Data Science

Bachelor of Arts (BA)

The Data Science Major degree program combines computational and inferential reasoning to draw conclusions based on data about some aspect of the real world. Data scientists come from all walks of life, all areas of study, and all backgrounds. They share an appreciation for the practical use of mathematical and scientific thinking and the power of computing to understand and solve problems for business, research, and societal impact.

The Data Science Major will equip students to draw sound conclusions from data in context, using knowledge of statistical inference, computational processes, data management strategies, domain knowledge, and theory. Students will learn to carry out analyses of data through the full cycle of the investigative process in scientific and practical contexts. Students will gain an understanding of the human and ethical implications of data analytics and integrate that knowledge in designing and carrying out their work.

The Data Science major requirements include DATA C8 and DATA C100, the core lower-division and upper-division elements of the major, along with courses from each of the following requirement groups:

- Foundations in Mathematics and Computing
- Computational and Inferential Depth
- Modeling, Learning and Decision Making
- Probability
- Human Contexts and Ethics
- Domain Emphasis

All students will select a Domain Emphasis, a cluster of one lower division course and two upper division courses, that brings them into the context of a domain and allows them to build bridges with data science.

Minor Program

The Minor in Data Science at UC Berkeley aims to provide students with practical knowledge of the methods and techniques of data analysis, as well as the ability to think critically about the construction and implications of data analysis and models. The minor will empower students across the wide array of campus disciplines with a working knowledge of statistics, probability, and computation that allow students not just to participate in data science projects, but to design and carry out rigorous computational and inferential analysis for their field of interest. Check the Data Science Minor program website (https://data.berkeley.edu/academics/data-science-undergraduate-studies/data-science-minor/) for details.

In addition to the University, campus, and college requirements, students must fulfill the below requirements specific to the major program. Please check the Data Science program website (https://data.berkeley.edu/academics/data-science-undergraduate-studies/data-science-major/) for updates.

General Guidelines

- All courses taken to fulfill the major requirements below must be taken for letter-graded credit.
- No more than two upper-division courses can overlap between two majors.
- A minimum grade point average (GPA) of 2.0 must be maintained in all courses toward the major, and in all upper-division courses toward the major.

Lower Division Prerequisites

DATA/COMPSCI/STAT/INFO C8	Foundations of Data Science [1]	4
or STAT 20	Introduction to Probability and Statistics	
MATH 51	Calculus I (MATH 51 as of Fall 2025)	4
or MATH 10A	Methods of Mathematics: Calculus, Statistics, and Combinatorics	
or MATH 16A	Analytic Geometry and Calculus	
MATH 52	Calculus II (MATH 52 as of Fall 2025)	4
MATH 54	Linear Algebra and Differential Equations	4
or MATH 56	Linear Algebra	
or STAT 89A	Linear Algebra for Data Science	
or EECS 16A & EECS 16B	Foundations of Signals, Dynamical Systems, and Information Processing and Introduction to Circuits & Devices	
or PHYSICS 89	Introduction to Mathematical Physics	
COMPSCI 61A	The Structure and Interpretation of Computer Programs	4
or DATA C88C	Computational Structures in Data Science	
or COMPSCI C88C	Computational Structures in Data Science	
or ENGIN 7	Introduction to Computer Programming and Numerical Methods	
COMPSCI 61B	Data Structures	4

[1] Students may substitute Stat 20 for Data C8 toward the major when combined with CS 61A or CS 88/Data C88C; this option is not available for students who take Engin 7 for their Program Structures requirement. See the lower-division requirements (https://data.berkeley.edu/academics/data-science-undergraduate-studies/data-science-major/requirements-lower-division/) page on the Data Science program website for more details.

Lower Division Requirements

Students will also be required to take one lower division course towards their choice of Domain Emphasis.

Upper Division Requirements

Students will be required to complete 8 unique upper-division courses for a total of 28 or more units from the following requirement categories.

Principles and techniques of data science

DATA/COMPSCI/STAT C100	Principles & Techniques of Data Science	4

Computational and Inferential Depth

Students will be required to take two upper division courses comprising 7 or more units that provide computational and inferential depth beyond that provided in Data 100 and the lower-division courses.

Choose two courses comprising 7+ units from the following:

ASTRON 128	Astronomy Data Science Laboratory	4
COMPSCI 161	Computer Security	4
COMPSCI 162	Operating Systems and System Programming	4

COMPSCI 164	Programming Languages and Compilers	4
COMPSCI 168	Introduction to the Internet: Architecture and Protocols	4
COMPSCI 169	Course Not Available	4
or COMPSCI 169A	Introduction to Software Engineering	
or COMPSCI W169A	Course Not Available	
COMPSCI 170	Efficient Algorithms and Intractable Problems	4
COMPSCI 186	Introduction to Database Systems	4
or COMPSCI W186	Course Not Available	
COMPSCI 188	Introduction to Artificial Intelligence	4
DATA C101	Data Engineering	4
DATA 144	Data Mining and Analytics	3
ECON 140	Econometrics	4
or ECON 141	Econometrics (Quantitative)	
EECS 127	Optimization Models in Engineering	4
EL ENG 120	Signals and Systems	4
EL ENG 123	Digital Signal Processing	4
ENVECON C118	Introductory Applied Econometrics	4
ESPM 174	Design and Analysis of Ecological Research	4
IAS C118	Introductory Applied Econometrics	4
IND ENG 115	Industrial and Commercial Data Systems	3
IND ENG 135	Applied Data Science with Venture Applications	3
IND ENG 142B	Machine Learning and Data Analytics II	4
IND ENG 160	Nonlinear and Discrete Optimization	3
IND ENG 162	Linear Programming and Network Flows	3
IND ENG 164	Introduction to Optimization Modeling	3
IND ENG 165	Engineering Statistics, Quality Control, and Forecasting	4
IND ENG 166	Decision Analytics	3
IND ENG 173	Introduction to Stochastic Processes	3
INFO 159	Natural Language Processing	4
INFO 190	Special Topics in Information (Introduction to Data Visualization - only when offered on this topic)	4
MATH 156	Numerical Analysis for Data Science and Statistics	4
NUC ENG 175	Methods of Risk Analysis	3
PHYSICS 188	Bayesian Data Analysis and Machine Learning for Physical Sciences (previously PHYSICS 188)	4
STAT 135	Concepts of Statistics	4
STAT 150	Stochastic Processes	3
STAT 151A	Linear Modelling: Theory and Applications	4
STAT 152	Sampling Surveys	4
STAT 153	Introduction to Time Series	4
STAT 158	Experimental Design	4
STAT 159	Reproducible and Collaborative Statistical Data Science	4
STAT 165	Forecasting	3
UGBA 142	Advanced Business Analytics	3

Probability

Students will be required to take one upper-division course on probability.

Choose one of the following:

DATA/STAT C140	Probability for Data Science	4
MATH 106	Mathematical Probability Theory	4
EL ENG 126	Probability and Random Processes	4
IND ENG 172	Probability and Risk Analysis for Engineers	4
STAT 134	Concepts of Probability	4

Modeling, Learning, and Decision-Making

Students will be required to take one upper-division course on modeling, learning, and decision-making.

Choose one of the following:

COMPSCI C182	Designing, Visualizing and Understanding Deep Neural Networks	4
COMPSCI 189	Introduction to Machine Learning	4
DATA/STAT C102	Data, Inference, and Decisions	4
IND ENG 142A	Introduction to Machine Learning and Data Analytics	4
or IND ENG 142	Introduction to Machine Learning and Data Analytics	
STAT 154	Modern Statistical Prediction and Machine Learning	4

Human Contexts and Ethics

Students will be required to take one course from a curated list of courses that establish a human, social, and ethical context in which data analytics and computational inference play a central role.

AFRICAM 134	Information Technology and Society	4
or AFRICAM/AMERSTD C134	Information Technology and Society	
BIO ENG 100	Ethics in Science and Engineering	3
CY PLAN 101	Introduction to Urban Data Analytics	4
DATA C104/HISTORY C184D/STS C104D	Human Contexts and Ethics of Data - DATA/History/STS	4
DIGHUM 100	Theory and Method in the Digital Humanities	3
INFO 188	Behind the Data: Humans and Values	3
ISF 100J	The Social Life of Computing	4
NWMEDIA 151AC	Transforming Tech: Issues and Interventions in STEM and Silicon Valley	4
PHILOS 121	Moral Questions of Data Science	4
PB HLTH C160/ESPM C167	Environmental Health and Development	4

Domain Emphasis

Students will also be required to take two upper-division courses towards their choice of Domain Emphasis.

Domain Emphases that students can choose from:

- Applied Mathematics and Modeling (p. 3)
- Business and Industrial Analytics (p. 3)
- Cognition (p. 3)
- Computational Methods in Molecular and Genomic Biology (p. 4)

- Data Arts and Humanities
- Ecology and the Environment (p. 5)
- Economics (p. 5)
- Environment, Resource Management, and Society (p. 6)
- Evolution and Biodiversity (p. 6)
- Geospatial Information and Technology (p. 6)
- Human and Population Health (p. 7)
- Human Behavior and Psychology (p. 7)
- Inequalities in Society (p. 7)
- Linguistic Sciences (p. 8)
- Neurosciences (p. 8)
- Organizations and the Economy (p. 8)
- Philosophical Foundations: Evidence and Inference (p. 8)
- Philosophical Foundations: Minds, Morals, and Machines (p. 9)
- Physical Science Analytics (p. 9)
- Quantitative Social Science (p. 9)
- Robotics (p. 10)
- Science, Technology, and Society (p. 10)
- Social Welfare, Health, and Poverty (p. 11)
- Social Policy and Law (p. 11)
- Sustainable Development and Engineering (p. 11)
- Urban Science (p. 12)

From the lists shown below, students will select one course from the lower-division, and two courses from the upper-division. The lower division course is a required element of the Domain Emphasis.

NOTE: Courses in each domain emphasis may be restricted by major to enroll and/or have extensive prerequisites. It may be difficult to complete an emphasis given these restrictions. Students are advised to make appropriate alternate plans. Prerequisites can be viewed by clicking on a course link.

Applied Mathematics and Modeling

The Applied Mathematics and Modeling domain emphasis gives students the opportunity to explore mathematical techniques essential to data science and mathematical modeling. Apart from gaining core competencies in advanced calculus and linear algebra, students can learn numerical approximation and optimal decision methods, as well as gain experience in their implementation in parallel programming.

The Honors versions of these courses (where applicable) will also be accepted.

Lower Division (choose one)		
MATH 53	Multivariable Calculus	4
MATH 55	Discrete Mathematics	4
Upper Division (choose two)		
CIV ENG C133/ MEC ENG C180	Engineering Analysis Using the Finite Element Method	3
EECS 127	Optimization Models in Engineering	4
ENGIN 150	Basic Modeling and Simulation Tools for Industrial Research Applications	4
IND ENG 160	Nonlinear and Discrete Optimization	3
IND ENG 162	Linear Programming and Network Flows	3
MATH 104	Introduction to Analysis	4
MATH 110	Abstract Linear Algebra	4
MATH 113	Introduction to Abstract Algebra	4
MATH 118	Fourier Analysis, Wavelets, and Signal Processing	4
MATH 128A	Numerical Analysis	4
MATH 156	Numerical Analysis for Data Science and Statistics	4
COMPSCI C267/ ENGIN C233	Applications of Parallel Computers	3

We recognize in general that to satisfy the prerequisites for these courses below, a student will have already satisfied the Domain Emphasis. Because these courses are natural to include in this emphasis, they will function as an elective for many students who take them. They are included here merely for those students who get to these courses from nontraditional paths, for whom these courses should count towards the DE.

MATH 128B	Numerical Analysis	4

Business and Industrial Analytics

The Business and Industrial Analytics domain emphasis allows students to explore the principles and methods of making data-driven decisions under uncertainty in the worlds of business and industry. Students will learn how to approach management decisions from economic, probabilistic, and computational perspectives, and how to analyze and manage risk.

Lower Division (select one)		
ECON 1	Introduction to Economics	4
ECON 2	Introduction to Economics--Lecture Format	4
MATH 53	Multivariable Calculus	4
Upper Division (select two)		
IND ENG 115	Industrial and Commercial Data Systems	3
IND ENG 120	Principles of Engineering Economics	3
IND ENG 130	Methods of Manufacturing Improvement	3
IND ENG 153	Logistics Network Design and Supply Chain Management	3
IND ENG 156	Healthcare Analytics	3
IND ENG 166	Decision Analytics	3
UGBA 104	Introduction to Business Analytics	3
UGBA 134	Introduction to Financial Engineering	3
UGBA 141	Production and Operations Management (when completed for 3 units)	3
UGBA 142	Advanced Business Analytics	3
UGBA 161	Market Research: Tools and Techniques for Data Collection and Analysis	3

For students completing the lower-division requirement outside of UC Berkeley at a college where microeconomics and macroeconomics are offered as separate courses, only microeconomics is required for the Data Science BA. However, note that full equivalence to Econ 1 may still be required as a prerequisite to other courses you wish to take at UC Berkeley.

COgnition

The Cognition domain emphasis introduces students to fundamental scientific questions about how the human mind works. It gives them the opportunity to pursue one or more disciplinary approaches, including psychology, neuroscience, and linguistics, and to consider computational models of mind.

Lower Division (select one)		
COG SCI 1/1B/ N1	Introduction to Cognitive Science	4
PSYCH C61	Brain, Mind, and Behavior	3
PSYCH C64	Exploring the Brain: Introduction to Neuroscience	3
Upper Division (select two)		
COG SCI C100/ PSYCH C120	Basic Issues in Cognition	3
COG SCI C101/ LINGUIS C105	Cognitive Linguistics	4
COG SCI/ PSYCH C126	Perception	3
COG SCI/ PSYCH C127	Cognitive Neuroscience	3
COG SCI 131/ PSYCH C123	Computational Models of Cognition	4
COG SCI 132	Rhythms of the Brain: from Neuronal Communication to Function	4
COG SCI 150	Sensemaking and Organizing	3
COG SCI 180	Mind, Brain, and Identity	3
COG SCI 190	Special Topics in Cognitive Science (Data Science and Cognition -- only when offered with this topic)	3
COMPSCI 188	Introduction to Artificial Intelligence	4
MUSIC 108	Music Perception and Cognition	4
or MUSIC 108N	Course Not Available	
PSYCH 114	Biology of Learning	3
PSYCH 117	Human Neuropsychology	3
PSYCH 131	Developmental Psychopathology	3
PSYCH C143/ LINGUIS C146	Language Acquisition	3

Computational Methods in Molecular and Genomic Biology

This domain emphasis will prepare students for work or graduate school in bioinformatics and computational biology with a focus on molecular biology and genomics. Students with this emphasis will be able to understand how computational and statistical methods are used to elucidate the mechanisms of cellular processing of genetic data and will prepare them for computational analyses of DNA sequencing data and other molecular biological data.

Lower Division (select one)		
BIOLOGY 1A	General Biology Lecture	3
BIOLOGY 1B	General Biology Lecture and Laboratory	4
MATH 53	Multivariable Calculus	4
Upper Division (select two)		
BIO ENG 131/ CMPBIO C131	Introduction to Computational Molecular and Cell Biology	4
BIO ENG 134	Biodesign Automation	4
BIO ENG 145	Introduction to Machine Learning for Computational Biology	4
BIO ENG C149	Computational Functional Genomics	4
CMPBIO C149	Computational Functional Genomics	4
CMPBIO 156	Human Genome, Environment and Public Health	4
CMPBIO/ COMPSCI C176	Algorithms for Computational Biology	4
INTEGBI 120	Introduction to Quantitative Methods In Biology	4
INTEGBI 134L	Practical Genomics	4
INTEGBI 141	Human Genetics	3
or INTEGBI 164	Human Genetics and Genomics	
or MCELLBI 149	The Human Genome	
INTEGBI 161	Population and Evolutionary Genetics	4
MATH 127	Mathematical and Computational Methods in Molecular Biology	4
MCELLBI C100A/ CHEM C130	Biophysical Chemistry: Physical Principles and the Molecules of Life	4
MCELLBI 102	Survey of the Principles of Biochemistry and Molecular Biology	4
MCELLBI 104	Genetics, Genomics, and Cell Biology	4
MCELLBI 132	Biology of Human Cancer	4
MCELLBI 137L	Physical Biology of the Cell	4
MCELLBI 140	General Genetics	4
MCELLBI 143	Evolution of Genomes, Cells, and Development	3
MCELLBI/ PLANTBI C148	Microbial Genomics and Genetics	4
MCELLBI 153	Molecular Medicine	4
PLANTBI 160	Plant Molecular Genetics	3

DATA ARTS AND HUMANITIES

The Data Arts and Humanities domain emphasis allows students to explore and engage data science practices across the humanities and arts. In addition to investigating the place of data in humanistic inquiry and creative work in broad terms, students can learn current data arts and humanities methods specific to different disciplines and departments, as and together with critical inquiry

Lower Division (select one)		
ART 23AC	DIGITAL MEDIA: FOUNDATIONS	4
HISTORY 88	How Does History Count?	2
L & S 88	Data Science Connector (Rediscovering Text as Data (only when offered with this topic))	2-4
L & S 88	Data Science Connector (Aesthetics and Data (only when offered with this topic))	2-4
MUSIC 29	Music Now	4
MUSIC 30	Computational Creativity for Music and the Arts	4
RHETOR 10	Introduction to Practical Reasoning and Critical Analysis of Argument	4
Upper Division (select two)		
ART 172	Advanced Digital Media: Computer Graphics Studio	4
DIGHUM 100	Theory and Method in the Digital Humanities (summer only)	3
DIGHUM 101	Python Programming for Digital Humanities (summer only)	3
DIGHUM 150A	Digital Humanities and Archival Design (summer only)	3
DIGHUM 150B	Digital Humanities and Visual and Spatial Analysis (summer only)	3
DIGHUM 150C	Digital Humanities and Text and Language Analysis (summer only)	3
DIGHUM 160	Critical Digital Humanities (summer only)	3

GLOBAL 140	Special Topics in Global Societies and Cultures (Mapping Diasporas: Jewish Culture, Museums, and Digital Humanities (only when offered with this topic))	4
or JEWISH 121	Topics in Jewish Arts and Culture	
HISTART C109/ ENGLISH C181	Digital Humanities, Visual Cultures	4
HISTORY 133D	Calculating Americans: Big Histories of Small Data	4
HISTART 190T	Transcultural (VR and Its Prehistories (only when offered with this topic))	4
HISTART 192DH	Undergraduate Seminar: Digital Imaging and Forensic Art History	4
INFO 103	Course Not Available	4
INFO 159	Natural Language Processing	4
INFO 190	Special Topics in Information (Introduction to Data Visualization)	4
MUSIC 107	Independent Projects in Computer Music	4
MUSIC 158A	Sound and Music Computing with CNMAT Technologies	4
MUSIC 158B	Situated Instrument Design for Musical Expression	4
MUSIC 159	Computer Programming for Music Applications	4
MELC 110	Digital Humanities and Egyptology	4
RHETOR 107	Rhetoric of Scientific Discourse	4
RHETOR 114	Rhetoric of New Media	4
RHETOR 115	Technology and Culture	4
RHETOR 137	Rhetoric of the Image	4
RHETOR 145	Science, Narrative, and Image	4
RHETOR 170	Rhetoric of Social Science	4
Additionally, many classes in this area have been taught on an experimental or infrequent basis. Students may petition to include the classes below, or other classes they believe meet the goals of this DE:		
AMERSTD H110	Honors Seminar: Special Topics in American Studies (Bay Area in the 1970s (only when offered with this topic))	3-4
ENGLISH 166	Special Topics (Slavery and Conspiracy (only when offered with this topic))	4
HISTORY 100S	Special Topics in the History of Science (Text Analysis for Digital Humanists and Social Scientists (only when offered with this topic))	4
HISTORY 104	The Craft of History	4
THEATER 166/ NWMEDIA 190	Special Topics: Theater Arts ("Making Sense of Cultural Data (only when offered with this topic))	1-4
MELC 114	Beyond Wikipedia: The Ancient Middle East	3
MELC 190A	Special Topics in Fields of Middle Eastern Languages and Cultures: Ancient Middle Eastern Studies (Introduction to Digital Humanities: From Analog to Digital (only when offered with this topic))	4
SPANISH 135	Studies in Hispanic Literature (Electronic Literature: A Critical Writing & Making Course (only when offered with this topic))	4

Ecology and the Environment

The domain emphasis in Ecology and Environment explores the rapidly emerging diverse data sources from gene sequencing to satellites that shed light on the behavior, abundance and distribution of living organisms and the ecosystems they inhabit

Lower Division (select one)		
L & S/ESPM C46	Climate Change and the Future of California	4
EPS 80	Environmental Earth Sciences	3
ESPM 15	Introduction to Environmental Sciences	3
ESPM 2	The Biosphere	3
ESPM 6	Environmental Biology	3
ESPM 88B	Data Sciences in Ecology and the Environment	2
GEOG 40	Introduction to Earth System Science	4
Upper Division (select two)		
ENE,RES 102	Quantitative Aspects of Global Environmental Problems	4
ESPM 102B & 102BL	Natural Resource Sampling and Laboratory in Natural Resource Sampling	2, 2
ESPM C103/ INTEGBI C156	Principles of Conservation Biology	4
ESPM 111	Ecosystem Ecology	4
ESPM/EPS C129	Biometeorology	3
ESPM 130A	Forest Hydrology	4
ESPM/INTEGBI C153	Ecology	3
INTEGBI 170LF	Methods in Population and Community Ecology	3
ESPM 157	Data Science in Global Change Ecology	4
ESPM C170/ EPS C183	Carbon Cycle Dynamics	3
ESPM 174A	Applied Time Series Analysis for Ecology and Environmental Sciences	3
CIV ENG C106/ EPS C180/ESPM C180	Air Pollution	3

Economics

Lower Division (select one)		
ECON 1	Introduction to Economics	4
ECON 2	Introduction to Economics--Lecture Format	4
DATA 88E	Economic Models	2
Upper Division (select two)		
ECON 100A	Microeconomics	4
or ECON 101A	Microeconomics (Quantitative)	
or ECON 100B	Macroeconomics	
or ECON 101B	Macroeconomics (Quantitative)	
ECON/MATH C103	Introduction to Mathematical Economics	4
MATH C103	Introduction to Mathematical Economics	4
ECON 104	Advanced Microeconomic Theory	4
ECON C110/N110/ POL SCI C135	Game Theory in the Social Sciences	4
ECON 119	Psychology and Economics	4
ECON 121	Industrial Organization and Public Policy	4
ECON C125/ ENVECON C101	Environmental Economics	4
ECON 131	Public Economics	4

ECON 134	Macroeconomic Policy from the Great Depression to Today	4
ECON 136	Financial Economics	4
ECON 139	Asset Pricing and Portfolio Choice	4
ECON 140	Econometrics	4
or ECON 141	Econometrics (Quantitative)	
ECON/PUB POL C142/ POL SCI C131A	Applied Econometrics and Public Policy	4
ECON 143	Econometrics: Advanced Methods and Applications	4
ECON 144/ COMPSCI C177	Empirical Asset Pricing	4
ECON 148	Data Science for Economists	4
ECON 151	Labor Economics	4
ECON 152	Wage Theory and Policy	4
ECON 172	Case Studies in Economic Development	4
ECON 174	Global Poverty and Impact Evaluation	4
ECON/DEMOG C175	Economic Demography	4
ECON C184	International Environmental Economics	4
ENVECON/IAS C118	Introductory Applied Econometrics	4
ENVECON C132	International Environmental Economics	4

Environment, Resource Management, and Society

The Domain Emphasis in Environment, Resource Management, and Society explores the interface of economics and policy with ecological and environmental sciences. Topics include climate change, agro-ecology, energy policy, natural resources, sociology, and culture.

Lower Division (select one)		
ECON C3/ ENVECON C1	Introduction to Environmental Economics and Policy	4
ESPM 50AC	Introduction to Culture and Natural Resource Management	4
Upper Division (select two)		
ENVECON 100	Intermediate Microeconomics with Applications to Sustainability	4
ENVECON C101/ ECON C125	Environmental Economics	4
ENVECON C102	Natural Resource Economics	4
ENVECON C115/ ESPM C104	Modeling and Management of Biological Resources	4
ENVECON 141	Agricultural and Environmental Policy	4
ENVECON 142	Industrial Organization with Applications to Agriculture and Natural Resources	4
ENVECON 145	Health and Environmental Economic Policy	4
ENVECON 147	The Economics of the Clean Energy Transition	4
ENVECON 153	Population, Environment, and Development	3
ENE,RES C100/ PUB POL C184	Energy and Society	4
OR		
ENE,RES W100/ PUB POL C184	Energy and Society [4]	
ENE,RES 131	Data, Environment and Society	4
ENE,RES/ ENVECON/IAS C176	Climate Change Economics	4
ESPM 102C	Resource Management	4
ESPM 102D	Climate and Energy Policy	4
ESPM 151	Society, Environment, and Culture	4
ESPM 155AC	Sociology and Political Ecology of Agro-Food Systems	4
ESPM 168	Political Ecology	4
ESPM 186	Grassland and Woodland Management and Conservation	4

Evolution and Biodiversity

The domain emphasis in Evolution and Biodiversity explores the origins and evolution of the astounding diversity of life on earth. Topics include the analyses and understanding of diverse data from fossils to genomes from our deep past to better understand our planet today.

Lower Division (select one)		
BIOLOGY 1A	General Biology Lecture	3
BIOLOGY 1B	General Biology Lecture and Laboratory	4
Upper Division (select two)		
ESPM/INTEGBI C105	Natural History Museums and Biodiversity Science	3
ESPM 108B	Environmental Change Genetics	3
ESPM C125/ GEOG C148/ INTEGBI C166	Biogeography	4
ESPM 152	Global Change Biology	3
INTEGBI/ PLANTBI C109	Evolution and Ecology of Development	3
INTEGBI 113L	Paleobiological Perspectives on Ecology and Evolution	4
INTEGBI 117 & 117LF	Medical Ethnobotany and Medical Ethnobotany Laboratory	2
INTEGBI 141	Human Genetics	3
or INTEGBI 164	Human Genetics and Genomics	
INTEGBI C160/ MCELLBI C144	Evolution	4
or INTEGBI 167	Evolution and Earth History: From Genes to Fossils	
INTEGBI 161	Population and Evolutionary Genetics	4
INTEGBI 162	Ecological Genetics	4
INTEGBI 169	Evolutionary Medicine	4
INTEGBI 172	Coevolution: From Genes to Ecosystems	4

GEOSPATIAL INFORMATION AND TECHNOLOGY

This domain emphasis explores the use of geospatial approaches to understand geophysical and ecological processes. Topics of study include climate change, cartography, digital mapping, remote sensing, ecology, and environmental data analysis, among others.

CIV ENG/CY PLAN C88	Data Science for Smart Cities	2
ESPM 72	Introduction to Geographic Information Systems	3
ESPM 88A	Exploring Geospatial Data	2
EPS 50	The Planet Earth	4

GEOG 80	An Introduction to Geospatial Technologies: Mapping, Space and Power	4
GEOG 88	Course Not Available	2
Upper Division (select two)		
GEOG 183	Cartographic Representation	5
GEOG 185	Earth System Remote Sensing	3
GEOG 186	Web Cartography	5
GEOG 187	Geographic Information Analysis	4
GEOG/LD ARCH C188	Geographic Information Science	4
EPS 101	Field Geology and Digital Mapping	4
EPS 115	Stratigraphy and Earth History	4
ESPM 137	Landscape Ecology	3
ESPM 164	GIS and Environmental Science	3
ESPM 172	Remote Sensing of the Environment	3
ESPM 173	Introduction to Ecological Data Analysis	3
ESPM/LD ARCH C177	GIS and Environmental Spatial Data Analysis	4
PB HLTH 177A	GIS and Spatial Analysis for Health Equity	3

Human and Population Health

The goal of the domain emphasis in Human and Population Health is to expose students to questions, data structures, and methodology related to research in subject-matter areas such as epidemiology, environmental health, nutrition, toxicology, metabolic diseases, infectious diseases, and cancer. This includes the formulation of meaningful research questions, the development of sound study designs, data collection, exploratory data analysis, the application of pertinent statistical and computational methods, and the interpretation and validation of results.

Lower Division (select one)		
BIOLOGY 1A	General Biology Lecture	3
BIOLOGY 1B	General Biology Lecture and Laboratory	4
MCELLBI 50	The Immune System and Disease	4
Upper Division (select two)		
DEMOG 110	Introduction to Population Analysis	3
INTEGBI 114	Infectious Disease Dynamics	4
INTEGBI 116L	Medical Parasitology	4
INTEGBI 132	Human Physiology	4
INTEGBI 137	Human Endocrinology	4
INTEGBI 140	Biology of Human Reproduction	4
MCELLBI 132	Biology of Human Cancer	4
NUSCTX 110	Course Not Available	4
NUSCTX 121	Course Not Available	3
NUSCTX 160	Metabolic Bases of Human Health and Diseases	4
PB HLTH 132	Artificial Intelligence for Health and Healthcare	3
PB HLTH 150A	Introduction to Epidemiology and Human Disease	4
PB HLTH 150B	Human Health and the Environment in a Changing World	3
PB HLTH 162A	Public Health Microbiology	4
PB HLTH 181	Poverty and Population	3

Human Behavior and Psychology

The domain emphasis in Human Behavior and Psychology engages students with fundamental aspects of individual and group behavior and the factors and processes that influence it, as explored in the cognitive, behavioral, and economic sciences.

Lower Division (select one)		
COG SCI 1/1B/N1	Introduction to Cognitive Science	4
PSYCH 1	General Psychology	3
PSYCH 2	Principles of Psychology	3
Upper Division (select two)		
COG SCI C131/ PSYCH C123	Computational Models of Cognition	4
ECON C110/ POL SCI C135	Game Theory in the Social Sciences	4
ECON 119	Psychology and Economics	4
PSYCH 101D	Data Science for Research Psychology	4
PSYCH 110	Introduction to Biological Psychology	3
PSYCH 124	The Evolution of Human Behavior	3
PSYCH 130	Clinical Psychology	3
PSYCH 134	Health Psychology	3
or PSYCH N134	Health Psychology	
PSYCH 140	Developmental Psychology	3
PSYCH 150	Psychology of Personality	3
PSYCH 156	Human Emotion	3
PSYCH 160	Social Psychology	3
or SOCIOL 150	Social Psychology	
PSYCH 167AC	Stigma and Prejudice	3
UGBA 160	Customer Insights	3

Inequalities in Society

The Inequalities in Society domain emphasis explores the nature, causes, and consequences of social inequalities, with special attention to race and ethnicity, social class, and gender. Students will develop an understanding of how scientists conceptualize and study social inequalities and the methodological tools they use to do so.

Lower Division (select one)		
DATA C4AC	Data and Justice	4
SOCIOL 1	Introduction to Sociology	4
SOCIOL 3AC	Principles of Sociology: American Cultures	4
Upper Division (select two)		
AFRICAM 101	Research Methods for African American Studies	4
or ETH STD 10	Social Science Methods in Ethnic Studies	
AFRICAM 111	Race, Class, and Gender in the United States	3
GEOG C155/ AFRICAM C156	Race, Space, and Inequality	4
GWS 131	Gender and Science	4
PHILOS 117AC	The Philosophy of Race, Ethnicity, and Citizenship	4
POL SCI 167	Racial and Ethnic Politics in the New American Century	4
POL SCI 132C	Berkeley Changemaker: Algorithms, Public Policy, and Ethics	4
PSYCH 167AC	Stigma and Prejudice	3
PUB POL C103	Wealth and Poverty	4
PUB POL 117AC	Race, Ethnicity, and Public Policy	4
SOCIOL 111AC	Sociology of the Family	4

SOCIOL 113	Sociology of Education	4
SOCIOL 113AC	Sociology of Education	4
SOCIOL 124	Sociology of Poverty	4
SOCIOL 127	Development and Globalization	4
SOCIOL 130	Social Inequalities	4
SOCIOL 130AC	Social Inequalities: American Cultures	4
SOCIOL 131AC	Race and Ethnic Relations: U.S. American Cultures	4
SOCIOL 133	Sociology of Gender	4

Linguistic Sciences

The domain emphasis in Linguistic Sciences explores the data-driven analysis of language. Topics include linguistic structure (phonetics, phonology, morphology, syntax), logic and the philosophy of language, natural language processing, and empirical approaches to reasoning about language as data.

Lower Division (select one)		
LINGUIS 100	Introduction to Linguistic Science *	4
PHILOS 12A	Introduction to Logic	4
Upper Division (select two)		
LINGUIS 100	Introduction to Linguistic Science *	4
LINGUIS 108	Psycholinguistics	3
LINGUIS 110	Phonetics	4
LINGUIS 111	Phonology	4
LINGUIS 113	Experimental Phonetics	3
LINGUIS 115	Morphology	4
LINGUIS 120	Syntax	4
LINGUIS 121	Formal Semantics	4
LINGUIS/COG SCI C142	Language and Thought	3
LINGUIS C160/ COG SCI C140	Quantitative Methods in Linguistics	4
LINGUIS 188	LINGUISTIC DATA	3
INFO 159	Natural Language Processing	4
PHILOS 133	Philosophy of Language	4

* May count toward the lower-division or upper-division requirement, but not both. Students may fulfill this domain emphasis by completing LINGUIS 100 plus two additional upper-division courses from the list, without taking a lower-division course. Please note that there are a limited number of courses approved for this domain emphasis that can be taken without LINGUIS 100 as a prerequisite.

Neurosciences

The Neuroscience domain emphasis provides students with expertise in models and methods of computational neuroscience, including data analysis and theoretical models of information processing in the brain. Students with this emphasis will be able to apply statistical analyses to extract patterns embedded in high-dimensional neuroscience datasets (multi-unit recordings, optical imaging, EEG, fMRI), and develop computational models toward elucidating neural mechanisms of information processing in the brain.

PSYCH C61	Brain, Mind, and Behavior	3
PSYCH C64	Exploring the Brain: Introduction to Neuroscience	3
Upper Division (select two)		
ANTHRO 107	Evolution of the Human Brain	4
COG SCI C127	Cognitive Neuroscience	3
INTEGBI 139	The Neurobiology of Stress	4
MCELLBI 160	Course Not Available	4
NEU 100A	Cellular and Molecular Neurobiology	4
NEU 100B	Circuit, Systems and Behavioral Neuroscience	4
NEU 165	Neurobiology of Disease	3
PSYCH C113/ INTEGBI C143A	Biological Clocks: Physiology and Behavior	3
PSYCH 117	Human Neuropsychology	3
PSYCH 125	The Developing Brain	3

Organizations and the Economy

The domain emphasis in Organizations and the Economy explores the social construction of markets and the role of organizations and institutions in the contemporary economy. How can we understand the economic behavior of firms and governments? What is the nature of work in modern capitalism?

Lower Division (select one)		
DATA C4AC	Data and Justice	4
SOCIOL 1	Introduction to Sociology	4
SOCIOL 3AC	Principles of Sociology: American Cultures	4
Upper Division (select two)		
ECON 121	Industrial Organization and Public Policy	4
ECON 131	Public Economics	4
ENVECON 142	Industrial Organization with Applications to Agriculture and Natural Resources	4
GEOG 110	Critical Economic Geographies	4
GWS 139	Why Work? Gender and Labor Under Capitalism	4
POL SCI 132C	Berkeley Changemaker: Algorithms, Public Policy, and Ethics	4
SOCIOL 110	Organizations and Social Institutions	4
SOCIOL 116	Sociology of Work	4
SOCIOL 119S	Organizational Strategy and Design: A Sociological Perspective	4
SOCIOL 120	Economy and Society	4
SOCIOL 121	Innovation and Entrepreneurship: Social and Cultural Context	4
UGBA 105	Leading People	3
UGBA 107	The Social, Political, and Ethical Environment of Business	3

Philosophical Foundations: Evidence and Inference

When do data confirm a hypothesis or a theory? What do we do when several different hypotheses or theories are consistent with the data? When, if ever, is inductive inference justified? How are models related to what they model? When is reasoning good reasoning? Which conclusions can be inferred from which premises? How does it depend on what we are reasoning about: arithmetic, the physical world, what exists, what is possible, what is known? What are we saying when we say that something is likely or unlikely to occur? What are we saying when we say that one event caused another? Are we saying something about the world or merely something about us, about what we have observed and what we now expect?

Lower Division (select one)		
L & S 22	Sense and Sensibility and Science	4
MATH 55	Discrete Mathematics	4
PHILOS 4	Knowledge and Its Limits	4
PHILOS 5	Science and Human Understanding	4
PHILOS 12A	Introduction to Logic	4
Upper Division (select two)		
MATH 125A	Mathematical Logic	4
MATH 135	Introduction to the Theory of Sets	4
MATH 136	Incompleteness and Undecidability	4
PHILOS 122	Theory of Knowledge	4
PHILOS 125	Metaphysics	4
PHILOS 128	Philosophy of Science	4
PHILOS 134	Form and Meaning	4
PHILOS 140A	Intermediate Logic	4
PHILOS 140B	Intermediate Logic	4
PHILOS 142	Philosophical Logic	4
PHILOS 143	Modal Logic	4
PHILOS 146	Philosophy of Mathematics	4
PHILOS 148	Probability and Induction	4
PHILOS 149	Special Topics in Philosophy of Logic and Mathematics	4
RHETOR 107	Rhetoric of Scientific Discourse	4

Philosophical Foundations: Minds, Morals, and Machines

Can machines think? Can they be conscious? Do they have rights? To answer these questions, we need to understand the nature of thought and consciousness is, and the basis of rights. In virtue of what do we count as thinking or conscious? In virtue of what do we have rights? Increasingly, algorithms are replacing human beings as decision makers. When are algorithmic decisions fair? Are we entitled to an explanation of algorithmic decisions? Is it paternalistic or anti-democratic to design algorithms that don't give you what you want, if that will mislead you or make you unhappy?

Lower Division (select one)		
COG SCI 1/1B/ N1	Introduction to Cognitive Science	4
PHILOS 2	Individual Morality and Social Justice	4
PHILOS 3	The Nature of Mind	4
PHILOS 14	Philosophy of Artificial Intelligence	4
Upper Division (select two)		
COG SCI C100/ PSYCH C120	Basic Issues in Cognition	3
COG SCI C101/ LINGUIS C105	Cognitive Linguistics	4
COG SCI C131/ PSYCH C123	Computational Models of Cognition	4
COG SCI/ LINGUIS C142	Language and Thought	3
ECON C110/ POL SCI C135	Game Theory in the Social Sciences	4
STAT 155	Game Theory	3
PHILOS 104	Ethical Theories	4
PHILOS 115	Political Philosophy	4
PHILOS 132	Philosophy of Mind	4
PHILOS 133	Philosophy of Language	4
PHILOS 135	Theory of Meaning	4
PHILOS 136	Philosophy of Perception	4
PHILOS 141	Philosophy and Game Theory	4

Physical Science Analytics

The Physical Science Analytics domain emphasis allows students to explore ways that data analytics, inference, computational simulation and modeling, uncertainty analysis, and prediction arise in physical science and engineering domains.

Lower Division (select one)		
PHYSICS 5BL & PHYSICS 5CL	Introduction to Experimental Physics I and Introduction to Experimental Physics II	2
PHYSICS 7A	Physics for Scientists and Engineers	4
PHYSICS 77	Introduction to Computational Techniques in Physics	3
Upper Division (select two)		
ASTRON 120	Optical and Infrared Astronomy Laboratory	4
ASTRON 121	Radio Astronomy Laboratory	4
ASTRON 128	Astronomy Data Science Laboratory	4
ASTRON C161	Relativistic Astrophysics and Cosmology	4
ASTRON C162	Planetary Astrophysics	4
CIV ENG C133/ MEC ENG C180	Engineering Analysis Using the Finite Element Method	3
ENGIN 150	Basic Modeling and Simulation Tools for Industrial Research Applications	4
EPS 108	Geodynamics	4
EPS 109	Computer Simulations with Jupyter Notebooks	4
EPS 122	Physics of the Earth and Planetary Interiors	3
EPS C183/ ESPM C170	Carbon Cycle Dynamics	3
GEOG C136/ ESPM C130	Terrestrial Hydrology	4
GEOG C139/ EPS C181	Atmosphere, Ocean, and Climate Dynamics	3
NUC ENG 101	Nuclear Reactions and Radiation	4
NUC ENG 130	Analytical Methods for Non-proliferation	3
NUC ENG 155	Introduction to Numerical Simulations in Radiation Transport	3
PHYSICS 105	Analytic Mechanics	4
PHYSICS 111A	Instrumentation Laboratory	4
PHYSICS 112	Introduction to Statistical and Thermal Physics	4
PHYSICS 129	Particle Physics	4
PHYSICS 188	Bayesian Data Analysis and Machine Learning for Physical Sciences	4

Quantitative Social Science

The Quantitative Social Science domain emphasis provides students with expertise in various methodologies used in quantitative social science research and analysis. Topics include mathematical modeling, description of patterns and trends, statistical modeling, and testing of social scientific hypotheses.

Lower Division (select one)		
ECON 1	Introduction to Economics	4
or ECON 2	Introduction to Economics--Lecture Format	
SOCIOL 1	Introduction to Sociology	4
SOCIOL 3AC	Principles of Sociology: American Cultures	4
SOCIOL 5	Evaluation of Evidence	4
POL SCI 3	Introduction to Empirical Analysis and Quantitative Methods	4
POL SCI 88	The Scientific Study of Politics	2
POL SCI 132C	Berkeley Changemaker: Algorithms, Public Policy, and Ethics	4
Upper Division (select two)		
DEMOG 110	Introduction to Population Analysis	3
DEMOG/SOCIOL C126	Sex, Death, and Data	4
DEMOG/ECON C175	Economic Demography	4
DEMOG 180	Social Networks	4
ECON C110/ POL SCI C135/ W135	Game Theory in the Social Sciences	4
ENVECON/IAS C118	Introductory Applied Econometrics	4
MEDIAST 130	Research Methods in Media Studies	4
POL SCI 132B	Machine Learning for Social Scientists	4
POL SCI 133	Selected Topics in Quantitative Methods	4
SOCIOL 106	Quantitative Sociological Methods	4

Robotics

The goal of the domain emphasis in Robotics is to provide a pathway into the field of robotics, which includes the design and control of robots as well as the study of relationships between robots and nature. Topics include manipulation and control, decision making grounded in the physical world, embedded systems, mechatronics, and human-robot interaction.

Lower Division		
MATH 53	Multivariable Calculus	4
Upper Division (select two)		
BIO ENG 101	Instrumentation in Biology and Medicine	4
BIO ENG 105	Engineering Devices 1	4
BIO ENG/EECS C106A	Introduction to Robotics	4
BIO ENG/EECS C106B	Robotic Manipulation and Interaction	4
COMPSCI 188	Introduction to Artificial Intelligence	4
EECS 149	Introduction to Embedded and Cyber Physical Systems	4
EL ENG 143	Microfabrication Technology	4
EL ENG 147	Introduction to Microelectromechanical Systems (MEMS)	3
EL ENG 192	Mechatronic Design Laboratory	4
INTEGBI C135L	Laboratory in the Mechanics of Organisms	3
MEC ENG 100	Electronics for the Internet of Things	4
MEC ENG 102B	Mechatronics Design	4
MEC ENG 119	Introduction to MEMS (Microelectromechanical Systems)	3
MEC ENG 131	Vehicle Dynamics and Control	4
MEC ENG 132	Dynamic Systems and Feedback	3
MEC ENG C134/ EL ENG C128	Feedback Control Systems	4
MEC ENG 135	Design of Microprocessor-Based Mechanical Systems	4
MEC ENG 139	Robotic Locomotion	4
MEC ENG 150	Modeling and Simulation of Advanced Manufacturing Processes	3

Science, Technology, and Society

The Science, Technology, and Society (STS) domain emphasis provides students with critical capacities to engage with a world shaped by science, technology, and medicine. It explores how these fields are constructed, contingent, and contested and how they interact with institutions, policy, and various forms of global social inequality.

Lower Division (select one)		
DATA C4AC	Data and Justice	4
GEOG 80	An Introduction to Geospatial Technologies: Mapping, Space and Power	4
HISTORY 30	Science and Society	4
ISF 60	Technology and Values	3
Upper Division (select two)		
ANTHRO 115	Introduction to Medical Anthropology	4
ANTHRO 119	Special Topics in Medical Anthropology	4
ANTHRO 168	Anthropology of Science, Technology and Data	4
ENGIN/IAS 157AC	Engineering, The Environment, and Society	4
ENGLISH 180Z	Science Fiction	4
ENVECON 143	Economics of Innovation and Intellectual Property	4
ESPM 161	Environmental Philosophy and Ethics	4
ESPM 162	Bioethics and Society	4
ESPM 163AC/ SOCIOL 137AC	Environmental Justice: Race, Class, Equity, and the Environment	4
FILM 155	Media Technologies	4
GEOG 130/N130	Food and the Environment	4
GWS 130AC	Gender, Race, Nation, and Health	4
HISTORY 100S/100ST	Special Topics in the History of Science	4
HISTORY 103S	Proseminar: Problems in Interpretation in the Several Fields of History: History of Science	4
HISTORY 138/138T	History of Science in the U.S.	4
HISTORY 180/180T	The Life Sciences since 1750	4
HISTORY 182A/182AT	Course Not Available	4
INFO 103	Course Not Available	4
ISF 100D	Introduction to Technology, Society, and Culture	4
ISF 100G	Introduction to Science, Society, and Ethics	4
POL SCI 132C	Berkeley Changemaker: Algorithms, Public Policy, and Ethics	4
RHETOR 107	Rhetoric of Scientific Discourse	4

RHETOR 115	Technology and Culture	4
RHETOR 145	Science, Narrative, and Image	4
SOCIOL C115/ PB HLTH C155	Sociology of Health and Medicine	4
SOCIOL 166	Society and Technology	4
SOCIOL 167	Virtual Communities/Social Media	4
STS C100/ HISTORY C182C/ ISF C100G	Introduction to Science, Technology, and Society	4
UGIS 110	Introduction to Disability Studies	3
One additional course that meets the Data Science Human Contexts & Ethics requirement may be counted toward the Domain Emphasis in STS. If counted toward the STS DE, this course may not be used to satisfy the HCE requirement:		
AMERSTD/ AFRICAM C134	Information Technology and Society	4
BIO ENG 100	Ethics in Science and Engineering	3
CY PLAN 101	Introduction to Urban Data Analytics	4
DATA C104/ HISTORY C184D/ STS C104D	Human Contexts and Ethics of Data - DATA/ History/STS	4
DIGHUM 100	Theory and Method in the Digital Humanities	3
ESPM C167/ PB HLTH C160	Environmental Health and Development	4
INFO 188	Behind the Data: Humans and Values	3
ISF 100J	The Social Life of Computing	4
NWMEDIA 151AC	Transforming Tech: Issues and Interventions in STEM and Silicon Valley	4
PHILOS 121	Moral Questions of Data Science	4

Social Welfare, Health, and Poverty

The goal of the domain emphasis in Social Welfare, Health, and Poverty is to expose students to questions, data structures, and methodology related to research in the subject-matter areas of social welfare, health, and poverty. This includes the formulation of meaningful research questions, the development of sound study designs, data collection, exploratory data analysis, the application of pertinent statistical and computational methods, and the interpretation and validation of results.

Lower Division (select one)		
DATA C4AC	Data and Justice	4
SOCIOL 1	Introduction to Sociology	4
SOCIOL 3AC	Principles of Sociology: American Cultures	4
Upper Division (select two)		
ENVECON 153	Population, Environment, and Development	3
GPP 105	The Ethics, Methods, and Pragmatics of Global Practice	4
GPP 115	Global Poverty: Challenges and Hopes	4
GLOBAL 102	Critical Thinking In Global Studies	4
GWS 130AC	Gender, Race, Nation, and Health	4
PB HLTH 112	Global Health: A Multidisciplinary Examination	4
PB HLTH 126	Health Economics and Public Policy	3
PB HLTH 150D	Introduction to Health Policy and Management	3
PB HLTH C155/ SOCIOL C115	Sociology of Health and Medicine	4
PB HLTH C150E/ CY PLAN C117	Urban and Community Health	3
PB HLTH C160/ ESPM C167	Environmental Health and Development	4
PB HLTH 181	Poverty and Population	3
POL SCI 132C	Berkeley Changemaker: Algorithms, Public Policy, and Ethics	4
POLECON 111	Poverty and Social Policy	3
SOCIOL 115G	Health in a Global Society	4
SOCIOL 127	Development and Globalization	4
SOC WEL 112	Social Welfare Policy	3

Social Policy and Law

The Social Policy and Law domain emphasis explores the foundations of legal institutions and its intersection with the history and analysis of social policy. Students can study the social construction of law, the nature of the criminal justice system, and the origins of contemporary social policies, such as health, welfare, and crime policies.

Lower Division (select one)		
DATA C4AC	Data and Justice	4
SOCIOL 1	Introduction to Sociology	4
SOCIOL 3AC	Principles of Sociology: American Cultures	4
Upper Division (select two)		
GWS 132AC	Gender, Race, and Law	4
LEGALST 100	Foundations of Legal Studies	4
LEGALST 102	Policing and Society	4
LEGALST 123	Data, Prediction & Law	4
LEGALST 158	Law and Development	4
LEGALST 160	Punishment, Culture, and Society	4
PB HLTH 150D	Introduction to Health Policy and Management	3
POLECON 111	Poverty and Social Policy	3
POL SCI 132C	Berkeley Changemaker: Algorithms, Public Policy, and Ethics	4
POL SCI 186	Public Problems	4
PUB POL 101	Introduction to Public Policy Analysis	4
SOC WEL 112	Social Welfare Policy	3
SOC WEL 181	Social Science and Crime Prevention Policy	3
SOCIOL 114	Sociology of Law	4
SOCIOL 148	Social Policy	4

Sustainable Development and Engineering

The domain emphasis in Sustainable Development and Engineering explores research in environmental science, sustainable engineering, climate change, transportation systems, and water resources. Data science topics include data-driven modeling, environmental decision-making, and spatial-data analysis.

Lower Division (select one)		
CIV ENG 11	Engineered Systems and Sustainability	3
LD ARCH 12	Environmental Science for Sustainable Development	4
Upper Division (select two)		
ARCH 140	Energy and Environment	4
CIV ENG 107	Climate Change Mitigation	3
CIV ENG 110	Water Systems of the Future	3

CIV ENG 111	Environmental Engineering	3
CIV ENG 155	Transportation Systems Engineering	3
CIV ENG 191	Civil and Environmental Engineering Systems Analysis	3
ENE,RES 131	Data, Environment and Society	4
ESPM C133/ GEOG C135	Course Not Available	3
ESPM/LD ARCH C177	GIS and Environmental Spatial Data Analysis	4
LD ARCH 122	Hydrology for Planners	4

Urban Science

The Urban Science domain emphasis explores the theories and methods used to understand the deep structure of how cities function and the potential of urban policies and planning to shape more equitable futures. Topics include sustainability, mapping, visualization, design, urban economic analysis, smart urbanism, metropolitan structure, urban communities, and place-making, among others

Lower Division (select one)		
CIV ENG C88	Data Science for Smart Cities	2
ENV DES 4B	Global Cities	3
GEOG 70AC	The Urban Experience: Race, Class, Gender & The American City	4
Upper Division (select two)		
ARCH 110AC	The Social and Cultural Processes in Architecture & Urban Design	3
CY PLAN 110	Introduction to City Planning	4
CY PLAN 113A	Economic Analysis for Planning	3
CY PLAN 114	Introduction to Urban and Regional Transportation	3
CY PLAN 119	Planning for Sustainability	4
CY PLAN 140	Urban Design: City-Building and Place-Making	3
ENE,RES 131	Data, Environment and Society	4
ENV DES 100	The City: Theories and Methods in Urban Studies	4
ENV DES 102	Climate Change and City Planning: Adaptation and Resilience	3
GEOG 181	Urban Field Study	4
GEOG 182	Field Study of Buildings and Cities	3
LD ARCH 130	Sustainable Landscapes and Cities	4
LD ARCH/GEOG C188	Geographic Information Science	4
LD ARCH 187	Representation as Research: Contemporary Topics in Landscape Visualization	3
SOCIOL 136	Urban Sociology	4

The Minor in Data Science at UC Berkeley aims to provide students with practical knowledge of the methods and techniques of data analysis, as well as the ability to think critically about the construction and implications of data analysis and models. The minor will empower students across the wide array of campus disciplines with a working knowledge of statistics, probability, and computation that allow students not just to participate in data science projects, but to design and carry out rigorous computational and inferential analysis for their field of interest.

General Guidelines

1. All minors must be declared prior to the first day of classes of the student's Expected Graduation Term (EGT). If the student's EGT is a summer term, the deadline to declare a minor is prior to the first day of classes of Summer Session A. To declare a minor, contact the department advisor for information on requirements, and the declaration process.
2. All courses for the minor must be taken for a letter grade.
3. Students must earn a C- or better in each course, and have a minimum 2.0 GPA in all courses towards the minor.
4. Students may overlap up to 1 course in the upper division requirements for the Data Science minor with each of their majors (for example, a Computer Science major may count COMPSCI/DATA/ STAT C100 toward both their major and the Data Science minor).
5. A maximum of one course offered by or cross-listed with the student's major department(s) may count toward the data science minor upper-division requirements, including any overlapping course (for example, if a Computer Science major takes COMPSCI/DATA/STAT C100 toward the Data Science minor, this is the only COMPSCI, ELENG, or EECS course which may count toward the upper-division requirements for the minor).
6. An upper-division course used to fulfill a lower-division requirement (for example, Stat 134 to fulfill the probability requirement) will not be counted toward the maximum 1 course allowed to overlap with the major, nor will it fulfill one of the four upper division course requirements.
7. There is no restriction on overlap with another minor.
8. Courses used to fulfill the minor requirements may be applied toward the Seven-Course Breadth requirement.
9. All minor requirements must be completed prior to the last day of finals during the semester in which you plan to graduate.

Lower-division Requirements

DATA/COMPSCI/ STAT/INFO C8	Foundations of Data Science [1]	4
or STAT 20	Introduction to Probability and Statistics	
DATA/COMPSCI C88C	Computational Structures in Data Science	3-4
or COMPSCI 61	The Structure and Interpretation of Computer Programs	
or ENGIN 7	Introduction to Computer Programming and Numerical Methods	
Choose one of the following: [2]		
DATA/STAT C88S	Probability and Mathematical Statistics in Data Science	3-4
or COMPSCI 70	Discrete Mathematics and Probability Theory	
or MATH 10B	Methods of Mathematics: Calculus, Statistics, and Combinatorics	
or MATH 55	Discrete Mathematics	
or CIV ENG 93	Engineering Data Analysis	

[1] Students may substitute Stat 20 for Data C8 toward the Data Science minor when combined with CS 61A or CS 88/Data C88C; this option is not available for students who take Engin 7 for their Program Structures requirement.

[2] Stat 134, Data C140, Ind Eng 172, EECS 126 or Math 106 may be substituted for the probability requirement.

Upper-division Requirements

Complete a total of 4 upper-division courses in one of the following pathways:

1-Core course Pathway

DATA/COMPSCI/STAT C100	Principles & Techniques of Data Science	4
Choose one of the following:		
AMERSTD/AFRICAM C134	Information Technology and Society [4]	
or AFRICAM 134	Information Technology and Society	
BIO ENG 100	Ethics in Science and Engineering [3]	
CY PLAN 101	Introduction to Urban Data Analytics [4]	
DATA C104/HISTORY C184/STS C104D	Human Contexts and Ethics of Data - DATA/History/STS [4]	
DIGHUM 100	Theory and Method in the Digital Humanities [3]	
ESPM C167/PB HLTH C160	Environmental Health and Development [4]	
INFO 188	Behind the Data: Humans and Values [3]	
ISF 100J	The Social Life of Computing [4]	
NWMEDIA 151TC	Transforming Tech: Issues and Interventions in STEM and Silicon Valley [4]	
PHILOS 121	Moral Questions of Data Science [4]	

If completing the 1-core course pathway, choose TWO from the Approved Elective List (https://docs.google.com/document/d/1OvQls_dcVndFVqcgufywEnUzXHovrWKLLFTXa8a3VyI/edit/?usp=sharing).

2-core course PATHWAY

DATA/STAT C131A	Statistical Methods for Data Science	4
STAT 133	Concepts in Computing with Data	3
Choose one of the following:		
AMERSTD/AFRICAM C134	Information Technology and Society [4]	
or AFRICAM 134	Information Technology and Society	
BIO ENG 100	Ethics in Science and Engineering [3]	
CY PLAN 101	Introduction to Urban Data Analytics [4]	
DATA C104/HISTORY C184/STS C104D	Human Contexts and Ethics of Data - DATA/History/STS [4]	
DIGHUM 100	Theory and Method in the Digital Humanities [3]	
ESPM C167/PB HLTH C160	Environmental Health and Development [4]	
INFO 188	Behind the Data: Humans and Values [3]	
ISF 100J	The Social Life of Computing [4]	
NWMEDIA 151TC	Transforming Tech: Issues and Interventions in STEM and Silicon Valley [4]	
PHILOS 121	Moral Questions of Data Science [4]	

If completing the 2-core course pathway, choose ONE from the Approved Elective List (https://docs.google.com/document/d/1OvQls_dcVndFVqcgufywEnUzXHovrWKLLFTXa8a3VyI/edit/?usp=sharing).

Essential Skills

Computational Reasoning (https://guide.berkeley.edu/undergraduate/colleges-schools/computing-data-science-society/computational-reasoning-requirement/)

The Computational Reasoning requirement is designed to provide a basic understanding of and competency in concepts such as programming, algorithms, iteration, and data-structures.

Human and Social Dynamics of Data and Technology (https://guide.berkeley.edu/undergraduate/colleges-schools/computing-data-science-society/human-social-data/)

The Human and Social Dynamics of Data and Technology requirement is designed for the purpose of developing an understanding of how technology and data interact with human and societal contexts, including ethical considerations and applications such as education, health, law, natural resources, and public policy.

Statistical Reasoning (https://guide.berkeley.edu/undergraduate/colleges-schools/computing-data-science-society/statistical-reasoning/)

The Statistical Reasoning requirement is designed to provide basic understanding of and competency in the scientific approach to statistical problem solving, including uncertainty, prediction, and estimation.

Reading and Composition (https://guide.berkeley.edu/undergraduate/colleges-schools/letters-science/reading-composition-requirement/)

The Reading and Composition requirement is the same as for the College of Letters and Science; it requires two semesters of lower division work in composition in sequence. Students must complete parts A & B reading and composition courses in sequential order by the end of their fourth semester.

To see how to satisfy the R&C requirement, visit the College of Letters and Science Reading and Composition Requirement page (http://guide.berkeley.edu/undergraduate/colleges-schools/letters-science/reading-composition-requirement/).

Breadth Requirements

The undergraduate breadth requirements are the same for CDSS students as for the College of Letters and Science, with the exception that a second semester foreign language course can be used to satisfy the International Studies breadth. To learn more about the L&S Seven-Course Breadth Requirement, visit the L&S Breadth Requirements page. (https://guide.berkeley.edu/undergraduate/colleges-schools/letters-science/#breadthrequirementstext) To learn more about using a foreign language course to satisfy the International Studies breadth, visit the CDSS website page on Satisfying International Studies Breadth with a Foreign Language Course (https://guide.berkeley.edu/undergraduate/colleges-schools/computing-data-science-society/satisfying-international-studies-class/).

The undergraduate major programs in computer science, data science, and statistics have transitioned from the College of Letters & Science to CDSS. Students who were admitted in Spring 2024 or earlier have the option of completing either the L&S College Requirements (https://guide.berkeley.edu/undergraduate/colleges-schools/letters-science/#collegerequirementstext), i.e., the breadth and essential skills requirements, or the CDSS college requirements described above.

All students must meet CDSS general policy (below). The one exception is with time-to-degree. Students admitted Fall 2022 or earlier are subject to the 130 unit maximum, rather than the 8 semester maximum (5 for transfer students).

Class Schedule Requirements

- Minimum units per semester: 12
- Maximum units per semester: 20.5

Academic (Grade) Requirements

- Minimum cumulative GPA: 2.0
- Minimum GPA for one semester: 1.5

Bachelor's Degree Requirements

- Minimum total units: 120. Of these 120 units:
  - PE maximum units: 4
  - Special Studies maximum units: 16
  - Maximum 300-499 course units: 6
- Minimum upper division units: 36
- Maximum number of semesters: 8 for first-year entrants; 5 for transfer students; summer terms do not count toward the maximum
- Minimum GPA in upper division and graduate courses identified for the major: 2.0
- Meet all major requirements
- Meet all general, curricular, and residence requirements of the University of California and the Berkeley campus

For more information about CDSS requirements, visit student resources and information (https://data.berkeley.edu/information-and-resources-students/) on the College of Computing, Data Science, and Society website.

Sample plans for completing major coursework are included below. These are not comprehensive plans which will reflect the situation of every student. These sample plans are meant only to serve as a baseline guide for structuring a plan of study, and only include the minimum courses for meeting the Data Science major requirements.

For new freshmen (four-year plan):

				Freshman
	Fall Units		**Spring Units**	
DATA C8	4		COMPSCI 61A or DATA C88C	3-4
MATH 1A (10A or 16A acceptable)	4		MATH 1B	4
Reading & Composition A	4		Reading & Composition B	4
Elective	2		Non-major Elective	1-2
	14			**12-14**
				Sophomore
	Fall Units		**Spring Units**	
COMPSCI 61B	4		MATH 54 or 56	4
Breadth/Elective	3-4		Lower-division Domain Emphasis	3-4
Breadth/Elective	3-4		Breadth/ Elective	3-4
	10-12			**10-12**
				Junior
	Fall Units		**Spring Units**	
DATA C104	4		DATA C100	4
DATA C140 (or other approved Probability)	4		Computational & Inferential Depth #1	3-4
undefined	4		Breadth/ Elective	3-4
Breadth/Elective	3-4			
	15-16			**10-12**
				Senior
	Fall Units		**Spring Units**	
Domain Emphasis Upper-division #1			DATA C102 (or other approved MLDM)	4
Computational & Inferential Depth #2	3-4		Domain Emphasis Upper-division #2	
Breadth/Elective	3-4		Breadth/ Elective	3-4
	6-8			**7-8**

Total Units: 84-96

For transfer students (two-year plan):

**Note: this sample plan is based on a transfer student who has completed 1 year of calculus, linear algebra and data structures, as well as IGETC/7-Course Breadth at their previous college or university, which may not reflect the reality for every transfer student. Students should consult with a Data Science Advisor to make an individualized plan based on their specific situation.*

				First Year
	Fall Units		**Spring Units**	
DATA C8	4		DATA C100	4
Lower-division Domain Emphasis	2-4		DATA C140 (or other approved Probability)	4
DATA C88C or COMPSCI 61A	3-4		American Cultures/ Upper-division Elective	3-4
Non-major Elective	1-2		Non-major Elective	1-2
	10-14			**12-14**

Second Year			
Fall Units		**Spring Units**	
Computational & Inferential Depth #1	3-4	DATA C102 (or other approved MLDM)	4
Domain Emphasis Upper-division #1	3-4	DATA C104 (or other approved HCE)	4
Domain Emphasis Upper-division #2	3-4	Computational & Inferential Depth #2	3-4
Non-major Elective	1-2	Non-major Elective	1-2
	10-14		**12-14**

Total Units: 44-56

Major maps are experience maps that help undergraduates plan their Berkeley journey based on intended major or field of interest. Featuring student opportunities and resources from your college and department as well as across campus, each map includes curated suggestions for planning your studies, engaging outside the classroom, and pursuing your career goals in a timeline format.

Use the major map below to explore potential paths and design your own unique undergraduate experience:

View the Data Science Major Map. (https://discovery.berkeley.edu/getting-started/major-maps/data-science/)

Student Teams

Each semester, we recruit dozens of students to participate in our student teams as interns and volunteers, with opportunities to advance into team lead roles and other leadership positions. Teams include Communications, Operations, External Relations, and Curriculum Development. Interested students can email ds-teams@berkeley.edu with questions about the opportunities. Learn more here (https://data.berkeley.edu/academics/campus-resources/student-opportunities/).

Data Scholars

The Data Scholars program addresses issues of underrepresentation in the data science community by establishing a welcoming, educational, and empowering environment for underrepresented and nontraditional students. The program, which offers specialized tutoring, advising, mentorship, and workshops, is especially suited for students who can bring diverse perspectives to the field of Data Science. Learn more here (https://data.berkeley.edu/academics/campus-resources/data-scholars/).

Data Science Peer Advising

Data Science Peer Advisors are available to help fellow students choose classes, explore academic interests, and learn how to declare the Data Science major and minor. The Data Science Peer Advising services are available on a drop-in basis. Contact the Data Science Peer Advisors at ds-peer-consulting@berkeley.edu. Learn more here (https://data.berkeley.edu/degrees/peer-advising/).

Data Science Course Staff

Data Science Undergraduate Studies appoints graduate and undergraduate students to support its instructional programs. Our outstanding staff teams bear significant responsibility for our students' experience and learning in Data classes. Staff team members also form strong bonds with each other, mentor junior members, and create staff networks for academic and professional development. Learn more here (https://cdss.berkeley.edu/data-science/student-opportunities/joining-data-course-staff/).

DATA C4AC Data and Justice 4 Units

Terms offered: Spring 2025

This course engages students with fundamental questions of justice in relation to data and computing in American society. Data collection, visualization, and analysis have been entangled in the struggle for racial and social justice because they can make injustice visible, imaginable, and thus actionable. Data has also been used to oppress minoritized communities and institutionalize, rationalize, and naturalize systems of racial violence. The course examines key sites of justice involving data (such as citizenship, policing, prisons, environment, and health). Along with critical social science tools, students gain introductory experience and do collaborative and creative projects with data science using real-world data.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1.5 hours of discussion per week

Additional Details

Subject/Course Level: Data Science, Undergraduate/Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

Formerly known as: Data Science, Undergraduate 4AC

Also listed as: STS C4AC

DATA 6 Introduction to Computational Thinking with Data Science and Society 4 Units

Terms offered: Fall 2025, Fall 2024
This foundational Data Science course combines inferential and computational thinking as applied to the fundamentals of quantitative social inquiry. Apply critical concepts and skills in computer programming to conduct quantitative social science research in various contexts, including economic outcomes, public health, environmental justice, privacy, bioethics, and social networks. Understand the process of using data for quantitative analysis and how to develop a variety of figures, combined with text, to communicate their findings. The focus is on data exploration and identifying patterns relevant to social concepts, rather than inferences and predictions. The course can serve as a precursor to Data 8: Foundations of Data Science.

Objectives & Outcomes

Course Objectives: C6 also includes quantitative reasoning concepts that aren't covered in Data 8. These include certain topics in: principles of data visualization; simulation of random processes; and understanding numerical functions through their graphs. This will help prepare students for computational and quantitative courses other than Data 8.
C6 takes advantage of the complementarity of computing and quantitative reasoning to enliven abstract ideas and build students' confidence in their ability to solve real problems with quantitative tools. Students learn computer science concepts and immediately apply them to plot functions, visualize data, and simulate random events.

Foundations of Data Science (CS/Info/Stat C8, a.k.a. Data 8) is an increasingly popular class for entering students at Berkeley. Data 8 builds students' computing skills in the first month of the semester, and students rely on these skills as the course progresses. For some students, particularly those with little prior exposure to computing, developing these skills benefits from further time and practice. C6 is a rapid introduction to Python programming, visualization, and data analysis, which will prepare students for success in Data 8.

Student Learning Outcomes: Appreciate the interdisciplinary nature of data science.
Create and use visualizations to understand univariate data and to identify associations or causal relationships in bivariate data.
Formulate questions about data and perform exploratory data analysis.
Perform basic computations in Python, and be able to work with tabular data.
Run and understand basic probabilistic simulations.
Understand the syntactic structure of Python code.
Use good practices in Python programming.

Rules & Requirements

Credit Restrictions: Students will receive no credit for DATA 6 after completing DATA C8, DATA C88C, or COMPSCI 61A.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture, 0 hours of discussion, and 2 hours of laboratory per week

Summer: 6 weeks - 6 hours of lecture, 2 hours of discussion, and 2 hours of laboratory per week

Additional Details

Subject/Course Level: Data Science, Undergraduate/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

DATA C8 Foundations of Data Science 4 Units

Terms offered: Fall 2025, Summer 2025 8 Week Session, Spring 2025, Fall 2024, Spring 2023, Fall 2022, Spring 2022, Fall 2021, Summer 2021 8 Week Session, Fall 2020
Foundations of data science from three perspectives: inferential thinking, computational thinking, and real-world relevance. Given data arising from some real-world phenomenon, how does one analyze that data so as to understand that phenomenon? The course teaches critical concepts and skills in computer programming and statistical inference, in conjunction with hands-on analysis of real-world datasets, including economic data, document collections, geographical data, and social networks. It delves into social and legal issues surrounding data analysis, including issues of privacy and data ownership.

Rules & Requirements

Prerequisites: This course may be taken on its own, but students are encouraged to take it concurrently with a data science connector course (numbered 88 in a range of departments)

Credit Restrictions: Students will receive no credit for DATA C8\COMPSCI C8\INFO C8\STAT C8 after completing COMPSCI 8, or DATA 8. A deficient grade in DATA C8\COMPSCI C8\INFO C8\STAT C8 may be removed by taking COMPSCI 8, COMPSCI 8, or DATA 8.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of laboratory per week

Summer: 8 weeks - 6 hours of lecture and 4 hours of laboratory per week

Additional Details

Subject/Course Level: Data Science, Undergraduate/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Formerly known as: Computer Science C8/Statistics C8/Information C8

Also listed as: COMPSCI C8/INFO C8/STAT C8

DATA 36 Data Scholars Seminar 1 Unit

Terms offered: Not yet offered
Data 36 is a seminar for Data Scholars who are concurrently taking Data C8: Foundations of Data Science. Data Scholars is a cohort-model program to provide support in exploring and potentially declaring a Data Science major for students with little to no computational or statistical background prior to coming to the university. The primary role of Data 36 is to provide technical instruction to review and reinforce concepts in Data C8, in order to support Data Scholars' individual learning and success in the Data C8 course. Data 36 also provides an introduction to the Data Science curriculum at UC Berkeley, and the overall Data Science landscape in both industry and academia.

Hours & Format

Fall and/or spring: 15 weeks - 1.5 hours of seminar per week

Additional Details

Subject/Course Level: Data Science, Undergraduate/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

DATA 88 Data Science Connector 2 - 4 Units

Terms offered: Spring 2022, Spring 2021, Fall 2020
Designed to be taken in conjunction with the Foundations of Data Science (COMPSCI/INFO/STAT C8) course, each connector course will flesh out data science ideas in the context of one particular field. Blending inferential thinking and computational thinking, the course relies on the increasing availability of datasets across a wide range of human endeavor, and students' natural interest in such data, to teach students to work actively with data in a field of their interest and to interpret and critique their analyses of data. Topics vary by field, and several topics will be offered each term.

Objectives & Outcomes

Course Objectives: Discuss how to formulate and substantiate an argument with evidence
Explain a variety of analytic and visualization techniques
Explore approaches to effective communication
Explore the challenges with working with primary and secondary data

Student Learning Outcomes: Apply data analysis to evaluate everyday problems
Communicate effectively in written, spoken, and graphical form about specific issues
Interpret statistical results
Know how to locate and use primary data sources
Obtain and/or collect relevant data using specific qualitative and/or quantitative research methods
Understand how to use empirical evidence to evaluate an argument

Rules & Requirements

Prerequisites: Instructors may require students to enroll concurrently or have completed Data 8 (COMPSCI/STAT/INFO C8)

Repeat rules: Course may be repeated for credit without restriction. Students may enroll in multiple sections of this course within the same semester.

Hours & Format

Fall and/or spring: 15 weeks - 2-4 hours of seminar per week

Additional Details

Subject/Course Level: Data Science, Undergraduate/Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

DATA 88E Economic Models 2 Units

Terms offered: Fall 2025, Fall 2024, Fall 2023
This class aims to motivate and illustrate key concepts in economics through a series of exercises and examples that use Python Jupyter notebooks. The class covers concepts from introductory economics, microeconomic theory, econometrics, development economics, environmental economics and public economics. The course provides data science students a pathway to apply Python programming and data science concepts within the discipline of economics. The course will also gives economics students a pathway to apply programming to reinforce fundamental concepts and to advance the level of study in upper division coursework and possible thesis work.
Objectives & Outcomes

Course Objectives: Demonstrate how to construct understanding of concepts in economics by developing and coding examples
Illustrate topics in economics through coding applications
Motivate basics of econometrics from a data science perspective

Student Learning Outcomes: Programmatically create and interpret graphs of simple equations used in microeconomics
Reason about and solve simple equations used in microeconomics through coding
Understand basic concepts in economics

Rules & Requirements

Prerequisites: You must have taken Data C8 or be concurrently enrolled in Data C8 to take this course. That being said, we are able to make exceptions if you have prior programming or data science experience; please email the course staff if you have any questions. Prior economics knowledge may be helpful but is not necessary

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture per week

Summer:
6 weeks - 5 hours of lecture per week
8 weeks - 4 hours of lecture per week

Additional Details

Subject/Course Level: Data Science, Undergraduate/Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

DATA C88C Computational Structures in Data Science 3 Units

Terms offered: Fall 2025, Summer 2025 8 Week Session, Spring 2025, Spring 2023, Fall 2022
Development of Computer Science topics appearing in Foundations of Data Science (C8); expands computational concepts and techniques of abstraction. Understanding the structures that underlie the programs, algorithms, and languages used in data science and elsewhere. Mastery of a particular programming language while studying general techniques for managing program complexity, e.g., functional, object-oriented, and declarative programming. Provides practical experience with composing larger systems through several significant programming projects.
Objectives & Outcomes

Course Objectives: Develop a foundation of computer science concepts that arise in the context of data analytics, including algorithm, representation, interpretation, abstraction, sequencing, conditional, function, iteration, recursion, types, objects, and testing, and develop proficiency in the application of these concepts in the context of a modern programming language at a scale of whole programs on par with a traditional CS introduction course.

Student Learning Outcomes: Students will be able to demonstrate a working knowledge of these concepts and a proficiency of programming based upon them sufficient to construct substantial stand-alone programs.

Rules & Requirements

Credit Restrictions: Students will receive no credit for DATA C88C after completing COMPSCI 61A.

Hours & Format

Fall and/or spring: 15 weeks - 2-2 hours of lecture, 2-2 hours of laboratory, and 0-1 hours of supplement per week

Summer: 8 weeks - 4-4 hours of lecture, 4-4 hours of laboratory, and 0-2 hours of supplement per week

Additional Details

Subject/Course Level: Data Science, Undergraduate/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Ball, Culler, DeNero

Formerly known as: Computer Science 88

Also listed as: COMPSCI C88C

DATA C88S Probability and Mathematical Statistics in Data Science 3 Units

Terms offered: Spring 2025, Spring 2024, Summer 2023 8 Week Session, Fall 2022
In this connector course we will state precisely and prove results discovered while exploring data in Data C8. Topics include: probability, conditioning, and independence; random variables; distributions and joint distributions; expectation, variance, tail bounds; Central Limit Theorem; symmetries in random permutations; prior and posterior distributions; probabilistic models; bias-variance tradeoff; testing hypotheses; correlation and the regression model.

Rules & Requirements

Prerequisites: Prerequisite: one semester of calculus at the level of Math 16A, Math 10A, Math 1A, or Math 51. Corequisite or Prerequisite: Foundations of Data Science (COMPSCI C8 / DATA C8 / INFO C8 / STAT C8)

Credit Restrictions: Students will receive no credit for DATA C88S after completing STAT 134, STAT 140, STAT 135, or DATA C102.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of discussion per week

Summer: 8 weeks - 6 hours of lecture and 4 hours of discussion per week

Additional Details

Subject/Course Level: Data Science, Undergraduate/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Formerly known as: Statistics 88

Also listed as: STAT C88S

DATA 94 Special Topics in Data Science 1 - 4 Units

Terms offered: Spring 2025, Fall 2024, Spring 2021
Topics will vary semester to semester.

Hours & Format

Fall and/or spring: 15 weeks - 1-3 hours of lecture, 0-2 hours of discussion, and 0-2 hours of laboratory per week

Summer: 8 weeks - 2-6 hours of lecture, 0-4 hours of discussion, and 0-4 hours of laboratory per week

Additional Details

Subject/Course Level: Data Science, Undergraduate/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

DATA C100 Principles & Techniques of Data Science 4 Units

Terms offered: Fall 2025, Summer 2025 8 Week Session, Spring 2025, Summer 2024 8 Week Session, Fall 2022, Fall 2021, Fall 2020
In this course, students will explore the data science lifecycle, including question formulation, data collection and cleaning, exploratory data analysis and visualization, statistical inference and prediction, and decision-making. This class will focus on quantitative critical thinking and key principles and techniques needed to carry out this cycle. These include languages for transforming, querying and analyzing data; algorithms for machine learning methods including regression, classification and clustering; principles behind creating informative data visualizations; statistical concepts of measurement error and prediction; and techniques for scalable data processing.

Rules & Requirements

Prerequisites: DATA C8 or STAT 20 with a C- or better, or Pass; and COMPSCI 61A, COMPSCI/DATA C88C, or ENGIN 7 with a C- or better, or Pass; Corequisite: MATH 54, 56, 110, EECS 16A, PHYSICS 89 or equivalent linear algebra (C- or better, or Pass, required if completed prior to Data C100)

Credit Restrictions: Students will receive no credit for DATA C100\STAT C100\COMPSCI C100 after completing DATA 100. A deficient grade in DATA C100\STAT C100\COMPSCI C100 may be removed by taking DATA 100.

Hours & Format

Fall and/or spring: 15 weeks - 3-3 hours of lecture, 1-1 hours of discussion, and 0-1 hours of laboratory per week

Summer: 8 weeks - 6-6 hours of lecture, 2-2 hours of discussion, and 0-2 hours of laboratory per week

Additional Details

Subject/Course Level: Data Science, Undergraduate/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Gonzalez, Nourozi, Perez, Yan

Formerly known as: Statistics C100/Computer Science C100

Also listed as: COMPSCI C100/STAT C100

DATA C101 Data Engineering 4 Units

Terms offered: Fall 2025, Spring 2025

This course will cover the principles and practices of managing data at scale, with a focus on use cases in data analysis and machine learning. We will cover the entire life cycle of data management and science, ranging from data preparation to exploration, visualization and analysis, to machine learning and collaboration, with a focus on ensuring reliable, scalable operationalization.

Rules & Requirements

Prerequisites: COMPSCI 61B, or INFO 206B, or equivalent courses in programming with a C- or better, or Pass; and COMPSCI C100 / DATA C100 / STAT C100, or COMPSCI 189, or INFO 251, or DATA 144, or equivalent upper-division course in data science with a C- or better, or Pass

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Data Science, Undergraduate/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Hellerstein, Jain, Parameswaran, Yan

Formerly known as: Data Science, Undergraduate 101

Also listed as: COMPSCI C187

DATA C102 Data, Inference, and Decisions 4 Units

Terms offered: Fall 2025, Spring 2025, Fall 2024

This course develops the probabilistic foundations of inference in data science, and builds a comprehensive view of the modeling and decision-making life cycle in data science including its human, social, and ethical implications. Topics include: frequentist and Bayesian decision-making, permutation testing, false discovery rate, probabilistic interpretations of models, Bayesian hierarchical models, basics of experimental design, confidence intervals, causal inference, Thompson sampling, optimal control, Q-learning, differential privacy, clustering algorithms, recommendation systems and an introduction to machine learning tools including decision trees, neural networks and ensemble methods.

Rules & Requirements

Prerequisites: Math 54 or 56 or 110 or Stat 89A or Physics 89 or both of EECS 16A and 16B with a C- or better, or Pass; Data/Stat/CompSci C100 with a C- or better, or Pass; and any of EECS 126, Data/Stat C140, Stat 134, IndEng 172, Math 106 with a C- or better, or Pass. Data/Stat C140 or EECS 126 are preferred

Credit Restrictions: Students will receive no credit for DATA C102 after completing STAT 102, or DATA 102. A deficient grade in DATA C102 may be removed by taking STAT 102, STAT 102, or DATA 102.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture, 1 hour of discussion, and 1 hour of laboratory per week

Additional Details

Subject/Course Level: Data Science, Undergraduate/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Formerly known as: Statistics 102

Also listed as: STAT C102

DATA C104 Human Contexts and Ethics of Data - DATA/History/STS 4 Units

Terms offered: Fall 2025, Summer 2025 8 Week Session, Spring 2025, Spring 2022, Fall 2020, Spring 2020

This course teaches you to use the tools of applied historical thinking and Science, Technology, and Society (STS) to recognize, analyze, and shape the human contexts and ethics of data. It addresses key topics such as doing ethical data science amid shifting definitions of human subjects, consent, and privacy; the changing relationship between data, democracy, and law; the role of data analytics in how corporations and governments provide public goods such as health and security to citizens; sensors, machine learning and artificial intelligence and changing landscapes of labor, industry, and city life. It prepares you to engage as a knowledgeable and responsible citizen and professional in the varied arenas of our datafied world.

Rules & Requirements

Credit Restrictions: Students will receive no credit for DATA C104\HISTORY C184D\STS C104D after completing DATA 104. A deficient grade in DATA C104\HISTORY C184D\STS C104D may be removed by taking DATA 104.

Hours & Format

Fall and/or spring: 15 weeks - 3-3 hours of lecture and 0-1.5 hours of discussion per week

Summer:
6 weeks - 7.5-7.5 hours of lecture and 0-3.5 hours of discussion per week
8 weeks - 6-6 hours of lecture and 0-3 hours of discussion per week

Additional Details

Subject/Course Level: Data Science, Undergraduate/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Formerly known as: History C184D/Science and Technology Studies C104D

Also listed as: HISTORY C184D/STS C104D

DATA C131A Statistical Methods for Data Science 4 Units

Terms offered: Fall 2025, Summer 2025 8 Week Session, Fall 2024, Fall 2023

This course teaches a broad range of statistical methods that are used to solve data problems. Topics include group comparisons and ANOVA, standard parametric statistical models, multivariate data visualization, multiple linear regression, logistic regression and classification, regression trees and random forests. An important focus of the course is on statistical computing and reproducible statistical analysis. The course and lab include hands-on experience in analyzing real world data from the social, life, and physical sciences. The R statistical language is used.

Rules & Requirements

Prerequisites: DATA/COMPSCI/INFO/STAT C8 or STAT 20; and MATH 1A, MATH 51, MATH 16A, or MATH 10A/10B. Strongly recommended corequisite: STAT 33A or STAT 133

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of laboratory per week

Summer: 8 weeks - 6 hours of lecture and 4 hours of laboratory per week

Additional Details

Subject/Course Level: Data Science, Undergraduate/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Formerly known as: Statistics 131A

Also listed as: STAT C131A

DATA C140 Probability for Data Science 4 Units

Terms offered: Fall 2025, Spring 2025, Fall 2024, Spring 2024
An introduction to probability, emphasizing the combined use of mathematics and programming. Discrete and continuous families of distributions. Bounds and approximations. Transforms and convergence. Markov chains and Markov Chain Monte Carlo. Dependence, conditioning, Bayesian methods. Maximum likelihood, least squares prediction, the multivariate normal, and multiple regression. Random permutations, symmetry, and order statistics. Use of numerical computation, graphics, simulation, and computer algebra.

Objectives & Outcomes

Course Objectives: Data/Stat C140 is a probability course for Data C8 graduates who have taken more mathematics and wish to go deeper into data science. The emphasis on simulation and the bootstrap in Data C8 gives students a concrete sense of randomness and sampling variability. Data/Stat C140 capitalizes on this, abstraction and computation complementing each other throughout. Topics in statistical theory are included to allow students to proceed to modeling and statistical learning classes without taking a further semester of mathematical statistics.

Student Learning Outcomes: Understand the difference between math and simulation, and appreciate the power of both
Use a variety of approaches to problem solving
Work with probability concepts algebraically, numerically, and graphically

Rules & Requirements

Prerequisites: DATA/COMPSCI/INFO/STAT C8, or both STAT 20 and one of COMPSCI 61A or COMPSCI/DATA C88C with C- or better, or Pass; and one year of calculus at the level of MATH 1A-1B or MATH 51-52 or higher, with C- or better, or Pass. Corequisite: MATH 54, MATH 56, EECS 16B, MATH 110 or equivalent linear algebra (C- or better, or Pass, required if completed prior to enrollment in Data/Stat C140)

Credit Restrictions: Students will receive no credit for STAT C140 after completing STAT 134, or EECS 126.

Hours & Format

Fall and/or spring:
15 weeks - 3-3 hours of lecture, 1-1 hours of discussion, 1-1 hours of supplement, and 0-1 hours of voluntary per week
15 weeks - 3-3 hours of lecture, 2-2 hours of discussion, 0-0 hours of supplement, and 0-1 hours of voluntary per week

Additional Details

Subject/Course Level: Data Science, Undergraduate/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Formerly known as: Statistics C140/Data Science, Undergraduate C140

Also listed as: STAT C140

DATA 144 Data Mining and Analytics 3 Units

Terms offered: Fall 2025, Fall 2024, Fall 2023
Data Mining and Analytics introduces students to practical fundamentals of data mining and emerging paradigms of data mining and machine learning with enough theory to aid intuition building. The course is project-oriented, with a project beginning in class every week. The in-class portion of the project is meant to be collaborative and a time for the instructor and GSIs to work closely with project groups to understand the objectives, help work through software logistics, and connect project work to lecture. Lectures will introduce theories, concepts, practical contexts, and algorithms. Students should expect to leave the class with hands-on, contemporary data mining skills they can confidently apply in research and industry.

Objectives & Outcomes

Course Objectives: Conduct manual feature engineering (from domain knowledge) vs. machine induced featurization (representation learning)
Develop intuition in various machine learning classification algorithms (e.g. decision trees, feed-forward neural networks, recurrent neural networks, skip-grams) and clustering techniques (e.g. k-means, spectral)
Foster critical thinking about real-world actionability from analytics
Provide an overview of issues in research and practice that will affect the practice of data science in a variety of domains

Student Learning Outcomes: Develop capabilities in a range of data mining techniques
Gain the ability to solve problems in data mining research and practice
Think critically about how to assess analytics
Use data mining and analytics in a domain of application

Rules & Requirements

Prerequisites: Corequisite: Data/CompSci/Stat C100 (C- or better, or Pass, required if completed prior to Data 144)

Credit Restrictions: Students will receive no credit for DATA 144 after completing INFO 154. A deficient grade in DATA 144 may be removed by taking INFO 154.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Data Science, Undergraduate/Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

Instructor: Pardos

DATA 145 Evidence and Uncertainty 4 Units

Terms offered: Not yet offered

When we learn about the world from data, how much can we rely on the conclusions we draw? How do we know if we could do better? This course will cover the statistical theory required to measure and control our uncertainty when we analyze large and complex modern data sets. We will use mathematical and computational lenses to examine optimality properties and error bounds. Topics include the Bayesian and frequentist paradigms, asymptotic and finite-sample methods, parametric and nonparametric techniques, causality, and multiple testing.

Objectives & Outcomes

Course Objectives: The course is primarily intended for students interested in machine learning and artificial intelligence, whether in industry or academia. It will also be helpful preparation for students who want to study statistics at the graduate level. It will examine approaches to defining and modeling uncertainty, and will identify connections and differences between the frequentist and Bayesian paradigms. The emphasis will be on situations where classical statistical methods do not apply and only minimal distributional assumptions can be made. In such settings, computational solutions might be feasible if the mathematics becomes intractable.

Student Learning Outcomes: Students will understand the need for statistical inference in data science and why the Bayesian viewpoint is so pervasive in modern data analysis. They will recognize the power and limitations of classical methods and newer computationally intensive approaches. They will appreciate the optimality or near-optimality properties of some asymptotic methods, and learn how to work in finite-sample settings where asymptotic methods do not apply. Throughout, they will use mathematics and computation as needed for problem solving. Upon leaving the course, students should be able to follow upcoming developments in the field without extensive further education in statistical inference.

Rules & Requirements

Prerequisites: Math 53, Data C100, and either Data C140 or EECS 126, with a C- or better or Pass

Credit Restrictions: Students will receive no credit for DATA 145 after completing STAT 210A. A deficient grade in DATA 145 may be removed by taking STAT 210A.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Data Science, Undergraduate/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Adhikari, Fithian

DATA C146 Foundations for Computational Precision Health 3 Units

Terms offered: Fall 2025

Students will build expertise in developing machine-learning tools to address challenges in health care. The course emphasizes both “how to formulate useful computational health problems”, and “how to develop computational solutions”. On the health side, we’ll get clinical guest lectures exploring challenges across diverse areas of healthcare (e.g., cardiology, cancer, primary care). On the computational side, the course will cover machine learning and deep learning foundations, state-of-the-art neural networks, and then advanced research topics. The course will emphasize rigorous evaluation, algorithmic bias, deployment, and auditing. The class will culminate in an open-ended final project, integrating skills learned in the course.

Objectives & Outcomes

Course Objectives: Articulate the key challenges in diverse areas of healthcare, including cancer, cardiology, and emergency care.
Develop machine learning methods to leverage, text, images, volumes and time-series data
Formulate precise computational research questions to improve healthcare.
Understand and perform clinically-informed evaluation analyses of predictive ML tools
Understand the role of the various information modalities (e.g., radiology, pathology, labs) in health care. This means understanding why the various modalities are acquired, what they physically capture, and what decisions they enable.

Rules & Requirements

Prerequisites: Data C100 and Data C140

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture per week

Additional Details

Subject/Course Level: Data Science, Undergraduate/Undergraduate

Grading/Final exam status: Letter grade. Alternate method of final assessment during regularly scheduled final exam group (e.g., presentation, final project, etc.).

Instructors: Yala, Chen

Also listed as: CPH C100

DATA C182 Designing, Visualizing and Understanding Deep Neural Networks 4 Units

Terms offered: Fall 2025, Spring 2025, Fall 2024, Spring 2008
Deep Networks have revolutionized computer vision, language technology, robotics and control. They have growing impact in many other areas of science and engineering. They do not however, follow a closed or compact set of theoretical principles. In Yann Lecun's words they require "an interplay between intuitive insights, theoretical modeling, practical implementations, empirical studies, and scientific analyses." This course attempts to cover that ground.
Objectives & Outcomes

Student Learning Outcomes: Students will come to understand visualizing deep networks. Exploring the training and use of deep networks with visualization tools.
Students will learn design principles and best practices: design motifs that work well in particular domains, structure optimization and parameter optimization.
Understanding deep networks. Methods with formal guarantees: generative and adversarial models, tensor factorization.

Rules & Requirements

Prerequisites: MATH 53, MATH 54, and COMPSCI 61B; COMPSCI 70 or STAT 134; COMPSCI 189 is recommended

Credit Restrictions: Students will receive no credit for COMPSCI 182 after completing COMPSCI W182, or COMPSCI L182. A deficient grade in COMPSCI 182 may be removed by taking COMPSCI L182, COMPSCI W182, COMPSCI W182, or COMPSCI L182.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Data Science, Undergraduate/Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

Instructor: Gonzalez

Formerly known as: Computer Science 182

Also listed as: COMPSCI C182

DATA 188 Advanced Data Science Connector 2 - 4 Units

Terms offered: Spring 2024
Designed to be taken concurrently with or after Principles and Techniques of Data Science (Data C100) or Probability for Data Science (Data C140) or both, each connector course consists of an intensive study of data science ideas in a particular field. Topics include the development of the theory of data science, the application of data science in a variety of domains, its human and social contexts, and anything else. Topics vary by field, and more than one topic may be offered in a semester.
Objectives & Outcomes

Course Objectives: Develop theoretical mastery in data science topics, address the challenges of gathering data and converting it to usable formats, develop skills in selecting appropriate data science methods, explore approaches to decision-making and effective communication.

Student Learning Outcomes: Understand and apply theory in an area of data science, or follow the data science life cycle in a domain of application from question formulation to the use of advanced data science methods and the communication of results.

Rules & Requirements

Prerequisites: Prerequisites or corequisites may vary depending on topic. Consult the Schedule of Classes or department website for details

Repeat rules: Course may be repeated for credit when topic changes. Students may enroll in multiple sections of this course within the same semester.

Hours & Format

Fall and/or spring: 15 weeks - 2-3 hours of seminar and 0-1 hours of discussion per week

Additional Details

Subject/Course Level: Data Science, Undergraduate/Undergraduate

Grading/Final exam status: Letter grade. Alternate method of final assessment during regularly scheduled final exam group (e.g., presentation, final project, etc.).

DATA H195A Data Science Honors Thesis Seminar 2 Units

Terms offered: Prior to 2007

The senior honors thesis seminar gives students an opportunity to experience firsthand what it means to do data science research. Over two semesters, students will learn to formulate a research problem, design a research strategy, collect evidence, and write up the findings and analysis. The first semester focuses primarily on the preparation and implementation of a research proposal, as well as data management strategies. During the second semester, we will emphasize analysis and writing. The final result will be a hybrid product with a 20-25 page research paper, with data visualizations and analysis tables, along with a documented data source, annotated code, well documented Github repository, and open science posting of the project.

Objectives & Outcomes

Course Objectives: Assist students with project organization and management.
Convey approaches to effective writing and visual communication.
Discuss how to formulate and substantiate an argument with evidence.
Explain approaches to designing a research question and project.
Explore a variety of analytic and visualization techniques and discuss their appropriateness to different research questions.
Identify the challenges in data acquisition and management.

Student Learning Outcomes: Communicate effectively in written, spoken, and graphical form.
Develop an understanding of data availability, constraints, and ethics.
Develop data management skills.
Develop reproducible research and interpret results.
Formulate a proposal for a research project.
Learn how to develop a research question and project.
Understand how to organize empirical work into a written document.
Understand how to use empirical evidence to construct an argument.

Rules & Requirements

Prerequisites: There are no specific prerequisites. Students must be accepted into the data science honors program in order to take this course. Students must complete H195A in order to enroll in H195B

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Data Science, Undergraduate/Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

DATA H195B Data Science Honors Thesis Seminar 2 Units

Terms offered: Spring 2020

The senior honors thesis seminar gives students an opportunity to experience firsthand what it means to do data science research. Over two semesters, students will learn to formulate a research problem, design a research strategy, collect evidence, and write up the findings and analysis. The first semester focuses primarily on the preparation and implementation of a research proposal, as well as data management strategies. During the second semester, we will emphasize analysis and writing. The final result will be a hybrid product with a 20-25 page research paper, with data visualizations and analysis tables, along with a documented data source, annotated code, well documented Github repository, and open science posting of the project.

Objectives & Outcomes

Course Objectives: Assist students with project organization and management.
Convey approaches to effective writing and visual communication.
Discuss how to formulate and substantiate an argument with evidence.
Explain approaches to designing a research question and project.
Explore a variety of analytic and visualization techniques and discuss their appropriateness to different research questions.
Identify the challenges in data acquisition and management.

Student Learning Outcomes: Communicate effectively in written, spoken, and graphical form.
Develop an understanding of data availability, constraints, and ethics.
Develop data management skills.
Develop reproducible research and interpret results.
Formulate a proposal for a research project.
Learn how to develop a research question and project.
Understand how to organize empirical work into a written document.
Understand how to use empirical evidence to construct an argument.

Rules & Requirements

Prerequisites: There are no specific prerequisites. Students must be accepted into the data science honors program in order to take this course. Students must complete H195A in order to enroll in H195B

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Data Science, Undergraduate/Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

DATA 197 Field Studies in Data Science 0.5 - 6 Units

Terms offered: Fall 2019
Students take part in organized individual field sponsored programs with off-campus organizations or tutoring/mentoring relevant to specific aspects and applications of data science on or off campus. Note Summer CPT or OPT students: written report required. Course may not count toward major requirements but will be counted in the cumulative units toward graduation.

Rules & Requirements

Prerequisites: Consent of instructor (see department advisor). Upper-division standing

Repeat rules: Course may be repeated for credit with advisor consent.

Hours & Format

Fall and/or spring: 15 weeks - 1.5-18 hours of fieldwork per week

Summer:
8 weeks - 3-34 hours of fieldwork per week
10 weeks - 2.5-27 hours of fieldwork per week

Additional Details

Subject/Course Level: Data Science, Undergraduate/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Alternative to final exam.

DATA 198 Directed Group Studies for Advanced Undergraduates 1 - 4 Units

Terms offered: Spring 2025, Fall 2024, Spring 2024
Written proposal must be approved by a faculty sponsor, who will serve as Instructor of Record. Seminars for the group study of selected topics, which will vary from semester to semester. Topics may be initiated by students.

Rules & Requirements

Prerequisites: Instructors may require students to enroll concurrently or have completed Data 8 (COMPSCI/STAT/INFO C8). Upper-division standing and consent of instructor

Repeat rules: Course may be repeated for credit without restriction. Students may enroll in multiple sections of this course within the same semester.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of directed group study per week

Additional Details

Subject/Course Level: Data Science, Undergraduate/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

DATA 199 Supervised Independent Study and Research 1 - 4 Units

Terms offered: Prior to 2007
Independent study and research by arrangement with faculty or staff. This course allows students to obtain course credit for participation in undergraduate research. Students may opt either to participate in a semester-long series of workshops which provide a guided research experience with project milestone assignments and regular feedback, or they may opt to work independently with supervision from one faculty research mentor.

Objectives & Outcomes

Student Learning Outcomes: Develop and refine skills acquired in other courses in a hands-on, self-directed research project.
Identify how to properly manage data and describe best practices in programming and analytics.
Integrate feedback from an instructor into research on a regular basis.
Learn how to structure and complete a research project working independently.

Rules & Requirements

Prerequisites: Instructors may require students to enroll concurrently or have completed Data 8 (COMPSCI/STAT/INFO C8). Upper-division standing and consent of instructor

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 3-12 hours of independent study per week

Summer:
6 weeks - 7.5-30 hours of independent study per week
8 weeks - 5.5-22.5 hours of independent study per week

Additional Details

Subject/Course Level: Data Science, Undergraduate/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Alternative to final exam.

DATA 200S Principles and Techniques of Data Science 3 Units

Terms offered: Fall 2025, Spring 2025, Fall 2024
Explores the data science lifecycle: question formulation, data collection and cleaning, exploratory, analysis, visualization, statistical inference, prediction, and decision-making. Focuses on quantitative critical thinking and key principles and techniques: languages for transforming, querying and analyzing data; algorithms for machine learning methods: regression, classification and clustering; principles of informative visualization; measurement error and prediction; and techniques for scalable data processing. Research term project.

Rules & Requirements

Prerequisites: DATA/COMPSCI/INFO/STAT C8; and COMPSCI 61A or COMPSCI/DATA C88C. Corequisites: MATH 54 or EECS 16A

Credit Restrictions: Students will receive no credit for DATA 200S after completing DATA C100, or DATA C200. A deficient grade in DATA 200S may be removed by taking DATA C200.

Hours & Format

Fall and/or spring: 15 weeks - 3-3 hours of lecture, 1-1 hours of discussion, and 0-1 hours of laboratory per week

Additional Details

Subject/Course Level: Data Science, Undergraduate/Graduate

Grading: Letter grade.

DATA C200 Principles and Techniques of Data Science 4 Units

Terms offered: Spring 2025, Fall 2024, Spring 2024, Spring 2023, Spring 2022, Spring 2021, Spring 2020
Explores the data science lifecycle: question formulation, data collection and cleaning, exploratory, analysis, visualization, statistical inference, prediction, and decision-making. Focuses on quantitative critical thinking and key principles and techniques: languages for transforming, querying and analyzing data; algorithms for machine learning methods: regression, classification and clustering; principles of informative visualization; measurement error and prediction; and techniques for scalable data processing. Research term project.

Rules & Requirements

Prerequisites: COMPSCI C8 / INFO C8 / STAT C8 or ENGIN 7; and either COMPSCI 61A or COMPSCI 88. Corequisites: MATH 54 or EECS 16A

Credit Restrictions: Students will receive no credit for DATA C200\COMPSCI C200A\STAT C200C after completing DATA C100.

Hours & Format

Fall and/or spring:
8 weeks - 6-6 hours of lecture, 2-2 hours of discussion, and 0-2 hours of laboratory per week
15 weeks - 3-3 hours of lecture, 1-1 hours of discussion, and 0-1 hours of laboratory per week

Summer: 8 weeks - 6-6 hours of lecture, 2-2 hours of discussion, and 0-2 hours of laboratory per week

Additional Details

Subject/Course Level: Data Science, Undergraduate/Graduate

Grading: Letter grade.

Formerly known as: Statistics C200C/Computer Science C200A

Also listed as: COMPSCI C200A/STAT C200C

DATA C204 Human Contexts and Ethics of Data 4 Units

Terms offered: Spring 2025, Fall 2024, Spring 2024
This course teaches you to use approaches from the across the humanities and interpretive social sciences and tools of Science, Technology, and Society (STS) to recognize, analyze, and shape the human contexts, social implications, and ethics of data and data technologies, including data analytics, algorithmic decision systems, machine learning (ML), and artificial intelligence (AI).
Rules & Requirements

Prerequisites: Graduate standing or permission of the instructor. Graduate students without previous (undergraduate or graduate-level) preparation in the interpretive social sciences or humanities are encouraged to confer with the instructor before enrolling

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Data Science, Undergraduate/Graduate

Grading: Letter grade.

Instructor: Carson

Also listed as: HISTORY C254/STS C204

DATA 298 Directed Group Studies for Graduates 1 - 4 Units

Terms offered: Prior to 2007
DATA 298 provides credit for directed group study by graduate students working closely with an instructor who is a faculty member. Students are responsible for finding an instructor to supervise their work, and they will meet with that instructor weekly or bi-weekly. Faculty members must commit to supervising and evaluating the students' work and be available to meet regularly as required by the guidelines.
Rules & Requirements

Prerequisites: Instructors may require students to enroll concurrently or have completed Data C8 (COMPSCI/STAT/INFO C8) or or Data C200 (COMPSCI C200A/STAT C200C). Graduate standing and consent of instructor

Repeat rules: Course may be repeated for credit without restriction. Students may enroll in multiple sections of this course within the same semester.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of directed group study per week

Additional Details

Subject/Course Level: Data Science, Undergraduate/Graduate

Grading: Letter grade.

DATA 375 Professional Preparation: Teaching of Data Science 2 Units

Terms offered: Spring 2025, Fall 2024, Spring 2024
Discussion and practice of techniques for effective teaching of student-centered learning, focusing on issues most relevant to teaching assistants in data science courses. Discussion, review and development of formative and summative assessments, guidance of laboratory classes, course development, supervised practice teaching, and culturally relevant pedagogy.
Rules & Requirements

Prerequisites: Concurrent Teaching Assistant appointment required

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture per week

Additional Details

Subject/Course Level: Data Science, Undergraduate/Professional course for teachers or prospective teachers

Grading: Offered for satisfactory/unsatisfactory grade only.