Undergraduate Manual

4118 Mathematical Sciences Building

stat-advising@ucdavis.edu

statistics.ucdavis.edu
Major Programs

Statistics (AB or BS)

- Bachelor of Arts
  - Applied Statistics Track: emphasizes statistical applications. This major track is recommended for students who are interested in applications of statistical techniques to various disciplines, especially the social sciences.

- Bachelor of Science
  - Applied Statistics Track: emphasizes statistical applications. This major track is recommended for students who are interested in applications of statistical techniques to various disciplines including the biological, physical and social sciences.
  
  - Computational Statistics Track: emphasizes computing. This major track is recommended for students interested in the computational and data management aspects of statistical analysis.
  
  - General Statistics Track: emphasizes statistical theory and is especially recommended as preparation for graduate study 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.
  
  - 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.

Data Science (BS)

- Bachelor of Science
  - Foundations Track: emphasizes underlying computer science, engineering, mathematics and statistics methodology and theory, and is especially recommended as preparation for graduate study in data science or related fields.
A.B. in Statistics - Applied Statistics Track (Effective Fall 2020)

This major is recommended for students who are interested in applications of statistical techniques to various disciplines, especially the social sciences.

Preparatory Subject Matter (20-23 units)

- MAT 16A or 17A or 21A Calculus (3-4)
- MAT 16B or 17B or 21B Calculus (3-4)
- MAT 16C or 17C or 21C Calculus (3-4)
- MAT 22A Linear Algebra (3)
- ECS 32A or 36A Programming (4)
- STA 13 or 32 or 100 Statistics (32 or 100 preferred) (4)

Depth Subject Matter (45-48 units)

- STA 106 Analysis of Variance (4)
- STA 108 Regression Analysis (4)
- STA 130A Mathematical Statistics: Brief Course (4)
- STA 130B Mathematical Statistics: Brief Course (4)
- STA 137 Applied Time Series Analysis or STA 141A Fundamentals of Statistical Data Science (4)
- STA 138 Analysis of Categorical Data (4)

Three courses from:

- STA 104 Nonparametric Statistics (4)
- STA 135 Multivariate Data Analysis (4)
- STA 137 Applied Time Series Analysis (4)
- STA 141A Fundamentals of Statistical Data Science (4)
- STA 141B Data & Web Technologies for Data Analysis or STA 141C Big Data & High Performance Statistical Computing (4)
- STA 144 Sampling Theory of Surveys (4)
- STA 145 Bayesian Statistical Inference (4)
- STA 160 Practice in Statistical Data Science (4)
- MAT 168 Optimization (4)
- One approved 4 unit course from STA 199, 194HA, or 194HB (4)

Three approved upper division elective courses outside of statistics in chosen discipline. (9-12)

- __________________________ (3-4)
- __________________________ (3-4)
- __________________________ (3-4)

A list of pre-approved elective courses can be found at https://statistics.ucdavis.edu/undergrad/ab-applied-track/electives.
Sample Two Year Schedule*

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<thead>
<tr>
<th>Junior (1st Year)</th>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
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<tbody>
<tr>
<td>Approved Elective</td>
<td>STA 106</td>
<td>STA 137 or 141A</td>
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<tr>
<td>STA 108</td>
<td>STA 130A</td>
<td>STA 130B</td>
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<thead>
<tr>
<th>Senior (2nd Year)</th>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
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<tbody>
<tr>
<td>STA 138</td>
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*This sample schedule assumes all preparatory subject matter has been completed. Your schedule will look significantly different if not all of the preparatory subject matter has been completed.
B.S. in Statistics - Applied Statistics Track (Effective Fall 2020)

This major is recommended for students who are interested in applications of statistical techniques to various disciplines including the biological, physical and social sciences.

Preparatory Subject Matter (27-31 units)

- MAT 16A or 17A or 21A Calculus (3-4)
- MAT 16B or 17B or 21B Calculus (3-4)
- MAT 16C or 17C or 21C Calculus (3-4)
- MAT 22A Linear Algebra (3)
- ECS 32A or 36A Programming (4)
- STA 13 or 32 or 100 Statistics (32 or 100 preferred) (4)

Two introductory courses serving as the prerequisites to upper division courses in a chosen discipline to which statistics is applied.

- ___________________________ (3-4)
- ___________________________ (4)

Depth Subject Matter (48-52 units)

- STA 106 Analysis of Variance (4)
- STA 108 Regression Analysis (4)
- STA 130A Mathematical Statistics: Brief Course (4)
- STA 130B Mathematical Statistics: Brief Course (4)
- STA 138 Analysis of Categorical Data (4)
- STA 141A Fundamentals of Statistical Data Science (4)

Three courses from:

- STA 104 Nonparametric Statistics (4)
- STA 135 Multivariate Data Analysis (4)
- STA 137 Applied Time Series Analysis (4)
- STA 141B Data & Web Technologies for Data Analysis or STA 141C Big Data & High Performance Statistical Computing (4)
- STA 144 Sampling Theory of Surveys (4)
- STA 145 Bayesian Statistical Inference (4)
- STA 160 Practice in Statistical Data Science (4)
- MAT 168 Optimization (4)
- One approved 4 unit course from STA 199, 194HA, or 194HB (4)

Four approved upper division elective courses outside of statistics in chosen discipline. (12-16)

(At least three must be quantitative.)

- ___________________________ (3-4)
- ___________________________ (3-4)
- ___________________________ (3-4)
- ___________________________ (3-4)

A list of pre-approved elective courses can be found at https://statistics.ucdavis.edu/undergrad/bs-applied-track/electives.
**Sample Two Year Schedule**

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<thead>
<tr>
<th>Junior (1st Year)</th>
<th>Fall</th>
<th>Winter</th>
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<td>STA 141A</td>
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<td>STA 108</td>
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<td>STA 130B</td>
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<tr>
<td></td>
<td>STA 138</td>
<td>STA/MAT 1XX</td>
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<td>STA 1XX</td>
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<td>Approved Elective</td>
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</table>

*This sample schedule assumes all preparatory subject matter has been completed. Your schedule will look significantly different if not all of the preparatory subject matter has been completed.*
B.S. in Statistics – Computational Statistics Track (Effective Fall 2020)
Recommended for students interested in the computational and data management aspects of statistical analysis.

Preparatory Subject Matter (27-28 units)

- MAT 21A Calculus (4)
- MAT 21B Calculus (4)
- MAT 21C Calculus (4)
- MAT 21D Vector Analysis (4)
- MAT 22A Linear Algebra (3)
- ECS 36C or 34 Programming (4-5)
- STA 13 or 32 or 100 Statistics (32 or 100 preferred) (4)

Depth Subject Matter (52 units)

- STA 106 Analysis of Variance (4)
- STA 108 Regression Analysis (4)
- STA 131A Intro to Probability Theory (4)
- STA 131B Intro to Mathematical Statistics (4)
- STA 141A Fundamentals of Statistical Data Science (4)

Two courses from:
- STA 104 Nonparametric Statistics (4)
- STA 135 Multivariate Data Analysis (4)
- STA 137 Applied Time Series Analysis (4)
- STA 138 Analysis of Categorical Data (4)
- STA 142A Statistical Learning I (4)
- STA 142B Statistical Learning II (4)
- STA 144 Sampling Theory of Surveys (4)
- STA 145 Bayesian Statistical Inference (4)
- STA 160 Practice in Statistical Data Science (4)
- One approved 4 unit course from STA 199, 194HA, or 194HB (4)

Programming, Data Management & Data Technologies:
- ECS 130 Scientific Computation or ECS 145 Scripting Languages (4)
- ECS 165A Database Systems (4)

Scientific Computational Algorithm & Visualization; choose two:
- ECS 122A Algorithm Design and Analysis (4)
- ECS 129 Computational Structural Bioinformatics (4)
- ECS 140A Programming Languages (4)
- ECS 158 Programming and Parallel Architectures (4)
- ECS 163 Information Interfaces (4)
- STA 141B Data & Web Technologies for Data Analysis (4)
- STA 141C Big Data & High Performance Statistical Computing (4)

Mathematics; choose two:
- MAT 124 Mathematical Biology (4)
- MAT 128A Numerical Analysis (4)
- MAT 128B Numerical Analysis (4)
- MAT 129 Fourier Analysis (4)
- MAT 145 Combinatorics (4)
- MAT 148 Discrete Mathematics (4)
- MAT 160 Math for Data Analytics (4)
- MAT 165 Math and Computers (4)
- MAT 167 Applied Linear Algebra (4)
- MAT 168 Optimization (4)
## Sample Two Year Schedule*

<table>
<thead>
<tr>
<th>Junior (1st Year)</th>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
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<tbody>
<tr>
<td></td>
<td>STA 131A</td>
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<tr>
<td></td>
<td>STA 108</td>
<td>STA 106</td>
<td>STA 141A</td>
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<table>
<thead>
<tr>
<th>Senior (2nd Year)</th>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
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<tbody>
<tr>
<td></td>
<td>MAT 1XX</td>
<td>ECS 130 or 145</td>
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<tr>
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<td>ECS 165A or STA 141B or ECS 1XX</td>
<td>STA 141C or ECS 1XX</td>
<td>STA 1XX</td>
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</table>

*This sample schedule assumes all preparatory subject matter has been completed. Your schedule will look significantly different if not all of the preparatory subject matter has been completed.
**B.S. in Statistics - General Statistics Track** (Effective Fall 2020)

Emphasizes statistical theory and is especially recommended as preparation for graduate study in statistics.

### Preparatory Subject Matter (27-28 units)

- MAT 21A Calculus (4)
- MAT 21B Calculus (4)
- MAT 21C Calculus (4)
- MAT 21D Vector Analysis (4)
- MAT 22A or 67 Linear Algebra (3-4)
- ECS 32A or 36A Programming (4)
- STA 13 or 32 or 100 Statistics (32 or 100 preferred) (4)

### Depth Subject Matter (55-56 units)

- STA 106 Analysis of Variance (4)
- STA 108 Regression Analysis (4)
- STA 131A Intro to Probability Theory (4)
- STA 131B Intro to Mathematical Statistics (4)
- STA 131C Intro to Mathematical Statistics (4)
- STA 138 Analysis of Categorical Data (4)

### Mathematics (16 units)

- MAT 127A Real Analysis (4)
- MAT 127B Real Analysis (4)
- MAT 108 Abstract Math or MAT 127C Real Analysis (4)
- MAT 167 Applied Linear Algebra (4)

### Three courses from:

- STA 104 Nonparametric Statistics (4)
- STA 135 Multivariate Data Analysis (4)
- STA 137 Applied Time Series Analysis (4)
- STA 141A Fundamentals of Statistical Data Science (4)
- STA 141B Data & Web Technologies for Data Analysis or STA 141C Big Data & High Performance Statistical Computing (4)
- STA 142A Statistical Learning I (4)
- STA 142B Statistical Learning II (4)
- STA 144 Sampling Theory of Surveys (4)
- STA 145 Bayesian Statistical Inference (4)
- STA 160 Practice in Statistical Data Science (4)
- MAT 168 Optimization (4)
- One approved 4 unit course from STA 199, 194HA, or 194HB (4)

### Related Elective Course: One upper division course approved by faculty advisor. A list of pre-approved electives can be found at [https://statistics.ucdavis.edu/undergrad/bs-general-track/electives](https://statistics.ucdavis.edu/undergrad/bs-general-track/electives).
## Sample Two Year Schedule*

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<thead>
<tr>
<th>Junior (1st Year)</th>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
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<tr>
<td></td>
<td>STA 131A</td>
<td>STA 131B</td>
<td>STA 131C</td>
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<tr>
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<td>STA 106</td>
<td>Approved Elective</td>
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<td></td>
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<td>MAT 108**</td>
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<table>
<thead>
<tr>
<th>Senior (2nd Year)</th>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
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<tbody>
<tr>
<td></td>
<td>STA 138</td>
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<td>MAT 127C**</td>
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<tr>
<td></td>
<td>MAT 127A</td>
<td>MAT 127B</td>
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*This sample schedule assumes all preparatory subject matter has been completed. Your schedule will look significantly different if not all of the preparatory subject matter has been completed.

**Choose 1 of: MAT 108 and 127C
B.S. in Statistics – Machine Learning Track (Effective Fall 2020)

This 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.

Preparatory Subject Matter (27 units)

- MAT 21A Calculus (4)
- MAT 21B Calculus (4)
- MAT 21C Calculus (4)
- MAT 21D Vector Analysis (4)
- MAT 22A Linear Algebra (4)
- ECS 32A or 36A Programming (Note: Additional coursework in Python is strongly recommended (e.g. ECS 32B)) (4)
- STA 13 or 32 or 100 Statistics (32 or 100 preferred) (4)

Depth Subject Matter (52 units)

- STA 106 Analysis of Variance (4)
- STA 108 Regression Analysis (4)
- STA 131A Intro to Probability Theory (4)
- STA 131B Intro to Mathematical Statistics (4)
- STA 131C Intro to Mathematical Statistics (4)
- STA 141A Fundamentals of Statistical Data Science (4)
- STA 142A Statistical Learning I (4)
- STA 142B Statistical Learning II (4)
- STA 144 Sampling Theory of Surveys or STA 145 Bayesian Statistical Inference (4)
- MAT 167 Applied Linear Algebra or MAT 168 Optimization (4)

Three courses from: (12)

- STA 104 Nonparametric Statistics (4)
- STA 135 Multivariate Data Analysis (4)
- STA 137 Applied Time Series Analysis (4)
- STA 138 Analysis of Categorical Data (4)
- STA 141B Data and Web Technologies for Data Analysis (4)
- STA 141C Big Data and High Performance Statistical Computing (4)
- STA 144 Sampling Theory of Surveys (4)
- STA 145 Bayesian Statistical Inference (4)
- MAT 127A Real Analysis (4)
- MAT 128A Numerical Analysis (4)
- MAT 170 Mathematics for Data Analytics and Decision Making (4)
- ECS 122A Algorithm Design and Analysis (4)
- ECS 158 Programming and Parallel Architectures (4)
- ECS 163 Information Interfaces (4)
- ECS 165A Database Systems (4)
- ECS 170 Introduction to Artificial Intelligence (4)
- ECS 174 Computer Vision (4)
One approved 4 unit course from STA 199, 194HA, or 194HB

Note: A course used to fulfill the core requirement cannot be used as an elective.

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**Sample Two Year Schedule***

<table>
<thead>
<tr>
<th>Junior (1st Year)</th>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
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<tbody>
<tr>
<td></td>
<td>STA 131A</td>
<td>STA 131B</td>
<td>STA 131C</td>
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<tr>
<td></td>
<td>STA 108</td>
<td>STA 106</td>
<td>STA 141A</td>
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<table>
<thead>
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<th>Senior (2nd Year)</th>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
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<tr>
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<td>MAT 167 or 168</td>
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<td>STA 144 or 145</td>
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*This sample schedule assumes all preparatory subject matter has been completed. Your schedule will look significantly different if not all of the preparatory subject matter has been completed.*
B.S. in Statistics – Statistical Data Science Track (Effective Fall 2020)

This track emphasizes data handling skills and statistical computation. It is recommended for students interested in statistical learning methodology, advanced data handling techniques and computational aspects of statistical analysis.

Preparatory Subject Matter (27 units)

- MAT 21A Calculus (4)
- MAT 21B Calculus (4)
- MAT 21C Calculus (4)
- MAT 21D Vector Analysis (4)
- MAT 22A Linear Algebra (3)
- ECS 32A or 36A Programming (4)  
  (Note: Additional coursework in Python is strongly recommended (e.g. ECS 32B))
- STA 13 or 32 or 100 Statistics (32 or 100 preferred) (4)

Depth Subject Matter (52 units)

- STA 106 Analysis of Variance (4)
- STA 108 Regression Analysis (4)
- STA 131A Intro to Probability Theory or STA 130A Mathematical Statistics: Brief Course (4)
- STA 131B Intro to Mathematical Statistics or STA 130B Mathematical Statistics: Brief Course (4)
- STA 135 Multivariate Data Analysis (4)
- STA 141A Fundamentals of Statistical Data Science (4)
- STA 141B Data & Web Technologies for Data Analysis (4)
- STA 141C Big Data & High-Performance Statistical Computing (4)
- STA 142A Statistical Learning I or ECS 171 Machine Learning (4)
- STA 160 Practice in Statistical Data Science (4)
- MAT 167 Applied Linear Algebra or MAT 168 Optimization (4)

Two courses from:

- STA 104 Nonparametric Statistics (4)
- STA 137 Applied Time Series Analysis (4)
- STA 138 Analysis of Categorical Data (4)
- STA 142A Statistical Learning I (4)
- STA 142B Statistical Learning II (4)
- STA 144 Sampling Theory of Surveys (4)
- STA 145 Bayesian Statistical Inference (4)
- MAT 128A Numerical Analysis (4)
- MAT 160 Mathematics for Data Analytics and Decision Making (4)
- ECS 122A Algorithm Design and Analysis (4)
- ECS 158 Programming and Parallel Architectures (4)
- ECS 163 Information Interfaces (4)
- ECS 165A Database Systems (4)
- One approved 4 unit course from STA 199, 194HA, or 194HB (4)

Note: A course used to fulfill the core requirement cannot be used as an elective.
Sample Two Year Schedule*

<table>
<thead>
<tr>
<th>Junior (1st Year)</th>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
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<tr>
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<td>STA 131B or 130B</td>
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<td>STA 108</td>
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<td>MAT 167 or 168</td>
<td>STA 142A or ECS 171</td>
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*This sample schedule assumes all preparatory subject matter has been completed. Your schedule will look significantly different if not all of the preparatory subject matter has been completed.
B.S. in Data Science – Foundations Track (Effective Fall 2022)

This track emphasizes underlying computer science, engineering, mathematics and statistics methodology and theory, and is especially recommended as preparation for graduate study in data science or related fields.

Preparatory Subject Matter (39 units)

- MAT 21A Calculus (4)
- MAT 21B Calculus (4)
- MAT 21C Calculus (4)
- MAT 22A Linear Algebra (3)
- ECS 17 Data, Logic, and Computing (4)
- ECS 32A Introduction to Programming (4)
- ECS 32B Introduction to Data Structures (4)
- STA 35A Statistical Data Science I (4)
- STA 35B Statistical Data Science II (4)
- STA 35C Statistical Data Science III (4)

Depth Subject Matter (52 units)

- ECS 116 Databases for Non-Majors (4)
- ECS 117 Introduction to Algorithms for Data Science *(Pending Approval)* (4)
- ECS 119 Data Processing Pipelines for Data Science *(Pending Approval)* (4)
- ECS 130 Scientific Computation OR MAT 167 Applied Linear Algebra (4)
- MAT 135A Probability OR STA 131A Introduction to Probability Theory (4)
- MAT 168 Optimization (4)
- STA 108 Linear Regression (4)
- STA 141A Fundamentals of Statistical Data Science (4)
- STS 101 Data & Society (4)

Choose One:

- ECS 111 Machine Learning for Non-Majors *(Pending Approval)* (4)
- MAT 170 Mathematics for Data Analytics & Decision Making (4)
- STA 142A Introduction to Statistical Learning (4)

Three elective courses in a related discipline. (12)

Three upper division courses approved by major advisor; they should be in statistics, mathematics, computer science or cover quantitative aspects of a substantive discipline. A list of pre-approved electives can be found at https://statistics.ucdavis.edu/undergrad/data-science/bs-foundations-track/electives.
**Sample Schedule***

<table>
<thead>
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<th>Class Level</th>
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<td>MAT 22A</td>
<td>STA 108</td>
<td>STA 141A</td>
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<td>ECS 117</td>
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<td>STS 101</td>
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<td><strong>Junior</strong></td>
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<td>Winter</td>
<td>Spring</td>
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<td>ECS 119</td>
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<td>MAT 135A or STA 131A</td>
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<td><strong>Senior</strong></td>
<td>Fall</td>
<td>Winter</td>
<td>Spring</td>
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<td></td>
<td>Elective</td>
<td>ECS 111 or MAT 170 or STA 142A</td>
<td>Elective</td>
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<td>MAT 168</td>
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*This sample schedule assumes no preparatory subject matter requirements have been completed. Your schedule will look significantly different if some or all of the preparatory subject matter requirements have been completed.*