# DATA SCIENCE, B.S.

## 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 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 (B.S.)

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.

**Foreign Language**
Complete the third unit of a foreign language.

**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.

## REQUIREMENTS FOR THE MAJOR

### Code | Title | Credits
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MATH 221 | Calculus and Analytic Geometry 1 | 5
or MATH 217 | Calculus with Algebra and Trigonometry II | 4
or MATH 275 | Topics in Calculus I | 4
MATH 222 | Calculus and Analytic Geometry 2 | 4
or MATH 276 | Topics in Calculus II | 4

### Code | Title | Credits
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STAT 240 | Introduction to Data Modeling I | 4
or MATH 275 | Topics in Calculus I | 4
MATH 222 | Calculus and Analytic Geometry 2 | 4
or MATH 276 | Topics in Calculus II | 4

### Code | Title | Credits
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COMP SCI 220 | Data Science Programming I | 4
or COMP SCI 300 | Programming II | 4
COMP SCI 320 | Data Science Programming II | 4
L I S 461 | Data and Algorithms: Ethics and Policy | 3-4

### Electives

Students must complete at least one course from each of the four following categories and then additional electives to reach the minimum credits. Additional courses taken within each category may count towards other electives.

**Machine Learning**
Complete one of the following:
- COMP SCI/E C E/ M E 532 | Matrix Methods in Machine Learning | 3
- COMP SCI/E C E/ M E 539 | Introduction to Artificial Neural Networks | 3
- COMP SCI 540 | Introduction to Artificial Intelligence | 3
MATH 535  Mathematical Methods in Data Science
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/ECE/ISYE 524  Introduction to Optimization
- COMP SCI 564  Database Management Systems: Design and Implementation
- GEOG 573  Advanced Geocomputing and Geospatial Big Data Analytics
- GEOG 574  Geospatial Database Design and Development

**Statistical Modeling**  
3
Complete one of the following:

- ECON 400  Introduction to Applied Econometrics
- ECON 410  Introductory Econometrics
- STAT/MATH 309  Introduction to Probability and Mathematical Statistics I
- STAT/MATH 310  Introduction to Probability and Mathematical Statistics II
- STAT 311  Introduction to Theory and Methods of Mathematical Statistics I
- 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/ME 424  Statistical Experimental Design
- STAT/MATH 431  Introduction to the Theory of Probability
- STAT 443  Classification and Regression Trees
- STAT 456  Applied Multivariate Analysis
- STAT 461  Financial Statistics
- MATH 531  Probability Theory
- MATH/ISYE/OTM/STAT 632  Introduction to Stochastic Processes
- MATH 635  An Introduction to Brownian Motion and Stochastic Calculus

**Linear Algebra**  
0-3
Complete one from the following:

- 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
- COMP SCI/ECE/M E 532  Matrix Methods in Machine Learning

**Other Electives**  
6-9
For additional electives students may complete courses from the list below or additional courses from the required categories above:

- ECE 203  Signals, Information, and Computation
- GEOG 570  Fundamentals of Data Analytics for Economists
- GEOG 572  Graphic Design in Cartography
- GEOG 575  Interactive Cartography & Geovisualization
- ISYE 323  Operations Research-Deterministic Modeling
- ISYE 412  Fundamentals of Industrial Data Analytics
- ISYE/M E 512  Inspection, Quality Control and Reliability
- ISYE 575  Introduction to Quality Engineering
- ISYE 612  Information Sensing and Analysis for Manufacturing Processes
- COMP SCI/ISYE/MATH 425  Introduction to Combinatorial Optimization
- COMP SCI/ISYE/MATH/STAT 525  Linear Optimization
- COMP SCI/ECE 533  Image Processing
- COMP SCI 559  Computer Graphics
- COMP SCI/BME 567  Medical Image Analysis
- COMP SCI/BME 576  Introduction to Bioinformatics
- COMP SCI 577  Introduction to Algorithms
- SOC 351  Introduction to Survey Methods for Social Research
- SOC/C&E SOC 693  Practicum in Analysis and Research
- STAT 433  Data Science with R

**RESIDENCE & QUALITY OF WORK**

- 2.000 GPA in all major courses
- 2.000 GPA in all upper level work in the major
- 15 credits in the major, taken on the UW-Madison campus

**FOOTNOTES**

1 Students who take COMP SCI/ECE/M E 532 may count the course towards both their linear algebra and machine learning requirements.
However, students should be aware that some elective courses, in MATH in particular, require linear algebra courses as a prerequisite.

Upper-level in the major includes LIS 461 and all courses listed in the Data Science Electives (i.e. Machine Learning, Advanced Computing, Statistical Modeling, Linear Algebra, and Other Electives).

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.