

DATA SCIENCE (BS)

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (<https://catalog.calpoly.edu/academic-standards-policies/general-requirements-bachelors-degree/#generaleducationtext>) section of this catalog, including:

- 40 units of upper-division courses
- 2.0 GPA
- Graduation Writing Requirement (GWR)
- U.S. Cultural Pluralism (USCP)

Note: No Major, Support or Concentration courses may be selected as credit/no credit. In addition, no more than 12 units of cooperative or internship courses can count towards your degree requirements.

Code	Title	Units
MAJOR COURSES		
CSC 1001 & CSC 1001L	Fundamentals of Computer Science and Fundamentals of Computer Science Laboratory	4
CSC 2001 & CSC 2001L	Data Structures and Data Structures Laboratory	4
DATA 2000	Data Science Seminar	1
DATA 3301	Introduction to Data Science	4
DATA 4401	Data Science Process and Ethics	4
DATA 4460	Senior Project - Data Science Capstone	2
DATA/CSC 4610	Fundamentals of Machine Learning	4
DATA/CSC 4620	Foundations and Applications of Deep Learning	4
MATH 1151	Linear Algebra	3
MATH/DATA 1264	Calculus for Data Science I (2) ¹	4
MATH/DATA 1265	Calculus for Data Science II	4
MATH 2031	Transition to Advanced Mathematics	3
MATH/DATA 2621	Introduction to Mathematical Optimization	3
STAT 1510	Statistics I	3
STAT 2610	Introduction to Probability and Simulation	3
STAT 3520	Statistics II	3
STAT 3530	Applied Linear Models	4
Concentration		
(See list of Concentrations below)		21-23
SUPPORT COURSES		
Select from the following: (Upper-Division 3) ¹		3
PHIL 3322	Philosophy of Technology	
PHIL 3323	Ethics, Science, and Technology	
PHIL 3327	Robot Ethics	
GENERAL EDUCATION (GE)		
(See GE program requirements below)		37
FREE ELECTIVES		
Free Electives ²		0-2
Total Units		120

¹ Required in Major or Support; also satisfies General Education (GE) requirement.

² If a General Education (GE) course is used to satisfy a Major or Support requirement, additional units of Free Electives may be needed to complete the total units required for the degree.

Concentrations

Machine Learning Engineering

Code	Title	Units
REQUIRED COURSES		
CSC 3449	Algorithms and Complexity	4
DATA 3302	Data Visualization	4
STAT/DATA 1810	Introduction to Statistical Computing with R	3
Select from the following:		4
CSC 3665	Introduction to Database Management Systems	
CSC 3660 & CSC 3662	Introduction to Databases and Introduction to Non-Relational Database Systems	
Modeling Electives		
Select from the following: ^{1, 2}		2-6
CSC 4880	Artificial Intelligence	
CSC 5887	Advanced Deep Learning	
DATA 4632	Graph Mining	
MATH 2343	Differential Equations	
MATH 3152	Advanced Linear Algebra	
MATH 3351	Differential Equations and Boundary Value Problems	
MATH/DATA 3622	Mathematics of Data Science	
MATH 3651	Introduction to Numerical Analysis	
MATH 4653	Numerical Optimization	
STAT 4610	Probability Theory	
STAT 4740	Multilevel and Mixed Modeling	
STAT 4750	Bayesian Reasoning and Methods	
STAT 4760	Statistical Analysis of Time Series	
STAT 4770	Survival Analysis Methods	
STAT 4780	Categorical Data Analysis	
STAT 4790	Applied Multivariate Statistics	
STAT 5530	Generalized Linear Models	
STAT/DATA 5550	Statistical Learning with R	
Computing Electives		
Select from the following: ^{1, 2}		2-6
CSC 4820	Natural Language Processing	
CSC 4880	Artificial Intelligence	
CSC 4881	Semantic Computing	
CSC 4888	Computer Vision	
CSC 4891	Seminars in Artificial Intelligence and Machine Learning ³	
CSC 4892	Research Experience in Artificial Intelligence and Machine Learning ³	
CSC 4893	Projects in Artificial Intelligence and Machine Learning ³	
CSC 5571	Special Advanced Laboratory	
CSC 5572	Special Advanced Activity	
CSC 5666	Advanced Machine Learning	
CSC 5820	Computational Linguistics	
CSC 5870	Special Advanced Topics in Artificial Intelligence	
CSC 5880	Artificial Intelligence	
CSC 5887	Advanced Deep Learning	
DATA 4720	Data Science Seminar ³	
STAT/DATA 3820	Intermediate Statistical Computing with R	
Total Units		23

¹ Courses can only be used once for major degree credit.

² A minimum of 23 units is required to complete the concentration. Unit selection for requirements will vary based on students' selection of modeling electives and computing electives.

³ CSC 4891, CSC 4892, CSC 4893 and DATA 4720 can be taken for a combined total of up to 4 units.

Mathematical Foundations

Code	Title	Units
REQUIRED COURSES		
MATH 2343	Differential Equations	3
MATH 3055	Graph Theory	3
MATH 3152	Advanced Linear Algebra	4
MATH 3351	Differential Equations and Boundary Value Problems	3
MATH/DATA 3622	Mathematics of Data Science	3
MATH 3651	Introduction to Numerical Analysis	3
MATH 4653	Numerical Optimization	3
Total Units		22

Statistical Modeling

Code	Title	Units
REQUIRED COURSES		
STAT/DATA 1810	Introduction to Statistical Computing with R	3
STAT/DATA 3820	Intermediate Statistical Computing with R	3
Statistical Modeling Electives		
Select from the following:		15
STAT 4740	Multilevel and Mixed Modeling	
STAT 4750	Bayesian Reasoning and Methods	
STAT 4760	Statistical Analysis of Time Series	
STAT 4770	Survival Analysis Methods	
STAT 4780	Categorical Data Analysis	
STAT 4790	Applied Multivariate Statistics	
STAT/DATA 5550	Statistical Learning with R	
Total Units		21

General Education (GE) Requirements

General Education (GE) Requirements

- 43 units required, 6 of which are specified in Major and/or Support.
- If any of the remaining 37 Units is used to satisfy a Major or Support requirement, additional units of Free Electives may be needed to complete the total units required for the degree.
- See the complete GE course listing (<https://catalog.calpoly.edu/academic-standards-policies/general-requirements-bachelors-degree/#generaleducationtext>).
- A grade of C- or better is required in one course in each of the following GE Areas: 1A (English Composition), 1B (Critical Thinking), 1C (Oral Communication), and 2 (Mathematics and Quantitative Reasoning).

Lower-Division General Education

Area 1	English Communication and Critical Thinking	
1A	Written Communication	3
1B	Critical Thinking	3
1C	Oral Communication	3
Area 2	Mathematics and Quantitative Reasoning	
2	Mathematics and Quantitative Reasoning (3 units in Major) ¹	0
Area 3	Arts and Humanities	
3A	Arts	3
3B	Humanities: Literature, Philosophy, Languages other than English	3

Area 4	Social and Behavioral Sciences (Area 4 courses must come from at least two different course prefixes.)	
4A	American Institutions (Title 5, Section 40404 Requirement)	3
4B	Social and Behavioral Sciences	3
Area 5	Physical and Life Sciences	
5A	Physical Sciences	3
5B	Life Sciences	3
5C	Laboratory (may be embedded in a 5A or 5B course)	1
Area 6	Ethnic Studies	
6	Ethnic Studies	3
Upper-Division General Education		
Upper-Division 2/5	Mathematics and Quantitative Reasoning or Physical and Life Sciences	3
Upper-Division 3	Arts and Humanities (3 units in Support) ¹	0
Upper-Division 4	Social and Behavioral Sciences (Area 4 courses must come from at least two different course prefixes.)	3
Total Units		37

¹ Required in Major or Support; also satisfies General Education (GE) requirement.