introduction to the Theory of Probability

STAT/MATH 310 Introduction to Probability and  
Mathematical Statistics II<sup>2</sup>

or STAT 312 Introduction to Theory and Methods of  
Mathematical Statistics II

STAT 349 Introduction to Time Series

STAT 351 Introductory Nonparametric  
Statistics

STAT 421 Applied Categorical Data Analysis

STAT/M E 424 Statistical Experimental Design

STAT 436 Statistical Data Visualization

STAT 443 Classification and Regression Trees

STAT 456 Applied Multivariate Analysis

STAT 461 Financial Statistics

STAT 575 Statistical Methods for Spatial Data

MATH 531 Probability Theory

MATH/I SY E/  
OTM/STAT 632 Introduction to Stochastic  
Processes

MATH 635 An Introduction to Brownian Motion  
and Stochastic Calculus

**Linear Algebra** 3

Complete one from the following. Only one course from the linear algebra list can be used towards the major.<sup>2</sup>

MATH 320 Linear Algebra and Differential  
Equations

MATH 340 Elementary Matrix and Linear  
Algebra

MATH 341 Linear Algebra

MATH 375 Topics in Multi-Variable Calculus and  
Linear Algebra

**Other Electives** 6

For additional electives students may complete courses from the list below or additional courses from the required categories above.<sup>2</sup>

COMP SCI/I SY E/ Introduction to Combinatorial  
MATH 425 Optimization

COMP SCI/I SY E/ Linear Optimization  
MATH/STAT 525

COMP SCI/  
E C E 533 Image Processing

COMP SCI 559 Computer Graphics

COMP SCI/  
B M I 567 Medical Image Analysis

COMP SCI 577 Introduction to Algorithms

E C E 203 Signals, Information, and  
Computation

ECON 315 Data Visualization for Economists

ECON 570	Fundamentals of Data Analytics for Economists
ECON 695	Topics in Economic Data Analysis
GEOG 378	Introduction to Geocomputing
GEOG 572	Graphic Design in Cartography
GEOG 575	Interactive Cartography & Geovisualization
I SY E 323	Operations Research–Deterministic Modeling
I SY E 412	Fundamentals of Industrial Data Analytics
I SY E/M E 512	Inspection, Quality Control and Reliability
I SY E 612	Information Sensing and Analysis for Manufacturing Processes
INFO SYS 322	Introduction to Databases
L I S 407	Data Storytelling with Visualization
L I S 440	Navigating the Data Revolution: Concepts of Data & Information Science
L I S 464	Applied Database Design
L I S 501	Introduction to Text Mining
LSC 460	Social Media Analytics
LSC 660	Data Analysis in Communications Research
MATH 331	Introductory Probability <sup>2</sup>
SOC 351	Introduction to Survey Methods for Social Research
SOC/ C&E SOC 618	Social Network Analysis
SOC/ C&E SOC 693	Practicum in Analysis and Research
SOIL SCI 585	Using R for Soil and Environmental Sciences
STAT 405	Data Science Computing Project
STAT 433	Data Science with R

**Total Credits** **18**

## RESIDENCE & QUALITY OF WORK

- 2.000 GPA in all major courses
- 2.000 GPA in all upper level work in the major<sup>1</sup>
- 15 credits in the major, taken on the UW-Madison campus

## FOOTNOTES

<sup>1</sup> Upper-level in the major includes L I S 461 and all courses counting towards the Electives requirement (i.e. Machine Learning, Advanced Computing, Statistical Modeling, Linear Algebra, and Other Electives).

<sup>2</sup> Students are only allowed to count one course from each of **probability** (MATH 331, STAT/MATH 309, STAT 311, or STAT/MATH 431), **inference** (STAT/MATH 310 or STAT 312), and **linear algebra** (MATH 320, MATH 340, MATH 341, or MATH 375) towards the major.

## 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.