

DATA SCIENCE (BS)

Offered at: San Luis Obispo Campus

The Bachelor of Science (BS) in Data Science is an interdisciplinary program that prepares students to analyze, interpret, and derive insights from complex data. The curriculum combines foundational knowledge in mathematics, statistics, computer science, and domain-specific applications, providing students with the skills necessary for careers in data analysis, machine learning, and big data management. Students gain proficiency in programming in multiple languages, data visualization, data mining, and predictive modeling, while engaging in hands-on projects with real-world data. This program equips graduates to excel in data-driven decision-making roles across diverse industries.

Concentrations

Machine Learning Engineering

Offered at: San Luis Obispo Campus

The Machine Learning Engineering concentration prepares students to design, build, deploy, and maintain scalable machine learning systems in real-world environments. Blending statistical modeling, software engineering, and data infrastructure, this concentration emphasizes the practical implementation of machine learning solutions beyond experimentation.

Mathematical Foundations

Offered at: San Luis Obispo Campus

The Mathematical Foundations concentration provides students with a rigorous grounding in the theoretical principles that underpin data science. This concentration emphasizes the mathematical structures, methods, and reasoning essential for understanding and developing modern data-driven techniques.

Statistical Modeling

Offered at: San Luis Obispo Campus

The Statistical Modeling concentration focuses on the development, analysis, and application of statistical methods for understanding complex data. This concentration prepares students to build interpretable models, draw valid inferences, and quantify uncertainty in data-driven decision-making. Through applied projects and coursework, students gain experience selecting appropriate modeling techniques, evaluating model performance, and interpreting results in context.

Program Learning Objectives

1. Analyze a complex data science problem and apply principles of statistics, computer science, mathematics, and a domain-specific field, such as health, engineering or application development, to identify solutions.
2. Design, implement, and evaluate a data-driven solution to meet a given set of analysis requirements.
3. Work with data of a wide range of volume, variety, velocity, and veracity.
4. Communicate effectively in a variety of professional contexts.
5. Attend to professional responsibilities and make informed judgments in data science practice based on legal and ethical principles.
6. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.

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.