Data Science, B.S.

Degree Offered

- Bachelor of Science

Nature of the Program

Data science is an interdisciplinary field with roots in applied mathematics, statistics and computer science. The Bachelor of Science in Data Science seeks to meet the increased employment demands across many industries and research fields.

Data Science majors will develop quantitative and computational skills to solve real-world problems. For example, data scientists are responsible for creating and maintaining dashboards in a pandemic, predicting traffic patterns to improve driver safety and helping apps like Uber Eats optimize food delivery. Students can customize the degree to fit their interests by selecting a focus area of their choice to create a degree with practical applications.

Working with their academic advisers, data science students will take classes in a discipline related to their interests and career goals. Students can choose their area of emphasis among a variety of areas including the social sciences, humanities, and sciences. Examples include astronomy, biology, criminology, geography, geology, GIS, physics, public health, psychology, and sociology.

Minors

All students have the possibility of earning one or more minors; view a list of all available minors and their requirements (http://catalog.wvu.edu/undergraduate/minors/) here. Please note that students may not earn a minor in their major field. An undergraduate student majoring in data science may choose to minor in actuarial science, applied mathematics, pure mathematics, or statistics.

Mathematics Learning Center

The Calculus Learning Center (https://mathanddata.wvu.edu/academic-support/math-learning-center-tutors/) (CLC) is a free walk-in tutoring center open 5-days a week that employs students who are proficient in mathematics. It is located at ARM 301, and the hours are posted on the door or on the School of Mathematical and Data Sciences' webpage. The CLC tutors help with all undergraduate mathematics courses from Calculus 1 through Calculus 4. The CLC also employs students who are proficient in mathematics. For more information about the center, call (304)293-2011 or contact Dr. Renee LaRue at reneelarue@math.wvu.edu.

Students in other foundational mathematics courses can receive help at the STEM Learning Center (https://stemcollab.wvu.edu/stem-learning-center/).

FACULTY

DIRECTOR OF THE SCHOOL OF MATHEMATICAL AND DATA SCIENCES

- Jessica Deshler - Ph.D. (University of New Mexico)
  Regular Graduate Faculty, Undergraduate Mathematics Education, Equity in Mathematics, Graduate Student Development

ASSOCIATE DIRECTOR OF THE INSTITUTE OF MATH LEARNING

- Lori Ogden - Ph.D. (West Virginia University)
  Associate Graduate Faculty, Undergraduate Mathematics Education

ASSOCIATE DIRECTOR FOR GRADUATE PROGRAMS

- Kevin Milans - Ph.D. (University of Illinois)
  Regular Graduate Faculty, Combinatorics, Graph Theory, and Partially Ordered Sets

ASSOCIATE DIRECTOR FOR UNDERGRADUATE PROGRAMS

- Charis Tsikkou - Ph.D. (Brown University)
  Regular Graduate Faculty, Hyperbolic and Mixed Type Partial Differential Equations, Conservation Laws

ASSOCIATE DIRECTOR OF THE SCHOOL OF MATHEMATICAL AND DATA SCIENCES

- Adrian Tudorascu - Ph.D. (Carnegie Mellon University)
  Regular Graduate Faculty, Partial Differential Equations, Optimal Transport

PROFESSORS

- Krzysztof Ciesielski - Ph.D. (Warsaw University)
  Regular Graduate Faculty, Topology, Set Theory, MRI Imaging
- Marjorie Darrah - Ph.D. (West Virginia University)

Regular Graduate Faculty, Applied Mathematics, Mathematics Education

- Jessica Deshler - Ph.D. (University of New Mexico)
  Regular Graduate Faculty, Undergraduate Mathematics Education, Equity, Graduate Student Development
- Harvey Diamond - Ph.D. (Massachusetts Institute of Technology)
  Regular Graduate Faculty, Approximation theory, Applied Mathematics
- Harry Gingold - D.Sc. (Israel Institute of Technology)
  Regular Graduate Faculty, Discrete Finite Difference systems of Equations, Factorization of Power Series, Foundation (Geometry), Mathematical Cryptography, Optimization, Compactification, Ordinary Differential Systems of Equations, Asymptotics, Approximations, Turning point theory, Celestial Mechanics
- Erin Goodykoontz - Ed.D (West Virginia University)
  Introductory Concepts of Mathematics
- Ádám M. Halász - Ph.D. (State University of New York at Stony Brook)
  Regular Graduate Faculty, Molecular systems biology, Monte Carlo methods, Mathematical Physics
- Rong Luo - Ph.D. (West Virginia University)
  Regular Graduate Faculty, Graph Theory, Discrete Math
- David Miller - Ph.D. (Oklahoma State University)
  Regular Graduate Faculty, Undergraduate math Education, Cognitive Science, STEM Education
- Robert Mnatsakanov - Ph.D. (Moscow Institute of Electronics and Mathematics)
  Regular Graduate Faculty, Applied Probability, Approximation of functions from moments, Risk Models
- Laura Pyzdrowski - Ed.D. (West Virginia University)
  Regular Graduate Faculty, Undergraduate Math Education, STEM Education, K-12 Outreach, Distance Learning, Instructional Technology
- Kenneth Ryan - Ph.D. (Iowa State University)
  Regular Graduate Faculty, Semi-supervised learning and design of experiments
- Adrian Tudorascu - Ph.D. (Carnegie Mellon University)
  Regular Graduate Faculty, Particial Differential Equations, Optimal Transport
- Jerzy Wojciechowski - Ph.D. (University of Cambridge)
  Regular Graduate Faculty, Combinatorics, Graph Theory

ASSOCIATE PROFESSORS

- Olgur Celikbas - Ph.D. (University of Nebraska)
  Regular Graduate Faculty, Commutative Algebra, Homologic Algebra
- Vito D'Orazio - Ph.D. (Pennsylvania State University)
  Regular Graduate Faculty, Data Sciences
- Renee LaRue - Ph.D. (West Virginia University)
  Associate Graduate Faculty, Undergraduate Mathematics Education
- Kevin Milans - Ph.D. (University of Illinois)
  Regular Graduate Faculty, Combinatorics, Graph Theory, Partially Ordered Sets
- Lori Ogden - Ph.D. (West Virginia University)
  Associate Graduate Faculty, Undergraduate Mathematics Education, Associate Director for the Institute for Math Learning
- Casian Pantea - Ph.D. (University of Wisconsin - Madison)
  Regular Graduate Faculty, Mathematical Biology, Dynamical Systems
- Vicki Sealey - Ph.D. (Arizona State University)
  Regular Graduate Faculty, Undergraduate Mathematics Education, Calculus student learning
- Charis Tsikkou - Ph.D. (Brown University)
  Regular Graduate Faculty, Hyperbolic and Mixed Type Partial Differential Equations

ASSISTANT PROFESSORS

- Krista Bresock - Ph.D. (West Virginia University)
  Undergraudate Mathematics Education
- Ela Celikbas - Ph.D. (University of Nebraska)
  Regular Graduate Faculty, Commutative Algebra, Representation Theory
- Srinjoy Das - Ph.D. (University of California, San Diego)
  Regular Graduate Faculty, Data Sciences
- Ryan Hansen - Ph.D. (West Virginia University)
  Combinatorics
- Cody Hood - Ph.D. (West Virginia University)
  Undergraduate Mathematics Education

- Josh Karr - Ph.D. (West Virginia University)
  Mathematics Education
- Jennifer Kearns - M.S. (West Virginia University)
  Undergraduate Mathematics Education
- Mihyun Kim - Ph.D. (Colorado State University)
  Regular Graduate Faculty, Functional Data Analysis, Extreme Value Analysis, and Time Series Analysis
- Clark Metz - Ph.D. (West Virginia University)
  Higher Education
- Matthew Schraeder - Ph.D. (West Virginia University)
  Undergraduate Mathematics Education
- Ignacio Segovia Dominguez - Ph.D. (Center for Research in Mathematics, A.C.)
  Regular Graduate Faculty, Applied Mathematics, Statistical Modeling and Computer Science
- Youngseok Song - Ph.D. (Colorado State University)
  Regular Graduate Faculty, High-dimensional Statistics, Graphical Model, Large-scale Inferences, Network Analyses
- Iwona Wojciechowska - Ph.D. (West Virginia University)

INSTRUCTORS

- Joelleen Bidwell - M.A. (West Virginia University)
- Gabriel Tapia - M.S. (West Virginia University)
- Galyna Voitiuk - Ph.D. (West Virginia University)
- Sylvanus Waibogha - M.S. (West Virginia University)

PROFESSORS EMERITI

- Anthony A. Billings - M.S. (West Virginia University, A.B.D. (Carnegie Mellon University))
  Statistical Computing, Statistical Modeling, Robust Estimation, Nonlinear Dynamic Systems, Statistical Education
- Gary Ganser - Ph.D. (Rensselaer Polytechnic Institute)
  Modeling, Data Analysis
- John Goldwasser - Ph.D. (University of Wisconsin-Madison)
  Combinatorics, Graph Theory
- Jack T. Goodykoontz - Ph.D. (University of Kentucky)
  Topology
- Henry W. Gould - M.A. (University of Virginia)
  Number Theory, Combinatorics, Special Functions
- Erdogan Gunel - Ph.D. (State University of New York at Buffalo)
  Bayesian Inference, Biostatistics, Categorical Data Analysis
- Harumi Hattori - Ph.D. (Rensselaer Polytechnic Institute)
  Differential Equations, Continuum Mechanics
- Gerald R. Hobbs - Ph.D. (Kansas State University)
  Biostatistics, Nonparametric Statistics, Regression Analysis
- Hong-Jian Lai - Ph.D. (Wayne State University)
  Graph Theory, Matroid Theory
- Dening Li - Ph.D. (Fudan University)
  Partial Differential Equations
- Michael E. Mays - Ph.D. (Pennsylvania State University)
  Number Theory
- James E. Miller - Ph.D. (University of Kentucky)
  Complex Analysis
- Sherman Riemenschneider - Ph.D. (Syracuse University)
  Approximation Theory, Wavelets, Signal Processing
- Cun-Quan Zhang - Ph.D. (Simon Fraser University)
  Graph Theory, Combinatorics, Algorithms, Bioinformatics, Data mining

Admissions for 2026-2027

The Admissions Requirements will be as follows for the 2025-2026 Academic Year.

- First Time Freshmen are admitted directly to the major. For the timely completion of the degree, it is recommended that students have a minimum MATH ACT of 22, a MATH SAT of 540, or an ALEKS score of 45.

- Students transferring from another WVU major or from another institution with fewer than 24 credits and at least a 2.0 overall GPA are admitted directly to the major. For the timely completion of the degree, it is recommended that students have a minimum MATH ACT of 22, a MATH SAT of 540, or an ALEKS score of 45.
- Students transferring from another WVU major or from another institution with 24-29 hours must have at least a 2.0 overall GPA and meet the following requirements prior to being admitted to the major: completion of MATH 126 (http://catalog.wvu.edu/search/?P=MATH%20126) with a grade of C-.
- Students transferring from another WVU major or from another institution 30 or more hours must have at least a 2.0 overall GPA and meet the following requirements prior to being admitted to the major: completion of MATH 155 (http://catalog.wvu.edu/search/?P=MATH%20155) with C-.

Major Code: 14E7

General Education Foundations

Please use this link to view a list of courses that meet each GEF requirement. **(**http://registrar.wvu.edu/gef/**)**

NOTE: Some major requirements will fulfill specific GEF requirements. Please see the curriculum requirements listed below for details on which GEFs you will need to select.

Code	Title	Hours
General Education Foundations		
F1 - Composition & Rhetoric		3-6
ENGL 101 & ENGL 102 or ENGL 103	Introduction to Composition and Rhetoric and Composition, Rhetoric, and Research Accelerated Academic Writing	
F2A/F2B - Science & Technology		4-6
F3 - Math & Quantitative Reasoning		3-4
F4 - Society & Connections		3
F5 - Human Inquiry & the Past		3
F6 - The Arts & Creativity		3
F7 - Global Studies & Diversity		3
F8 - Focus (may be satisfied by completion of a minor, double major, or dual degree)		9
Total Hours		31-37

Please note that not all of the GEF courses are offered at all campuses. Students should consult with their advisor or academic department regarding the GEF course offerings available at their campus.

Degree Requirements

Student must complete the WVU General Education Foundations requirements, Eberly Edge Program requirements, major requirements, and electives to total a minimum of 120 hours.

Departmental Requirements for the B.S. in Data Science

- **Calculation of Major GPA:** A minimum GPA of a 2.0 is required in all courses applied to major requirements. If a course is repeated, all attempts will be included the calculation of the GPA, unless the course is eligible for a D/F repeat.
- **Writing and Communication Skills Requirements:** Data Science Bachelor of Science students fulfill the Writing and Communication Skills requirement by completing ENGL 101 and ENGL 102 (or ENGL 103), DSCI 480 and DSCI 481, and one additional **SpeakWrite Certified Courses™**
- **Capstone Requirement:** The university requires the successful completion of a Capstone course. Data Science majors must complete DSCI 480 and DSCI 481.

Curriculum Requirements

Code	Title	Hours
University Requirements		32
Eberly Edge Requirement		12
Data Science Major Requirements		76
Total Hours		120

University Requirements

Code	Title	Hours
General Education Foundations (GEF) 1, 2, 3, 4, 5, 6, 7, and 8 (31-37 Credits)		
Outstanding GEF Requirements 1, 4, 5, and 6 or 7		15
DSCI 191: First-Year Seminar		1
General Electives		16
Total Hours		32

Eberly Edge Program Requirements

Code	Title	Hours
EDG 1: Data and Society (DSCI 450)		
EDG 2: Effective and Civil Communication		3
EDG 3: Ethics and Civil Responsibility		3
EDG 4: Global and Regional Perspectives (GEF 6 or 7)		3
EDG 5: Practicing Arts and Sciences (ARSC 380)		3
EDG 6: High Impact Experience (DSCI 480 & DSCI 481)		
Total Hours		12

Data Science Major Requirements

Code	Title	Hours
STEM FOUNDATIONS*		**12**
MATH 155	Calculus 1	
Select one science pair:		
BIOL 115 & 115 & BIOL 117 & BIOL 117L	Principles of Biology and Principles of Biology and Introductory Physiology and Introductory Physiology Laboratory	
CHEM 111 & 111L & CHEM 112 & CHEM 112L	Survey of General, Organic, and Biological Chemistry 1 and Survey of Chemistry 1 Laboratory and Survey of General Organic Biological Chemistry 2 and Survey of Chemistry 2 Laboratory	
CHEM 115 & 115L & CHEM 116 & CHEM 116L	Fundamentals of Chemistry 1 and Fundamentals of Chemistry 1 Laboratory and Fundamentals of Chemistry 2 and Fundamentals of Chemistry 2 Laboratory	
PHYS 101 & 101L & PHYS 102 & PHYS 102L	Introductory Physics 1 and Introductory Physics 1 Laboratory and Introductory Physics 2 and Introductory Physics 2 Laboratory	
PHYS 111 & 111L & PHYS 112 & PHYS 112L	General Physics 1 and General Physics 1 Laboratory and General Physics 2 and General Physics 2 Laboratory	
SUST 101 & 101L & SUST 201 & SUST 201L	Sustainable Earth and Sustainable Earth Laboratory and Earth System Science and Earth System Science Laboratory	
CORE COURSES		
Computer Science/Mathematics/Statistics Core		**25**
CS 110 & 110L	Introduction to Computer Science and Introduction to Computer Science Laboratory	
CS 111 & 111L	Introduction to Data Structures and Introduction to Data Structures Laboratory	
MATH 156	Calculus 2	

MATH 251	Multivariable Calculus	
MATH 441	Applied Linear Algebra	
STAT 215	Introduction to Probability and Statistics	
STAT 312	Intermediate Statistical Methods	
Data Science Core		**24**
DSCI 101	Introduction to Data Science	
DSCI 221	Reproducible Data Science using R	
DSCI 222	Data Science Workflows using Python	
DSCI 301	Databases for Data Science	
DSCI 310	Statistical Machine Learning 1	
DSCI 311	Statistical Machine Learning 2	
DSCI 410	Big Data in Practice: Cloud and Parallel Computing	
DSCI 450	Current Topics in Data Science	
TECHNICAL ELECTIVES		**12**
Select four courses from the list below:		
ASTR 469	Observational Astronomy	
BIOL 476	Computational Neuroscience	
COMM 201	Communication Research Methods	
COMM 401	Advanced Communication Research Methods	
CS 320	Analysis of Algorithms	
CS 350	Computer System Concepts	
CS 472	Artificial Intelligence	
CS 474	Introduction to Responsible and Safe AI	
GEOG 300	Geographical Data Analysis	
GEOG 454	Environmental Geographic Information Systems	
GEOG 455 & 455L	Introduction to Remote Sensing and Introduction to Remote Sensing Laboratory	
GEOG 457	Open-Source Spatial Analytics	
MATH 303	Introduction to the Concepts of Mathematics	
MATH 322	Introduction to Programming and Computational Mathematics	
MATH 378	Discrete Mathematics	
MATH 420	Numerical Analysis 1	
POLS 300	Empirical Political Analysis	
STAT 331	Sampling Methods	
STAT 445	Introductory Regression Analysis	
SUST 250 & 250L	Digital Earth and GIS and Digital Earth and GIS Laboratory	
WRIT 303	Multimedia Writing	
CAPSTONE EXPERIENCE		**3**
DSCI 480	Capstone Design	
DSCI 481	Capstone Experience	
Total Hours		76

*****

The STEM Foundation courses are common to all STEM majors and are excluded from the 50% count of upper-division courses.

Suggested Plan of Study

First Year

Fall	Hours	Spring	Hours
DSCI 101	3	DSCI 221	3
DSCI 191	1	ENGL 101 (GEF 1)	3
CS 110 (GEF 2)	3	CS 111	3
CS 110L	1	CS 111L	1

MATH 155 (GEF 3)	4	MATH 156 (GEF 8 Course 1)	4
GEF 4	3	General Elective	1
	15		15

Second Year

Fall	Hours	Spring	Hours
DSCI 222	3	DSCI 301	3
STAT 215 (GEF 8 Course 2)	3	ENGL 102 (GEF 1)	3
MATH 251	4	MATH 441	3
EDG 3: Ethics and Civil Responsibility	3	STAT 312	3
General Elective	1	Science Course 1 (GEF 8 Course 3)	4
	14		16

Third Year

Fall	Hours	Spring	Hours
DSCI 310	3	DSCI 311	3
EDG 4: Global and Regional Perspectives (GEF 6 or 7)	3	ARSC 380 (EDG 5)	3
Technical Elective 1	3	GEF 6 or 7	3
Science Course 2	4	General Elective	3
General Elective	2	Technical Elective 2	3
	15		15

Fourth Year

Fall	Hours	Spring	Hours
DSCI 410	3	DSCI 481 (EDG 6)	2
DSCI 450 (EDG 1)	3	Technical Elective 4	3
DSCI 480 (EDG 6)	1	General Elective	3
Technical Elective 3	3	General Elective	3
EDG 2: Effective and Civil Communication	3	General Elective	3
GEF 5	3		
	16		14

Total credit hours: 120

Degree Progress

- By the beginning of a student's third regular semester (fall or spring), they should have completed MATH 155 with a C- or better.
- During the first four regular semesters (fall and spring) in the major, student must complete their foundational mathematics courses through MATH 441, CS 110, CS 111, DSCI 101, DSCI 221, and DSCI 222.
- A minimum cumulative and major GPA of a 2.0 must be maintained. Students who do not meet this benchmark will be removed from the major.
- All majors must meet with a department advisor working in data science or statistics each semester.

Major Learning Outcomes

DATA SCIENCE

Learning Outcome 1: Students will communicate data science workflows in both written and oral forms.

Outcome 1.1 Students will demonstrate their ability to develop and use appropriate data science techniques to address ‘science’ (subject matter) topics and questions.

Outcome 1.2 Students will communicate the biases and other implications of the data and analysis.

Outcome 1.3 Students will prepare a clear and concise written project and orally present a data science workflow and analysis effectively and professionally.

Learning Outcome 2: Students will understand and demonstrate the programming and technological aspects of a data science workflow

Outcome 2.1 Students will develop workflows using the languages and platforms common in data science practice (eg. R and Python, Rstudio and JupyterLab)

Outcome 2.2 Students will demonstrate their ability to acquire and manipulate data via a variety of platforms (eg. databases to cloud computing)

Outcome 2.3 Students will demonstrate their ability to use technologies for collaboration (eg. Git and GitHub)

Learning Outcome 3: Students will demonstrate their ability to visualize and model data

Outcome 3.1 Students will demonstrate visualization of data from simple plots for smaller data sets to visualizations for big data

Outcome 3.2 Students will demonstrate their ability to use current machine learning and other data science modeling methods appropriately and understand the underlying statistical and mathematical concepts.