

# Bachelor of Science in Data Science

The McKelvey School of Engineering and the College of Arts & Sciences developed a new major that efficiently captures the intersection of mathematics and statistics with computer science for data science. The Bachelor of Science in Data Science (BSDS) will give students the formal foundation needed to understand the applicability and consequences of the various approaches to analyzing data with a focus on statistical modeling and machine learning.

McKelvey Engineering students who declare this major must fulfill the core course requirements listed below and all other requirements for the Applied Science degree (<http://bulletin.wustl.edu/undergrad/engineering/requirements/>) in the McKelvey School of Engineering. They must also complete Engr 310 Technical Writing and 8 units of courses designated as NSM (Natural Sciences & Math) from Anthropology (L48 Anthro), Biology and Biomedical Sciences (L41 Biol), Chemistry (L07 Chem), Earth and Planetary Sciences (L19 EPSc), Physics (L31 Physics) or Environmental Studies (L82 EnSt).

Arts & Sciences students who declare this major must fulfill the distribution requirements and all other requirements for an AB degree (<http://bulletin.wustl.edu/undergrad/artsci/requirements/>) in addition to the specific requirements listed below.

## Data Science Core Requirements (CR)

Code	Title	Units
Math 131	Calculus I	3
Math 132	Calculus II	3
Math 233	Calculus III	3
Math 309	Matrix Algebra	3
Math 3211	Statistics for Data Science I	3
Math 4211	Statistics for Data Science II	3
Math 439	Linear Statistical Models	3
CSE 131	Introduction to Computer Science	3
CSE 247	Data Structures and Algorithms	3
CSE 217A	Introduction to Data Science	3
CSE 314A	Data Manipulation and Management	3
CSE 417T	Introduction to Machine Learning (or Math 4601 Statistical Learning)	3
<b>Total Units</b>		<b>36</b>

## Data Science Technical Electives

Four courses from Mathematics & Statistics or Computer Science & Engineering can be chosen from an approved list, with the following caveats:

- At least one course from Mathematics & Statistics (at the 400 level or above)
- At least one course from CSE (ending in S, T, M, or A)
- At most one course at the 200 level

## List of Approved Data Science Technical Electives

### Computer Science and Engineering

Code	Title	Units
CSE 237S	Programming Tools and Techniques	3
CSE 256A	Introduction to Human-Centered Design	3
CSE 311A	Introduction to Intelligent Agents Using Science Fiction	3
CSE 347	Analysis of Algorithms	3
CSE 359A	Signals, Data and Equity (Cannot be double-counted in EPR)	3
CSE 411A	AI and Society (Cannot be double-counted in EPR)	3
CSE 412A	Introduction to Artificial Intelligence	3
CSE 416A	Analysis of Network Data	3
CSE 417T	Introduction to Machine Learning (Cannot be double-counted in CR)	3
CSE 427S	Cloud Computing with Big Data Applications	3
CSE 435S	Database Management Systems	3
CSE 457A	Introduction to Visualization	3
CSE 514A	Data Mining	3
CSE 515T	Bayesian Methods in Machine Learning	3
CSE 517A	Machine Learning	3
CSE 518A	Human-in-the-Loop Computation	3
CSE 534A	Large-Scale Optimization for Data Science	3
CSE 543T	Algorithms for Nonlinear Optimization	3
CSE 559A	Computer Vision	3

### Mathematics and Statistics

Code	Title	Units
Math 322	Biostatistics	3
Math 420	Experimental Design	3
Math 434	Survival Analysis	3
Math 4392	Advanced Linear Statistical Models	3

Math 449	Numerical Applied Mathematics	3
Math 450	Topics in Applied Mathematics	3
Math 456	Topics in Financial Mathematics	3
Math 459	Bayesian Statistics	3
Math 460	Multivariate Statistical Analysis	3
Math 461	Time Series Analysis	3
Math 4601	Statistical Learning (Cannot be double-counted in CR)	3
Math 462	Mathematical Foundations of Big Data	3
Math 475	Statistical Computation	3
Math 493	Probability	3
Math 494	Mathematical Statistics	3
Math 495	Stochastic Processes	3
Math 5047	Geometry/Topology III: Differential Geometry	3
Math 5061	Theory of Statistics I	3
Math 5062	Theory of Statistics II	3
Math 5071	Linear Statistical Models Grad	3
Math 5072	Advanced Linear Models II	3

### Electrical and Systems Engineering

Code	Title	Units
ESE 4031	Optimization for Engineered Planning, Decisions and Operations	3
ESE 415	Optimization	3
ESE 427	Financial Mathematics	3

### Energy, Environmental & Chemical Engineering

Code	Title	Units
EECE 202	Computational Modeling in Energy, Environmental and Chemical Engineering	3

### Linguistics

Code	Title	Units
Ling 317	Introduction to Computational Linguistics	3

## Ethics and Professional Responsibility Requirement (EPR)

- 3 units of courses from the following list:

## List of EPR Course Options

Code	Title	Units
Engr 4501	Engineering Ethics and Sustainability	1
Engr 4502	Engineering Leadership and Team Building	1
Engr 4503	Conflict Management and Negotiation	1
Engr 450F	Engineers in the Community (Engineering Ethics, Leadership and Conflict Management)	3
Engr 520P	Presentation Skills for Scientists and Engineers	2
CSE 359A	Signals, Data and Equity (Cannot be double-counted as an Elective)	3
CSE 411A	AI and Society (Cannot be double-counted as an Elective)	3
MSB 512	Ethics in Biostatistics and Data Science	2

## Practicum Requirement

- 3 units of an **approved comprehensive data science project or experience**. A practicum must be approved by the committee of data science faculty.
- The practicum experience should be completed during the next-to-last semester of study (i.e., the first semester of senior year). It is important that practicum plans be submitted for review prior to starting the project or course work to ensure the proposed work is sufficient for the objectives of the practicum. After-the-fact approvals are possible but not guaranteed.
- Appropriate practicum work is possible via Independent Study (CSE 400E or Math 400) or via project-focused classes, including (but not limited to) CSE 437S Software Engineering Workshop and CSE 454A Software Engineering for External Clients. Students should contact course instructors in advance to identify the degree of agency the student will have over project selection and requirements.
- Contact Maria Sanchez (smaria@wustl.edu) in the CSE department office or the Math department office to initiate the approval process.