STATISTICS, BACHELOR OF SCIENCE

College of Letters & Science

The Major Program

Statistics enables us to make inferences about entire populations, based on samples extracted from those populations. Statistical methods can be applied to problems from almost every discipline and they are vitally important to researchers in agricultural, biological, environmental, social, engineering, and medical sciences.

The Program

Statistics majors may receive either a Bachelor of Arts or a Bachelor of Science degree. Both the A.B. and the B.S. programs require theoretical and applied course work and underscore the strong interdependence of statistical theory and the applications and computational aspects of statistics. The B.S. degree program has five tracks: Applied Statistics Track, Computational Statistics Track, General Track, Machine Learning Track, and the Statistical Data Science Track.

B.S. in Statistics-Applied Statistics Track emphasizes statistical applications. This track is recommended for students who are interested in applications of statistical techniques to various disciplines including the biological, physical and social sciences.

B.S. in Statistic-Computational Statistics Track emphasizes computing. This track is recommended for students interested in the computational and data management aspects of statistical analysis.

B.S. in Statistics-General Track emphasizes statistical theory and is especially recommended as preparation for graduate study in statistics.

B.S in Statistics-Machine Learning Track emphasizes algorithmic and theoretical aspects of statistical learning methodologies that are geared towards building predictive and explanatory models for large and complex data. It is recommended for students interested in pursuing graduate programs in statistics, machine learning, or data science, as well as for students interested in learning statistical techniques for industry.

B.S. in Statistic-Statistical Data Science Track emphasizes data handling skills and statistical computation. This track is recommended for students interested in statistical learning methodology, advanced data handling techniques and computational aspects of statistical analysis.

Major Advisors

For a current list of faculty and staff advisors, see Undergraduate Advising (https://statistics.ucdavis.edu/undergrad/advising/).

Students are encouraged to meet with an advisor to plan a program as early as possible.

Career Alternatives

Probability models, statistical methods, and computational techniques are used in a great many fields, including the biological, physical, social, and health sciences, business, and engineering. The wide applicability of statistics is reflected in the strong demand for graduates with statistical training in both the public and private sectors. Employment opportunities include careers in data & policy analysis in government & industry, financial management, quality control, insurance & healthcare industry, actuarial science, engineering, public health, biological & pharmaceutical research, law, and education. Students with an undergraduate degree in statistics have entered advanced studies in statistics, economics, finance, psychology, medicine, business management & analytics, and other professional school programs.

Applied Statistics Track

Code	Title	Units
Preparatory Subject Matter		
Mathematics		
Choose a series:		9-12
MAT 016A & MAT 016B & MAT 016C	Short Calculus and Short Calculus and Short Calculus	
MAT 017A & MAT 017B & MAT 017C	Calculus for Biology & Medicine and Calculus for Biology & Medicine and Calculus for Biology & Medicine	
MAT 021A & MAT 021B & MAT 021C	Calculus and Calculus and Calculus	
MAT 021 series preferred.		
MAT 022A	Linear Algebra	3
Computer Science Engineering		
ECS 032A	Introduction to Programming	4
or ECS 036A	Programming & Problem Solving	
Statistics		
Choose one:		4
STA 013	Elementary Statistics	
or STA 013Y	Elementary Statistics	
STA 032	Gateway to Statistical Data Science	
STA 100	Applied Statistics for Biological Sciences	
STA 032 or STA 100 preferred.		
Cluster Elective Prerequisites		
Two introductory courses serving as the prerequisites to the chosen Cluster Electives (see **Cluster Electives** section below).		7-8
Note: Additional coursework beyond this requirement may be needed to fulfill the Cluster Elective prerequisites.		
Preparatory Subject Matter Subtotal		27-31
Depth Subject Matter		
Core Coursework		
Statistics		24
STA 106	Applied Statistical Methods: Analysis of Variance	
STA 108	Applied Statistical Methods: Regression Analysis	
STA 130A	Mathematical Statistics: Brief Course	
STA 130B	Mathematical Statistics: Brief Course	
STA 138	Analysis of Categorical Data	
STA 141A	Fundamentals of Statistical Data Science	
Restricted Electives		
Choose three:		12
STA 104	Applied Statistical Methods: Nonparametric Statistics	
STA 135	Multivariate Data Analysis	

STA 137	Applied Time Series Analysis	
STA 141B	Data & Web Technologies for Data Analysis	
Only one of STA 141B or STA 141C can be used as an elective.		
STA 141C	Big Data & High Performance Statistical Computing	
Only one of STA 141B or STA 141C can be used as an elective.		
STA 144	Sampling Theory of Surveys	
STA 145	Bayesian Statistical Inference	
STA 160	Practice in Statistical Data Science	
MAT 168	Optimization	
With advisor approval, one of STA 194HA or STA 194HB or STA 199 may be used as an elective. The course must be taken for four units.		
STA 194HA	Special Studies for Honors Students	
STA 194HB	Special Studies for Honors Students	
STA 199	Special Study for Advanced Undergraduates	
Cluster Electives		
Choose four upper division elective courses outside of statistics:		12-16
Cluster electives are chosen with and must be approved by the major advisor. **A list of pre-approved electives can be found on the Statistics Department website.** Electives must follow a coherent sequence in one single disciple/cluster where statistical methods and models are applied. At least three of the cluster electives must cover the quantitative aspects of the discipline.		
Depth Subject Matter Subtotal		48-52
Total Units		**75-83**

Computational Statistics Track

Code	Title	Units
Preparatory Subject Matter		
Mathematics		
MAT 021A	Calculus	4
MAT 021B	Calculus	4
MAT 021C	Calculus	4
MAT 021D	Vector Analysis	4
MAT 022A	Linear Algebra	3
Computer Science Engineering		
Choose one:		4-5
ECS 034	Software Development in UNIX & C++	
ECS 036C	Data Structures, Algorithms, & Programming	
Or the equivalent.		
Statistics		
Choose one:		4
STA 013	Elementary Statistics	
or STA 013Y	Elementary Statistics	
STA 032	Gateway to Statistical Data Science	
STA 100	Applied Statistics for Biological Sciences	
STA 032 or STA 100 preferred.		
Preparatory Subject Matter Subtotal		27-28
Depth Subject Matter		
Statistics		
STA 106	Applied Statistical Methods: Analysis of Variance	4
STA 108	Applied Statistical Methods: Regression Analysis	4
STA 131A	Introduction to Probability Theory	4
STA 131B	Introduction to Mathematical Statistics	4
STA 141A	Fundamentals of Statistical Data Science	4
Choose two:		*8*
STA 104	Applied Statistical Methods: Nonparametric Statistics	
STA 135	Multivariate Data Analysis	
STA 137	Applied Time Series Analysis	
STA 138	Analysis of Categorical Data	
STA 142A	Statistical Learning I	
STA 142B	Statistical Learning II	
STA 144	Sampling Theory of Surveys	
STA 145	Bayesian Statistical Inference	
STA 160	Practice in Statistical Data Science	
With advisor approval, one of STA 194HA or STA 194HB or STA 199 may be used as an elective. The course must be taken for four units.		
STA 194HA	Special Studies for Honors Students	
STA 194HB	Special Studies for Honors Students	
STA 199	Special Study for Advanced Undergraduates	
Programming, Data Management & Data Tehnologies		
ECS 130	Scientific Computation	4
or ECS 145	Scripting Languages & Their Applications	
ECS 165A	Database Systems	4
Scientific Computational Algorithm & Visualization		
Choose two:		8
ECS 122A	Algorithm Design & Analysis	
ECS 129	Computational Structural Bioinformatics	
ECS 140A	Programming Languages	
ECS 158	Programming on Parallel Architectures	
ECS 163	Information Interfaces	
STA 141B	Data & Web Technologies for Data Analysis	
STA 141C	Big Data & High Performance Statistical Computing	
Mathematics		
Choose two:		8
MAT 124	Mathematical Biology	
MAT 128A	Numerical Analysis	
MAT 128B	Numerical Analysis in Solution of Equations	
MAT 129	Fourier Analysis	
MAT 145	Combinatorics	
MAT 148	Discrete Mathematics	
MAT 170	Mathematics for Data Analytics & Decision Making	
MAT 165	Mathematics & Computers	
MAT 167	Applied Linear Algebra	
MAT 168	Optimization	

Depth Subject Matter Subtotal	52
Total Units	**79-80**

General Statistics Track

Code	Title	Units
Preparatory Subject Matter		
Mathematics		
MAT 021A	Calculus	4
MAT 021B	Calculus	4
MAT 021C	Calculus	4
MAT 021D	Vector Analysis	4
MAT 022A	Linear Algebra	3-4
or MAT 067	Modern Linear Algebra	
Computer Science Engineering		
ECS 032A	Introduction to Programming	4
or ECS 036A	Programming & Problem Solving	
Statistics		
Choose one:		4
STA 013	Elementary Statistics	
or STA 013Y	Elementary Statistics	
STA 032	Gateway to Statistical Data Science	
STA 100	Applied Statistics for Biological Sciences	
STA 032 or STA 100 preferred.		
Preparatory Subject Matter Subtotal		27-28
Depth Subject Matter		
Core Coursework		
Statistics		24
STA 106	Applied Statistical Methods: Analysis of Variance	
STA 108	Applied Statistical Methods: Regression Analysis	
STA 131A	Introduction to Probability Theory	
STA 131B	Introduction to Mathematical Statistics	
STA 131C	Introduction to Mathematical Statistics	
STA 138	Analysis of Categorical Data	
Mathematics		16
MAT 108	Introduction to Abstract Mathematics	
or MAT 127C	Real Analysis	
MAT 127A	Real Analysis	
MAT 127B	Real Analysis	
MAT 167	Applied Linear Algebra	
Restricted Electives		
Choose three:		12
STA 104	Applied Statistical Methods: Nonparametric Statistics	
STA 135	Multivariate Data Analysis	
STA 137	Applied Time Series Analysis	
STA 141A	Fundamentals of Statistical Data Science	
STA 141B	Data & Web Technologies for Data Analysis	
Only one of STA 141B or STA 141C can be used as an elective.		
STA 141C	Big Data & High Performance Statistical Computing	
Only one of STA 141B or STA 141C can be used as an elective.		
STA 142A	Statistical Learning I	
STA 142B	Statistical Learning II	
STA 144	Sampling Theory of Surveys	
STA 145	Bayesian Statistical Inference	
STA 160	Practice in Statistical Data Science	
MAT 168	Optimization	
With advisor approval, one of STA 194HA or STA 194HB or STA 199 may be used as an elective. The course must be taken for four units.		
STA 194HA	Special Studies for Honors Students	
STA 194HB	Special Studies for Honors Students	
STA 199	Special Study for Advanced Undergraduates	
Related Elective Course		
One upper division course outside of Statistics approved by major advisor. **A list of pre-approved electives can be found on the Statistics Department website.** The Related Elective should be in mathematics, computer science or cover quantitative aspects of a substantive discipline.		3-4
Depth Subject Matter Subtotal		55-56
Total Units		**82-84**

Machine Learning Track

Code	Title	Units
Preparatory Subject Matter		
Mathematics		
MAT 021A	Calculus	4
MAT 021B	Calculus	4
MAT 021C	Calculus	4
MAT 021D	Vector Analysis	4
MAT 022A	Linear Algebra	3
Computer Science Engineering		
ECS 032A	Introduction to Programming	4
or ECS 036A	Programming & Problem Solving	
Note: Additional coursework in Python is strongly recommended; e.g., ECS 032B.		
Statistics		
Choose one:		4
STA 013	Elementary Statistics	
or STA 013Y	Elementary Statistics	
STA 032	Gateway to Statistical Data Science	
STA 100	Applied Statistics for Biological Sciences	
STA 032 or STA 100 preferred.		
Preparatory Subject Matter Subtotal		27
Depth Subject Matter		
Core Coursework		
Statistics		36
STA 106	Applied Statistical Methods: Analysis of Variance	
STA 108	Applied Statistical Methods: Regression Analysis	
STA 131A	Introduction to Probability Theory	
STA 131B	Introduction to Mathematical Statistics	

STA 131C	Introduction to Mathematical Statistics	
STA 141A	Fundamentals of Statistical Data Science	
STA 142A	Statistical Learning I	
STA 142B	Statistical Learning II	
STA 144	Sampling Theory of Surveys	
or STA 145	Bayesian Statistical Inference	
Mathematics		4
MAT 167	Applied Linear Algebra	
or MAT 168	Optimization	
Restricted Electives		
Choose three:		12
STA 104	Applied Statistical Methods: Nonparametric Statistics	
STA 135	Multivariate Data Analysis	
STA 137	Applied Time Series Analysis	
STA 138	Analysis of Categorical Data	
STA 141B	Data & Web Technologies for Data Analysis	
STA 141C	Big Data & High Performance Statistical Computing	
STA 144	Sampling Theory of Surveys	
STA 145	Bayesian Statistical Inference	
MAT 127A	Real Analysis	
MAT 128A	Numerical Analysis	
MAT 170	Mathematics for Data Analytics & Decision Making	
ECS 122A	Algorithm Design & Analysis	
ECS 158	Programming on Parallel Architectures	
ECS 163	Information Interfaces	
ECS 160	Software Engineering	
ECS 170	Introduction to Artificial Intelligence	
ECS 174	Computer Vision	
With advisor approval, one of STA 194HA or STA 194HB or STA 199 may be used as an elective. The course must be taken for four units.		
STA 194HA	Special Studies for Honors Students	
STA 194HB	Special Studies for Honors Students	
STA 199	Special Study for Advanced Undergraduates	
Note: A course used to fulfill the core requirement cannot be used as an elective.		
Depth Subject Matter Subtotal		52
Total Units		**79**

Statistical Data Science Track

Code	Title	Units
Preparatory Subject Matter		
Mathematics		
MAT 021A	Calculus	4
MAT 021B	Calculus	4
MAT 021C	Calculus	4
MAT 021D	Vector Analysis	4
MAT 022A	Linear Algebra	3
Computer Science Engineering		
ECS 032A	Introduction to Programming	4
or ECS 036A	Programming & Problem Solving	
Note: Additional coursework in Python is strongly recommended; e.g., ECS 032B.		
Statistics		
Choose one:		4
STA 013	Elementary Statistics	
or STA 013Y	Elementary Statistics	
STA 032	Gateway to Statistical Data Science	
STA 100	Applied Statistics for Biological Sciences	
STA 032 or STA 100 preferred.		
Preparatory Subject Matter Subtotal		27
Depth Subject Matter		
Core Coursework		
Statistics		36
STA 106	Applied Statistical Methods: Analysis of Variance	
STA 108	Applied Statistical Methods: Regression Analysis	
STA 131A	Introduction to Probability Theory	
or STA 130A	Mathematical Statistics: Brief Course	
STA 131B	Introduction to Mathematical Statistics	
or STA 130B	Mathematical Statistics: Brief Course	
STA 135	Multivariate Data Analysis	
STA 141A	Fundamentals of Statistical Data Science	
STA 141B	Data & Web Technologies for Data Analysis	
STA 141C	Big Data & High Performance Statistical Computing	
STA 160	Practice in Statistical Data Science	
Machine Learning		4
STA 142A	Statistical Learning I	
or ECS 171	Machine Learning	
Mathematics		4
MAT 167	Applied Linear Algebra	
or MAT 168	Optimization	
Restricted Electives		
Choose two:		8
STA 104	Applied Statistical Methods: Nonparametric Statistics	
STA 137	Applied Time Series Analysis	
STA 138	Analysis of Categorical Data	
STA 142A	Statistical Learning I	
STA 142B	Statistical Learning II	
STA 144	Sampling Theory of Surveys	
STA 145	Bayesian Statistical Inference	
MAT 128A	Numerical Analysis	
MAT 170	Mathematics for Data Analytics & Decision Making	
ECS 122A	Algorithm Design & Analysis	
ECS 158	Programming on Parallel Architectures	
ECS 163	Information Interfaces	
ECS 165A	Database Systems	

With advisor approval, one of STA 194HA or STA 194HB or STA 199 may be used as an elective. The course must be taken for four units.		
STA 194HA	Special Studies for Honors Students	
STA 194HB	Special Studies for Honors Students	
STA 199	Special Study for Advanced Undergraduates	
Note: A course used to fulfill a core requirement cannot be used as a restricted elective.		
Depth Subject Matter Subtotal		52
Total Units		**79**