Statistics

Bachelor of Arts (BA)
The undergraduate major at Berkeley provides a systematic and thorough grounding in applied and theoretical statistics as well as probability. The quality and dedication of the teaching staff and faculty are extremely high. A major in Statistics from Berkeley is an excellent preparation for a career in science or industry, or for further academic study in a wide variety of fields. The department has particular strength in Machine Learning, a key ingredient of the emerging field of Data Science. It is also very useful to combine studies of statistics and probability with other subjects. Our department excels at interdisciplinary science, and more than half of the department’s undergraduate students are double or triple majors.

Students interested in teaching statistics and mathematics in middle or high school should pursue the teaching option within the major. Students interested in teaching should also consider the Cal Teach Program (http://calteach.berkeley.edu/).

Declaring the Major
Students should apply in the semester they will complete their prerequisites. For applicants with prerequisites in progress, applications will be reviewed after the grades for all prerequisites are available, 2-3 weeks after finals. For applicants who have completed all prerequisites in a previous term, applications will be reviewed and processed within a week.

For detailed information regarding the process of declaring the major, please see the Statistics Department website. (https://statistics.berkeley.edu/academics/undergrad/prospective/declare-major/)

Minor Program
The minor is for students who want to study a significant amount of statistics and probability at the upper division level. For information regarding the requirements, please see the Minor Requirements tab on this page.

For detailed information regarding the process of declaring the minor, please see the Statistics Department website. (https://statistics.berkeley.edu/academics/undergrad/prospective/declare-minor/)

In addition to the University, campus, and college requirements, listed on the College Requirements tab, students must fulfill the below requirements specific to their major program.

General Guidelines
1. All courses taken to fulfill the major requirements below must be taken for graded credit, other than courses listed which are offered on a Pass/No Pass basis only. Other exceptions to this requirement are noted as applicable.
2. No more than one upper division course may be used to simultaneously fulfill requirements for a student’s major and minor programs, with the exception of minors offered outside of the College of Letters & Science.
3. A minimum grade point average (GPA) of 2.0 must be maintained in both upper and lower division courses used to fulfill the major requirements.

4. The requirements below apply to freshmen entering Berkeley in Fall 2018, and transfer students entering in Fall 2020. Freshmen students admitted to Berkeley prior to Fall 2018 and transfer students admitted prior to Fall 2020 are required to complete the requirements as published in the 2017-18 Berkeley Academic Guide (http://guide.berkeley.edu/archive/).

For information regarding residency requirements and unit requirements, please see the College Requirements tab.

Prerequisites
Students must earn a minimum 3.2 UC grade point average in the lower division math prerequisites with no lower than a C in each. 1

- MATH 1A Calculus 4
- MATH 1B Calculus 4
- MATH 53 Multivariable Calculus 4
  - or MATH H53 Honors Multivariable Calculus 4
  - or MATH N53 Multivariable Calculus 4
  - or MATH W53 Multivariable Calculus 4
- MATH 54 Linear Algebra and Differential Equations 4
  - or MATH H54 Honors Linear Algebra and Differential Equations 4
  - or MATH N54 Linear Algebra and Differential Equations 4

A minimum C grade in one of the following:

- STAT/COMPSCI/ Foundations of Data Science 4
- DATA/INFO C8
  - or STAT 20 Introduction to Probability and Statistics 4

A minimum B- grade in one of the following: 2

- STAT 134 Concepts of Probability 4
  - or STAT C140 Probability for Data Science 4
- STAT 135 Concepts of Statistics 4

Upper Division Requirements (Nine Courses)

Core Statistics Courses (3)
- STAT 133 Concepts in Computing with Data 3
- STAT 134 Concepts of Probability 3
  - or STAT C140 Probability for Data Science 4
- STAT 135 Concepts of Statistics 4

Statistics Electives (3)
Select three statistics electives from the following; at least one of the 0-12 selections must have a lab:

- STAT/DATA C102 Data, Inference, and Decisions 4
- STAT 150 Stochastic Processes 3
- STAT 151A Linear Modelling: Theory and Applications (LAB COURSE) 4
- STAT 152 Sampling Surveys (LAB COURSE) 4
- STAT 153 Introduction to Time Series (LAB COURSE) 4
- STAT 154 Modern Statistical Prediction and Machine Learning (LAB COURSE) 4
- STAT 155 Game Theory 3
- STAT 156 Causal Inference 4
- STAT 157 Seminar on Topics in Probability and Statistics 3
- STAT 158 Experimental Design (LAB COURSE) 4
Upper Division Requirements: Teaching Option (Nine Courses)

Core Statistics Courses (3)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 133</td>
<td>Concepts in Computing with Data</td>
</tr>
<tr>
<td>STAT 134</td>
<td>Concepts of Probability</td>
</tr>
<tr>
<td>STAT 135</td>
<td>Concepts of Statistics</td>
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or STAT C140 Probability for Data Science

Statistics Electives (2)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>STAT 150</td>
<td>Stochastic Processes</td>
</tr>
<tr>
<td>STAT 151A</td>
<td>Linear Modelling: Theory and Applications (LAB COURSE)</td>
</tr>
<tr>
<td>STAT 152</td>
<td>Sampling Surveys (LAB COURSE)</td>
</tr>
<tr>
<td>STAT 153</td>
<td>Introduction to Time Series (LAB COURSE)</td>
</tr>
<tr>
<td>STAT 154</td>
<td>Modern Statistical Prediction and Machine Learning (LAB COURSE)</td>
</tr>
<tr>
<td>STAT 155</td>
<td>Game Theory</td>
</tr>
<tr>
<td>STAT 156</td>
<td>Causal Inference</td>
</tr>
<tr>
<td>STAT 157</td>
<td>Seminar on Topics in Probability and Statistics</td>
</tr>
<tr>
<td>STAT 158</td>
<td>Experimental Design (LAB COURSE)</td>
</tr>
<tr>
<td>STAT 159</td>
<td>Reproducible and Collaborative Statistical Data Science (LAB COURSE)</td>
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Teaching Track Cluster (4)

<table>
<thead>
<tr>
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<tr>
<td>MATH 110</td>
<td>Linear Algebra</td>
</tr>
<tr>
<td>MATH 113</td>
<td>Introduction to Abstract Algebra</td>
</tr>
<tr>
<td>MATH 151</td>
<td>Mathematics of the Secondary School Curriculum I</td>
</tr>
<tr>
<td>MATH 152</td>
<td>Mathematics of the Secondary School Curriculum II</td>
</tr>
<tr>
<td>or MATH 153</td>
<td>Course Not Available</td>
</tr>
</tbody>
</table>

Cluster Course Information

Two of the best reasons to study statistics are the immense variety of important and exciting real-world questions we can answer through careful data analysis, as well as the broad range of technical fields with close connections to statistics. No major is complete without encountering the fields that interface closely with statistics.

The applied cluster is a chance to learn about areas in which Statistics can be applied, and to learn specialized techniques not taught in the Statistics Department. Students need to design your own Cluster. The courses should have a unifying theme. Picking your own Cluster is a valuable exercise that gives you a chance to explore and refine your interests and to develop a coherent course of study. A pre-approved list has been provided. However, it is not exhaustive. Clusters may consist of courses from more than one department, but at least two must be approved courses from the same department. If students would like to use a course that is not on the list or select three courses from three different departments, the Head Undergraduate Faculty Adviser must approve the proposed cluster.

Economics and Business courses are treated as though they are in the same department for purposes of evaluating clusters. The same is true for courses in EE, CS, and EECS. Likewise, courses concerning social and ethical aspects of statistics including CYPLAN 101, INFO 188, PHILOS 121, and DATA C104 / HISTORY C184D / STS C1040 are treated as though they are in the same department even if offered in different departments.

Cluster Guidelines

Courses must be: upper division courses, at least 3 units, and must be taken for a letter grade.

Courses with statistics prerequisites are often acceptable. Courses that are similar to Statistics courses are not acceptable. If an approved cluster course has a credit restriction with another approved course, both cannot be used for the applied cluster (refer to the Berkeley Academic Guide http://guide.berkeley.edu/courses/ for credit restrictions, click on “read more” under the course description).

Content Criteria:

Generally, to be an acceptable cluster course, a course should meet at least one of the following three criteria:

1. The course centers on questions about ethical data analysis or experimental methodology.
2. The course is focused on a substantive area of natural sciences or social sciences, and includes a significant quantitative or data analysis component as part of the course requirements.
3. The course is in a related technical field like mathematics, computer science, engineering, or operations research.

Sample Clusters

Below is a list of sample clusters for students to consider if they would like an idea of courses to combine for their cluster based on a topic of interest.

• Economics and Finance: Econ 101A, Econ 101B and UGBA 103
• Math: Math 110, Math 104, and Math 128B
• Public Health/Biostatistics graduate school: Math 110, Pb Hlth 150A, and Pb Hlth 150B
• Public Policy: Pub Policy C103, Pub Pol C142/Econ C142/Pol Sci C131A, and Pb Hlth 126
• Social and Ethical Aspects of Statistics: CYPLAN 101, INFO 188, and DATA C104 / HISTORY C184D / STS C1040

Approved Cluster Courses

Of the three applied cluster courses required for the major, at least two must be approved courses from the same department. This is not an exhaustive list.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>ANTHRO C100</td>
<td>Course Not Available</td>
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<tr>
<td>ANTHRO C103</td>
<td>Course Not Available</td>
</tr>
<tr>
<td>ANTHRO 115</td>
<td>Introduction to Medical Anthropology</td>
</tr>
<tr>
<td>ANTHRO 121C</td>
<td>Historical Archaeology: Historical Artifact Identification and Analysis</td>
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<tr>
<td>Course Code</td>
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<tr>
<td>ANTHRO C124C</td>
<td>Human Biogeography of the Pacific</td>
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<tr>
<td>INTEGBI C187</td>
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<tr>
<td>ANTHRO 127A</td>
<td>Bioarchaeology: Introduction to Skeletal Biology and Bioarchaeology</td>
</tr>
<tr>
<td>ANTHRO 127B</td>
<td>Bioarchaeology: Reconstruction of Life in Bioarchaeology</td>
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<tr>
<td>ANTHRO C129D/ INTEGBI C155</td>
<td>Holocene Paleoenvironment: How Humans Changed the Earth</td>
</tr>
<tr>
<td>ANTHRO 132A</td>
<td>Analysis of Archaeological Materials: Ceramics</td>
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<tr>
<td>ANTHRO 135</td>
<td>Paleoenvironment: Archaeological Methods and Laboratory Techniques</td>
</tr>
<tr>
<td>ANTHRO 169B</td>
<td>Research Theory and Methods in Socio-cultural Anthropology</td>
</tr>
<tr>
<td>ARCH 140</td>
<td>Energy and Environment</td>
</tr>
<tr>
<td>ARCH 150</td>
<td>Introduction to Structures</td>
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<td>ARCH 154</td>
<td>Design and Computer Analysis of Structure</td>
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<tr>
<td>ASTRON 128</td>
<td>Astronomy Data Science Laboratory</td>
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<tr>
<td>ASTRON 160</td>
<td>Stellar Physics</td>
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<tr>
<td>ASTRON C161</td>
<td>Relativistic Astrophysics and Cosmology</td>
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<tr>
<td>ASTRON C162</td>
<td>Planetary Astrophysics</td>
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<tr>
<td>BIO ENG 104</td>
<td>Biological Transport Phenomena</td>
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<tr>
<td>BIO ENG C112</td>
<td>Molecular Biomechanics and Mechanobiology of the Cell</td>
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<td>BIO ENG C117</td>
<td>Structural Aspects of Biomaterials</td>
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<td>BIO ENG C119</td>
<td>Orthopedic Biomechanics</td>
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<tr>
<td>BIO ENG C125</td>
<td>Introduction to Robotics</td>
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<tr>
<td>BIO ENG C125B</td>
<td>Robotic Manipulation and Interaction</td>
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<tr>
<td>BIO ENG 131</td>
<td>Introduction to Computational Molecular and Cell Biology</td>
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<tr>
<td>BIO ENG C136L</td>
<td>Laboratory in the Mechanics of Organisms</td>
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<tr>
<td>BIO ENG C137</td>
<td>Designing for the Human Body</td>
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<tr>
<td>BIO ENG 144</td>
<td>Introduction to Protein Informatics</td>
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<tr>
<td>BIO ENG C145L</td>
<td>Introductory Electronic Transducers Laboratory</td>
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<td>BIO ENG C145M</td>
<td>Introductory Microcomputer Interfacing Laboratory</td>
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<tr>
<td>BIO ENG 147</td>
<td>Principles of Synthetic Biology</td>
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<tr>
<td>BIO ENG C165</td>
<td>Medical Imaging Signals and Systems</td>
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<td>BIO ENG C181</td>
<td>The Berkeley Lectures on Energy: Energy from Biomass</td>
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<td>CHM ENG 140</td>
<td>Introduction to Chemical Process Analysis</td>
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<td>CHM ENG 141</td>
<td>Chemical Engineering Thermodynamics</td>
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<td>CHM ENG C195A</td>
<td>The Berkeley Lectures on Energy: Energy from Biomass</td>
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<td>CHEM C110L</td>
<td>General Biochemistry and Molecular Biology Laboratory</td>
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<td>CHEM 120A</td>
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<td>Physical Chemistry</td>
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<td>CHEM C130</td>
<td>Biophysical Chemistry: Physical Principles and the Molecules of Life</td>
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<tr>
<td>CHEM C138</td>
<td>The Berkeley Lectures on Energy: Energy from Biomass</td>
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<td>CY PLAN 101</td>
<td>Introduction to Urban Data Analytics</td>
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<td>CY PLAN 118AC</td>
<td>The Urban Community</td>
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<td>CY PLAN 119</td>
<td>Planning for Sustainability</td>
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<td>CIV ENG 100</td>
<td>Elementary Fluid Mechanics</td>
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<td>CIV ENG 103</td>
<td>Course Not Available</td>
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<tr>
<td>CIV ENG C106</td>
<td>Air Pollution</td>
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<tr>
<td>CIV ENG C116</td>
<td>Chemistry of Soils</td>
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<tr>
<td>CIV ENG C133</td>
<td>Engineering Analysis Using the Finite Element Method</td>
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<td>CIV ENG 155</td>
<td>Transportation Systems Engineering</td>
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<td>COG SCI C100</td>
<td>Basic Issues in Cognition</td>
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<td>COG SCI C101</td>
<td>Cognitive Linguistics</td>
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<td>COG SCI C102</td>
<td>Scientific Approaches to Consciousness</td>
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<td>COG SCI C126</td>
<td>Perception</td>
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<td>COG SCI C127</td>
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<td>Computational Models of Cognition</td>
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<td>COG SCI C140</td>
<td>Quantitative Methods in Linguistics</td>
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<td>COMPSCI 152</td>
<td>Computer Architecture and Engineering</td>
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<td>COMPSCI 160</td>
<td>User Interface Design and Development</td>
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<td>Computer Security</td>
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<td>COMPSCI 162</td>
<td>Operating Systems and System Programming</td>
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<td>COMPSCI 164</td>
<td>Programming Languages and Compilers</td>
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<td>COMPSCI 168</td>
<td>Introduction to the Internet: Architecture and Protocols</td>
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<td>Efficient Algorithms and Intractable Problems</td>
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<td>Computability and Complexity</td>
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<td>Algorithms for Computational Biology</td>
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<td>COMPSCI 182</td>
<td>Designing, Visualizing and Understanding Deep Neural Networks</td>
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<td>COMPSCI 184</td>
<td>Foundations of Computer Graphics</td>
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<td>Introduction to Database Systems</td>
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<td>COMPSCI 189</td>
<td>Introduction to Machine Learning</td>
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<td>DATA C104</td>
<td>Human Contexts and Ethics of Data - DATA/History/STS</td>
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<td>Data Mining and Analytics</td>
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<td>DEMOG 110</td>
<td>Introduction to Population Analysis</td>
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<td>DEMOG C126</td>
<td>Sex, Death, and Data</td>
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<td>Economic Demography</td>
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<td>DEMOG 180</td>
<td>Social Networks</td>
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<td>DEMOG 260</td>
<td>Special Topics in Demography Seminar</td>
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<td>EPS 101</td>
<td>Field Geology and Digital Mapping</td>
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<td>EPS C129</td>
<td>Biomeeteorology</td>
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<td>EPS 130</td>
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<td>EPS C146</td>
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<td>EPS C162</td>
<td>Planetary Astrophysics</td>
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<tr>
<td>EPS C180</td>
<td>Air Pollution</td>
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<td>EPS C181</td>
<td>Atmospheric Physics and Dynamics</td>
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<tr>
<td>ECON 101A</td>
<td>Microeconomics (Math Intensive)</td>
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<td>ECON 101B</td>
<td>Macroeconomics (Math Intensive)</td>
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ECON C102  Natural Resource Economics  4
ECON C103  Introduction to Mathematical Economics  4
ECON 104  Advanced Microeconomic Theory  4
ECON 119  Psychology and Economics  4
ECON 121  Industrial Organization and Public Policy  4
ECON C125  Environmental Economics  4
ECON 131  Public Economics  4
ECON 136  Financial Economics  6
ECON 138  Financial and Behavioral Economics  4
ECON 139  Asset Pricing and Portfolio Choice  4
ECON 141  Econometrics (Math Intensive)  4
ECON C142  Applied Econometrics and Public Policy  4
ECON 157  Health Economics  4
ECON C171  Development Economics  4
ECON 174  Global Poverty and Impact Evaluation  4
ECON C175  Economic Demography  3
  or ECON N175  Economic Demography
ECON C181  International Trade  4
ECON 182  International Monetary Economics  4
EL ENG 100  Course Not Available  4
EL ENG 105  Microelectronic Devices and Circuits  4
EL ENG C106A  Introduction to Robotics  4
EL ENG C106B  Robotic Manipulation and Interaction  4
EL ENG 113  Power Electronics  4
EL ENG 117  Electromagnetic Fields and Waves  4
EL ENG 118  Introduction to Optical Engineering  4
EL ENG 120  Signals and Systems  4
EL ENG 121  Introduction to Digital Communication Systems  4
EL ENG 122  Introduction to Communication Networks  4
EL ENG 123  Digital Signal Processing  4
EL ENG 127  Course Not Available  4
EL ENG C128  Feedback Control Systems  4
EL ENG 129  Course Not Available  3
EL ENG 130  Integrated-Circuit Devices  4
EL ENG 134  Fundamentals of Photovoltaic Devices  4
EL ENG 137A  Introduction to Electric Power Systems  4
EL ENG 137B  Introduction to Electric Power Systems  4
EL ENG 140  Linear Integrated Circuits  4
EL ENG 142  Integrated Circuits for Communications  4
EL ENG 143  Microfabrication Technology  4
EL ENG 144  Fundamental Algorithms for Systems Modeling, Analysis, and Optimization  4
EL ENG C145B  Medical Imaging Signals and Systems  4
EL ENG C145L  Introductory Electronic Transducers Laboratory  3
EL ENG C145M  Introductory Microcomputer Interfacing Laboratory  3
EL ENG C145O  Laboratory in the Mechanics of Organisms  3
EL ENG 147  Introduction to Microelectromechanical Systems (MEMS)  3
EL ENG C149  Course Not Available  4
ENE,RES C100  Energy and Society  4
ENE,RES 102  Quantitative Aspects of Global Environmental Problems  4
ENE,RES 131  Data, Environment and Society  4
ENE,RES 175  Water and Development  4
ENE,RES C176  Climate Change Economics  4
ENGIN 115  Course Not Available  4
ENGIN 117  Methods of Engineering Analysis  3
ENGIN 120  Principles of Engineering Economics  3
ENVECON C101  Environmental Economics  4
ENVECON C102  Natural Resource Economics  4
ENVECON C115  Modeling and Management of Biological Resources  4
ENVECON 131  Globalization and the Natural Environment  3
ENVECON 140ACEconomics of Race, Agriculture, and the Environment  3
ENVECON 141  Agricultural and Environmental Policy  4
ENVECON 142  Industrial Organization with Applications to Agriculture and Natural Resources  4
ENVECON 143  Economics of Innovation and Intellectual Property  4
ENVECON 145  Health and Environmental Economic Policy  4
ENVECON 147  Regulation of Energy and the Environment  4
ENVECON C151  Development Economics  4
ENVECON 152  Advanced Topics in Development and International Trade  3
ENVECON 153  Population, Environment, and Development  3
ENVECON 154  Economics of Poverty and Technology  3
ENVECON 161  Advanced Topics in Environmental and Resource Economics  4
ENVECON 162  Economics of Water Resources  3
ENVECON C175  The Economics of Climate Change  4
ENVECON C176  Climate Change Economics  4
ENVECON C181  International Trade  4
ENVECON C183  Forest Ecosystem Management  4
ESPM 100  Environmental Problem Solving  4
ESPM 102A  Course Not Available  4
ESPM 102C  Resource Management  4
ESPM 102D  Climate and Energy Policy  4
ESPM C103  Principles of Conservation Biology  4
ESPM C104  Modeling and Management of Biological Resources  4
ESPM C107  Biology and Geomorphology of Tropical Islands  13
ESPM 108A  Trees: Taxonomy, Growth, and Structures  3
ESPM 108B  Environmental Change Genetics  3
ESPM 111  Ecosystem Ecology  4
ESPM 112  Microbial Ecology  3
ESPM 114  Wildlife Ecology  3
ESPM 115C  Fish Ecology  3
ESPM 116B  Grassland and Woodland Ecology  4
ESPM 116C  Tropical Forest Ecology  3
ESPM 117  Urban Garden Ecosystems  4
ESPM 118  Agricultural Ecology  4
ESPM 120  Science of Soils  3
ESPM 121  Development and Classification of Soils  3
ESPM C126  Animal Behavior  4
ESPM C128  Chemistry of Soils  3
ESPM C129  Biometeorology  3
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<th>Course Code</th>
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<td>ESPM 131</td>
<td>Soil Microbiology and Biogeochemistry</td>
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<td>ESPM 132</td>
<td>Spider Biology</td>
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<tr>
<td>ESPM C138</td>
<td>Introduction to Comparative Virology</td>
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<td>ESPM 140</td>
<td>General Entomology</td>
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<td>ESPM 142</td>
<td>Insect Behavior</td>
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<td>ESPM 144</td>
<td>Insect Physiology</td>
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<td>ESPM C148</td>
<td>Pesticide Chemistry and Toxicology</td>
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<td>ESPM C149</td>
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<td>ESPM 152</td>
<td>Global Change Biology</td>
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<td>ESPM C159</td>
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<td>MEC ENG 164</td>
<td>Marine Statics and Structures</td>
<td>3</td>
</tr>
</tbody>
</table>
Statistics

PLANTBI 160 Plant Molecular Genetics 3
PLANTBI 165 Plant-Microbe Interactions 3
PLANTBI 185 Techniques in Light Microscopy 3
PLANTBI 190 Special Topics in Plant and Microbial Biology (only 3-4 when taken for 3-4 units) 3
POL SCI C131A Applied Econometrics and Public Policy 4
POL SCI 133 Selected Topics in Quantitative Methods 4
PSYCH 110 Introduction to Biological Psychology 3
PSYCH C113 Biological Clocks: Physiology and Behavior 3
PSYCH 114 Biology of Learning 3
PSYCH C116 Hormones and Behavior 3
PSYCH 117 Human Neuropsychology 3
PSYCH C120 Basic Issues in Cognition 3
PSYCH 121 Animal Cognition 3
PSYCH 122 Course Not Available
PSYCH 125 The Developing Brain 3
PSYCH C126 Perception 3
PSYCH C127 Cognitive Neuroscience 3
PSYCH C129 Scientific Approaches to Consciousness 3
PSYCH 130 Clinical Psychology 3
PSYCH 131 Developmental Psychopathology 3
PSYCH 133 Psychology of Sleep 3
PSYCH 140 Developmental Psychology 3
PSYCH 141 Development During Infancy 3
PSYCH C143 Language Acquisition 3
PSYCH 150 Psychology of Personality 3
PSYCH 164 Social Cognition 3
PB HLTH C102 Course Not Available
PB HLTH 112 Global Health: A Multidisciplinary Examination 4
PB HLTH 126 Health Economics and Public Policy 3
PB HLTH 129 The Aging Human Brain 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 170B Course Not Available 3
PB HLTH 250A Epidemiologic Methods I 3
PB HLTH 252B Infectious Disease Modeling (only when taken for 3-4 units) 3
NOT Pb Hlth 141, 142, 142AB, W142, or 145
PUB POL 101 Introduction to Public Policy Analysis 4
PUB POL C103 Wealth and Poverty 4
PUB POL C142 Applied Econometrics and Public Policy 4
PUB POL C184 Energy and Society 4
RHETOR 107 Rhetoric of Scientific Discourse 4
RHETOR 170 Rhetoric of Social Science 4
STS C104D Human Contexts and Ethics of Data - DATA/History/STS 4
SOCIOL 105 Research Design and Sociological Methods 5
SOCIOL 106 Quantitative Sociological Methods 4
SOCIOL 108 Advanced Methods: In-depth Interviewing 4
UGBA 101A Microeconomic Analysis for Business Decisions 3
UGBA 101B Macroeconomic Analysis for Business Decisions 3
UGBA 102A Financial Accounting 5
UGBA 102B Managerial Accounting 5
UGBA 103 Introduction to Finance 6
UGBA 106 Marketing 5
UGBA 118 International Trade 3
UGBA 119 Course Not Available
UGBA 120AA Intermediate Financial Accounting 1 4
UGBA 120AB Intermediate Financial Accounting 2 4
UGBA 120B Advanced Financial Accounting 4
UGBA 122 Financial Information Analysis 4
UGBA 126 Auditing 4
UGBA 131 Corporate Finance and Financial Statement Analysis 3
UGBA 131A Corporate Strategy and Valuation 3
UGBA 132 Financial Institutions and Markets 3
UGBA 133 Investments 3
UGBA 134 Introduction to Financial Engineering 3
UGBA 136F Behavioral Finance 3
UGBA 141 Production and Operations Management 2-3
UGBA 160 Customer Insights 3
UGBA 161 Market Research: Tools and Techniques for Data Collection and Analysis 3
UGBA 162 Brand Management and Strategy 3
UGBA 165 Advertising Strategy 3
UGBA 169 Pricing 3
UGBA 180 Introduction to Real Estate and Urban Land Economics 3
UGBA 182 Introduction to Real Estate Finance 3
UGBA 184 Urban and Real Estate Economics 3

1 Students who have completed any of the math prerequisites at a non-UC institution should look at the Statistics Major Frequently Asked Questions (http://statistics.berkeley.edu/programs/undergrad/major/faq/) on the Statistics Department website.
2 No more than one course repeated between STAT 134 (or STAT C140) and STAT 135.
3 Other non-statistics UC Berkeley courses, such as IND ENG 172, cannot be used to fulfill this requirement.
4 Due to overlap of course content, only one course from STAT 154, COMPSCI 182, COMPSCI 189, and IND ENG 142 can be used to satisfy Statistics major requirements.
5 Students may use UGBA 102A and/or UGBA 102B for their cluster, but may NOT use UC Berkeley Extension's XB102A nor XB102B since, effective Spring 2014, the Haas School of Business no longer deems them equivalent (see http://www.haas.berkeley.edu/Undergrad/ugbacourses.html).
6 Due to overlap of course content, only one course from ECON 136, ENGIN 120 and UGBA 103 can be used to satisfy Statistics major requirements.
7 If MATH 110 or MATH H110 has been used to satisfy the math prerequisite requirement, course cannot be used for the applied cluster.
8 MATH 170 cannot be combined with either IND ENG 160 or IND ENG 162.

Students who have a strong interest in an area of study outside their major often decide to complete a minor program. These programs
have set requirements and are noted officially on the transcript in the memoranda section, but they are not noted on diplomas.

**General Guidelines**

1. All minors must be declared no later than one semester before a student's Expected Graduation Term (EGT). If the semester before EGT is fall or spring, the deadline is the last day of RRR week. If the semester before EGT is summer, the deadline is the final Friday of Summer Sessions. To declare a minor, contact the department advisor for information on requirements, and the declaration process.

2. All courses taken to fulfill the minor requirements below must be taken for graded credit.

3. A minimum of three of the upper division courses taken to fulfill the minor requirements must be completed at UC Berkeley.

4. A minimum grade point average (GPA) of 2.0 is required for courses used to fulfill the minor requirements.

5. Courses used to fulfill the minor requirements may be applied toward the Seven-Course Breadth requirement, for Letters & Science students.

6. No more than one upper division course may be used to simultaneously fulfill requirements for a student's major and minor programs.

7. All minor requirements must be completed prior to the last day of finals during the semester in which the student plans to graduate. Students who cannot finish all courses required for the minor by that time should see a College of Letters & Science adviser.

8. All minor requirements must be completed within the unit ceiling. (For further information regarding the unit ceiling, please see the College Requirements tab.)

**Requirements**

**Lower Division Prerequisites**

- MATH 1A  Calculus  4
- or MATH N1A  Calculus
- MATH 1B  Calculus  4
- or MATH N1B  Calculus
- or MATH H1B  Honors Calculus
- MATH 53  Multivariable Calculus  4
- or MATH H53  Honors Multivariable Calculus
- or MATH N53  Multivariable Calculus
- or MATH W53  Multivariable Calculus
- MATH 54  Linear Algebra and Differential Equations  4
- or MATH H54  Honors Linear Algebra and Differential Equations
- or MATH N54  Linear Algebra and Differential Equations

**Upper Division Requirements**

- STAT 134  Concepts of Probability  4
- or STAT C140  Probability for Data Science
- STAT 135  Concepts of Statistics  4
- Select three statistics electives from the following; at least one of the selections must have a lab:
  - STAT C102  Data, Inference, and Decisions  4
  - STAT 150  Stochastic Processes  3
  - STAT 151A  Linear Modelling: Theory and Applications (LAB COURSE)  4
  - STAT 152  Sampling Surveys (LAB COURSE)  4
  - STAT 153  Introduction to Time Series (LAB COURSE)  4

**University of California Requirements**

**Entry Level Writing** ([http://guide.berkeley.edu/undergraduate/colleges-schools/letters-science/entry-level-writing-requirement/](http://guide.berkeley.edu/undergraduate/colleges-schools/letters-science/entry-level-writing-requirement/))

All students who will enter the University of California as freshmen must demonstrate their command of the English language by fulfilling the Entry Level Writing requirement. Fulfillment of this requirement is also a prerequisite to enrollment in all reading and composition courses at UC Berkeley.

**American History and American Institutions** ([http://guide.berkeley.edu/undergraduate/colleges-schools/letters-science/american-history-institutions-requirement/](http://guide.berkeley.edu/undergraduate/colleges-schools/letters-science/american-history-institutions-requirement/))

The American History and Institutions requirements are based on the principle that a US resident graduated from an American university, should have an understanding of the history and governmental institutions of the United States.

**Berkeley Campus Requirement**

American Cultures ([http://americancultures.berkeley.edu/students/courses/](http://americancultures.berkeley.edu/students/courses/))

All undergraduate students at Cal need to take and pass this course in order to graduate. The requirement offers an exciting intellectual environment centered on the study of race, ethnicity and culture of the United States. AC courses offer students opportunities to be part of research-led, highly accomplished teaching environments, grappling with the complexity of American Culture.

**College of Letters & Science Essential Skills Requirements**


The Quantitative Reasoning requirement is designed to ensure that students graduate with basic understanding and competency in math, statistics, or computer science. The requirement may be satisfied by exam or by taking an approved course.


The Foreign Language requirement may be satisfied by demonstrating proficiency in reading comprehension, writing, and conversation in a
foreign language equivalent to the second semester college level, either by passing an exam or by completing approved course work.

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

In order to provide a solid foundation in reading, writing, and critical thinking the College 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.

College of Letters & Science 7 Course Breadth Requirements

Breadth Requirements (http://guide.berkeley.edu/undergraduate/colleges-schools/letters-science/#breadthrequirementstext)

The undergraduate breadth requirements provide Berkeley students with a rich and varied educational experience outside of their major program. As the foundation of a liberal arts education, breadth courses give students a view into the intellectual life of the University while introducing them to a multitude of perspectives and approaches to research and scholarship. Engaging students in new disciplines and with peers from other majors, the breadth experience strengthens interdisciplinary connections and context that prepares Berkeley graduates to understand and solve the complex issues of their day.

Unit Requirements

- 120 total units
- Of the 120 units, 36 must be upper division units
- Of the 36 upper division units, 6 must be taken in courses offered outside your major department

Residence Requirements

For units to be considered in “residence,” you must be registered in courses on the Berkeley campus as a student in the College of Letters & Science. Most students automatically fulfill the residence requirement by attending classes here for four years. In general, there is no need to be concerned about this requirement, unless you go abroad for a semester or year or want to take courses at another institution or through UC Extension during your senior year. In these cases, you should make an appointment to meet an adviser to determine how you can meet the Senior Residence Requirement.

Note: Courses taken through UC Extension do not count toward residence.

Senior Residence Requirement

After you become a senior (with 90 semester units earned toward your BA degree), you must complete at least 24 of the remaining 30 units in residence in at least two semesters. To count as residence, a semester must consist of at least 6 passed units. Intercampus Visitor, EAP, and UC Berkeley-Washington Program (UCDC) units are excluded.

You may use a Berkeley Summer Session to satisfy one semester of the Senior Residence requirement, provided that you successfully complete 6 units of course work in the Summer Session and that you have been enrolled previously in the college.

Modified Senior Residence Requirement

Participants in the UC Education Abroad Program (EAP), Berkeley Summer Abroad, or the UC Berkeley Washington Program (UCDC) may meet a Modified Senior Residence requirement by completing 24 (excluding EAP) of their final 60 semester units in residence. At least 12 of these 24 units must be completed after you have completed 90 units.

Upper Division Residence Requirement

You must complete in residence a minimum of 18 units of upper division courses (excluding UCEAP units), 12 of which must satisfy the requirements for your major.

Mission

Statisticians help to design data collection plans, analyze data appropriately, and interpret and draw conclusions from those analyses. The central objective of the undergraduate major in Statistics is to equip students with consequently requisite quantitative skills that they can employ and build on in flexible ways.

Learning Goals for the Major

Majors are expected to learn concepts and tools for working with data and have experience in analyzing real data that goes beyond the content of a service course in statistical methods for non-majors. Majors should understand the following:

1. The fundamentals of probability theory
2. Statistical reasoning and inferential methods
3. Statistical computing
4. Statistical modeling and its limitations

Skills

Graduates should also have skills in the following:

1. Description, interpretation, and exploratory analysis of data by graphical and other means
2. Effective communication

Major Maps help undergraduate students discover academic, co-curricular, and discovery opportunities at UC Berkeley based on intended major or field of interest. Developed by the Division of Undergraduate Education in collaboration with academic departments, these experience maps will help you:

- **Explore** your major and gain a better understanding of your field of study
- **Connect** with people and programs that inspire and sustain your creativity, drive, curiosity and success
- **Discover** opportunities for independent inquiry, enterprise, and creative expression
- **Engage** locally and globally to broaden your perspectives and change the world
- **Reflect** on your academic career and prepare for life after Berkeley

Use the major map below as a guide to planning your undergraduate journey and designing your own unique Berkeley experience.

View the Statistics Major Map PDF. (https://ue.berkeley.edu/sites/default/files/statistics.pdf)
**Statistics**

Expand all course descriptions [+]Collapse all course descriptions [-]

**STAT 0PX Preparatory Statistics 1 Unit**

Terms offered: Summer 2016 10 Week Session, Summer 2015 10 Week Session, Summer 2014 10 Week Session

This course assists entering Freshman students with basic statistical concepts and problem solving. Designed for students who do not meet the prerequisites for 2. Offered through the Student Learning Center.

Preparatory Statistics:

Read More [+]

**Rules & Requirements**

**Prerequisites:** Consent of instructor

**Hours & Format**

Summer:
- 6 weeks - 5 hours of lecture and 4.5 hours of workshop per week
- 8 weeks - 5 hours of lecture and 4.5 hours of workshop per week

**Additional Details**

**Subject/Course Level:** Statistics/Undergraduate

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

**Instructor:** Purves

Preparatory Statistics: Read Less [-]

**STAT 2 Introduction to Statistics 4 Units**

Terms offered: Spring 2023, Fall 2022, Summer 2022 8 Week Session, Spring 2022, Fall 2021, Summer 2021 8 Week Session, Fall 2020


Introduction to Statistics:

Read More [+]

**Rules & Requirements**

**Credit Restrictions:** Students will receive no credit for STAT 2 after completing STAT W21, STAT 20, STAT 21, STAT S2, STAT 21X, STAT N21, STAT 5, or STAT 2X.

**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:** Statistics/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/DATA C8/INFO C8

Introduction to Statistics: Read Less [-]

**STAT C8 Foundations of Data Science 4 Units**

Terms offered: Spring 2023, Fall 2022, Summer 2022 8 Week Session, 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.

Foundations of Data Science:

Read More [+]

**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:** Statistics/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/DATA C8/INFO C8

Foundations of Data Science: Read Less [-]
STAT 20 Introduction to Probability and Statistics 4 Units
Terms offered: Spring 2023, Fall 2022, Summer 2022 8 Week Session
For students with mathematical background who wish to acquire basic concepts. Relative frequencies, discrete probability, random variables, expectation. Testing hypotheses. Estimation. Illustrations from various fields.
Introduction to Probability and Statistics: Read More [+]

Rules & Requirements

Prerequisites: Mathematics 1A, Mathematics 16A, Mathematics 10A/10B, or consent of instructor. One semester of calculus.

Credit Restrictions: Students will receive no credit for STAT 20 after completing STAT W21, STAT 2, STAT 5, STAT 21, STAT N21, STAT 2X, STAT S20, STAT 21X, or STAT 25. A deficient grade in STAT 20 may be removed by taking STAT W21, STAT 21, or STAT N21. Students who have taken 2, 2X, 5, 21, 21X, or 25 will receive no credit for 20.

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 3 hours of laboratory per week

Additional Details
Subject/Course Level: Statistics/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Introduction to Probability and Statistics: Read Less [-]

STAT 21 Introductory Probability and Statistics for Business 4 Units
Terms offered: Summer 2022 8 Week Session, Fall 2016, Fall 2015
Descriptive statistics, probability models and related concepts, sample surveys, estimates, confidence intervals, tests of significance, controlled experiments vs. observational studies, correlation and regression.
Introductory Probability and Statistics for Business: Read More [+]

Rules & Requirements

Prerequisites: Mathematics 1A, Mathematics 16A, Mathematics 10A/10B, or consent of instructor. One semester of calculus.

Credit Restrictions: Students will receive no credit for STAT 21 after completing STAT W21, STAT 2, STAT 5, STAT 21, STAT N21, STAT 2X, STAT S20, STAT 21X, or STAT 25. A deficient grade in STAT 21 may be removed by taking STAT W21, STAT 21, or STAT N21. Students who have taken 2, 2X, 5, 21, 21X, or 25 will receive no credit for 20.

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Summer: 8 weeks - 7.5 hours of lecture per week

Additional Details
Subject/Course Level: Statistics/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Introductory Probability and Statistics for Business: Read Less [-]
STAT W21 Introductory Probability and Statistics for Business 4 Units
Terms offered: Summer 2021 8 Week Session, Summer 2020 8 Week Session, Summer 2019 8 Week Session
Reasoning and fallacies, descriptive statistics, probability models and related concepts, combinatorics, sample surveys, estimates, confidence intervals, tests of significance, controlled experiments vs. observational studies, correlation and regression.
Introductory Probability and Statistics for Business: Read More [+]
Rules & Requirements
Prerequisites: One semester of calculus
Credit Restrictions: Students will receive no credit for Statistics W21 after completing Statistics 2, 20, 21, N21 or 25. A deficient grade in Statistics 21, N21 may be removed by taking Statistics W21.

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of web-based lecture per week
Summer: 8 weeks - 7.5 hours of web-based lecture per week
Online: This is an online course.

Additional Details
Subject/Course Level: Statistics/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Formerly known as: N21
Introductory Probability and Statistics for Business: Read Less [-]

STAT 24 Freshman Seminars 1 Unit
Terms offered: Spring 2021, Fall 2016, Fall 2003
The Berkeley Seminar Program has been designed to provide new students with the opportunity to explore an intellectual topic with a faculty member in a small-seminar setting. Berkeley seminars are offered in all campus departments, and topics vary from department to department and semester to semester. Enrollment limited to 15 freshmen.
Freshman Seminars: Read More [+]
Rules & Requirements
Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format
Fall and/or spring: 15 weeks - 1 hour of seminar per week

Additional Details
Subject/Course Level: Statistics/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.

Freshman Seminars: Read Less [-]

STAT 33A Introduction to Programming in R 1 Unit
Terms offered: Spring 2023, Fall 2022, Spring 2022
An introduction to the R statistical software for students with minimal prior experience with programming. This course prepares students for data analysis with R. The focus is on the computational model that underlies the R language with the goal of providing a foundation for coding. Topics include data types and structures, such as vectors, data frames and lists; the REPL evaluation model; function calls, argument matching, and environments; writing simple functions and control flow. Tools for reading, analyzing, and plotting data are covered, such as data input/output, reshaping data, the formula language, and graphics models.
Introduction to Programming in R: Read More [+]
Rules & Requirements
Credit Restrictions: Students will receive no credit for STAT 33A after completing STAT 33B, or STAT 133. A deficient grade in STAT 33A may be removed by taking STAT 33B, or STAT 133.

Hours & Format
Fall and/or spring: 15 weeks - 1 hour of lecture and 1 hour of laboratory per week
Summer: 6 weeks - 2 hours of lecture and 3 hours of laboratory per week

Additional Details
Subject/Course Level: Statistics/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Introduction to Programming in R: Read Less [-]
STAT 33B Introduction to Advanced Programming in R 1 Unit
Terms offered: Spring 2023, Fall 2022, Spring 2022
The course is designed primarily for those who are already familiar with programming in another language, such as python, and want to understand how R works, and for those who already know the basics of R programming and want to gain a more in-depth understanding of the language in order to improve their coding. The focus is on the underlying paradigms in R, such as functional programming, atomic vectors, complex data structures, environments, and object systems. The goal of this course is to better understand programming principles in general and to write better R code that capitalizes on the language's design.

Introduction to Advanced Programming in R: Read More [+]

Rules & Requirements
Prerequisites: CompSci 61A or equivalent programming background
Credit Restrictions: Students will receive no credit for STAT 33B after completing STAT 133. A deficient grade in STAT 33B may be removed by taking STAT 133.

Hours & Format
Fall and/or spring: 15 weeks - 1 hour of lecture and 1 hour of laboratory per week
Summer: 6 weeks - 2 hours of lecture and 3 hours of laboratory per week

Additional Details
Subject/Course Level: Statistics/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.

STAT C79 Societal Risks and the Law 3 Units
Terms offered: Spring 2013
Defining, perceiving, quantifying and measuring risk; identifying risks and estimating their importance; determining whether laws and regulations can protect us from these risks; examining how well existing laws work and how they could be improved; evaluating costs and benefits. Applications may vary by term. This course cannot be used to complete engineering unit or technical elective requirements for students in the College of Engineering.

Societal Risks and the Law: Read More [+]

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

Additional Details
Subject/Course Level: Statistics/Undergraduate
Grading/Final exam status: Letter grade. Final exam not required.
Also listed as: COMPSCI C79/POL SCI C79

STAT C88S Probability and Mathematical Statistics in Data Science 3 Units
Terms offered: Spring 2023, Fall 2022
In this connector course we will state precisely and prove results discovered while exploring data in Data 8. 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.

Probability and Mathematical Statistics in Data Science: Read More [+]

Rules & Requirements
Prerequisites: Prerequisite: one semester of calculus at the level of Math 16A, Math 10A, or Math 1A. Corequisite or Prerequisite: Foundations of Data Science (COMPSCI C8 / DATA C8 / INFO C8 / STAT C8)
Credit Restrictions: Students will receive no credit for STAT 88 after completing STAT 134, STAT C140, STAT 135, or STAT 102.

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: Statistics/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Formerly known as: Statistics 88
Also listed as: DATA C88S
Probability and Mathematical Statistics in Data Science: Read Less [-]
STAT 89A Linear Algebra for Data Science 4 Units
Terms offered: Spring 2022, Spring 2021, Spring 2020
An introduction to linear algebra for data science. The course will cover introductory topics in linear algebra, starting with the basics: discrete probability and how probability can be used to understand high-dimensional vector spaces; matrices and graphs as popular mathematical structures with which to model data (e.g., as models for term-document corpora, high-dimensional regression problems, ranking/classification of web data, adjacency properties of social network data, etc.); and geometric approaches to eigendecompositions, least-squares, principal components analysis, etc.
Linear Algebra for Data Science: Read More [+]

Rules & Requirements
Prerequisites: One year of calculus. Prerequisite or corequisite: Foundations of Data Science (COMPSCI C8 / INFO C8 / STAT C8)

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

Additional Details
Subject/Course Level: Statistics/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.

STAT 94 Special Topics in Probability and Statistics 1 - 4 Units
Terms offered: Fall 2015
Topics will vary semester to semester.
Special Topics in Probability and Statistics: Read More [+]

Rules & Requirements
Prerequisites: Consent of instructor
Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format
Fall and/or spring: 15 weeks - 1-3 hours of lecture and 0-2 hours of discussion per week

Additional Details
Subject/Course Level: Statistics/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.

STAT 97 Field Study in Statistics 1 - 3 Units
Terms offered: Fall 2015, Spring 2012
Supervised experience relevant to specific aspects of statistics in off-campus settings. Individual and/or group meetings with faculty.
Field Study in Statistics: Read More [+]

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

Hours & Format
Fall and/or spring: 15 weeks - 1-3 hours of fieldwork per week
Summer: 6 weeks - 2.5-7.5 hours of fieldwork per week
8 weeks - 1.5-5.5 hours of fieldwork per week

Additional Details
Subject/Course Level: Statistics/Undergraduate
Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

Field Study in Statistics: Read Less [-]

STAT 98 Directed Group Study 1 - 3 Units
Terms offered: Spring 2023, Fall 2022, Spring 2022
Must be taken at the same time as either Statistics 2 or 21. This course assists lower division statistics students with structured problem solving, interpretation and making conclusions.
Directed Group Study: Read More [+]

Rules & Requirements
Prerequisites: Consent of instructor
Repeat rules: Course may be repeated for credit without restriction.

Hours & Format
Fall and/or spring: 15 weeks - 2-3 hours of directed group study per week
Summer: 8 weeks - 4-6 hours of directed group study per week

Additional Details
Subject/Course Level: Statistics/Undergraduate
Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

Directed Group Study: Read Less [-]
STAT C100 Principles & Techniques of Data Science 4 Units
Terms offered: Spring 2023, Fall 2022, Summer 2022 8 Week Session, Spring 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.

Principles & Techniques of Data Science: Read More [+]

Rules & Requirements
Prerequisites: COMPSCI C8 / DATA C8 / INFO C8 / STAT C8; and COMPSCI 61A, COMPSCI 88, or ENGIN 7; Corequisite: MATH 54 or EECS 16A
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 hours of lecture, 1 hour of discussion, and 1 hour of laboratory per week
Summer: 8 weeks - 6 hours of lecture, 2 hours of discussion, and 2 hours of laboratory per week

Additional Details
Subject/Course Level: Statistics/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Formerly known as: Statistics C100/Computer Science C100
Also listed as: COMPSCI C100/DATA C100

Principles & Techniques of Data Science: Read Less [-]

STAT C102 Data, Inference, and Decisions 4 Units
Terms offered: Spring 2023, Fall 2022, Spring 2022
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.

Data, Inference, and Decisions: Read More [+]

Rules & Requirements
Prerequisites: Mathematics 54 or Mathematics 110 or Statistics 89A or Physics 89 or both of Electrical Engineering and Computer Science 16A and Electrical Engineering and Computer Science 16B; Statistics/Computer Science C100; and any of Electrical Engineering and Computer Science 126, Statistics 140, Statistics 134, Industrial Engineering and Operations Research 172. Statistics 140 or Electrical Engineering and Computer Science 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: Statistics/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Formerly known as: Statistics 102
Also listed as: DATA C102

Data, Inference, and Decisions: Read Less [-]
STAT C131A Statistical Methods for Data Science 4 Units
Terms offered: Spring 2023, Fall 2022, Spring 2022
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.

Statistical Methods for Data Science: Read More [+]

Rules & Requirements

Prerequisites: Statistics/Computer Science/Information C8 or Statistics 20; and Mathematics 1A, Mathematics 16A, or Mathematics 10A/10B.
Strongly recommended corequisite: Statistics 33A or Statistics 133

Hours & Format

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

Additional Details

Subject/Course Level: Statistics/Undergraduate

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

Formerly known as: Statistics 131A

Also listed as: DATA C131A

Statistical Methods for Data Science: Read Less [-]

STAT 134 Concepts of Probability 4 Units
Terms offered: Spring 2023, Fall 2022, Summer 2022 8 Week Session
An introduction to probability, emphasizing concepts and applications. Conditional expectation, independence, laws of large numbers. Discrete and continuous random variables. Central limit theorem. Selected topics such as the Poisson process, Markov chains, characteristic functions.

Concepts of Probability: Read More [+]

Rules & Requirements

Prerequisites: One year of calculus

Credit Restrictions: Students will not receive credit for 134 after taking 140 or 201A.

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: Statistics/Undergraduate

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

Concepts of Probability: Read Less [-]

STAT 135 Concepts of Statistics 4 Units
Terms offered: Spring 2023, Fall 2022, Spring 2022
A comprehensive survey course in statistical theory and methodology. Topics include descriptive statistics, maximum likelihood estimation, non-parametric methods, introduction to optimality, goodness-of-fit tests, analysis of variance, bootstrap and computer-intensive methods and least squares estimation. The laboratory includes computer-based data-analytic applications to science and engineering.

Concepts of Statistics: Read More [+]

Rules & Requirements

Prerequisites: STAT 134 or STAT 140; and MATH 54, EL ENG 16A, STAT 89A, MATH 110 or equivalent linear algebra. Strongly recommended corequisite: 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: Statistics/Undergraduate

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

Concepts of Statistics: Read Less [-]
STAT C140 Probability for Data Science 4 Units
Terms offered: Spring 2023, Fall 2022, Spring 2022, Fall 2021

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; and one year of calculus at the level of MATH 1A-1B or higher. Corequisite: MATH 54, EECS 16B, MATH 110 or equivalent linear algebra
Credit Restrictions: Students will receive no credit for STAT C140 after completing STAT 134, or EECS 126. A deficient grade in STAT C140 may be removed by taking STAT 134.

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

Addisonal Details
Subject/Course Level: Statistics/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.

STAT 150 Stochastic Processes 3 Units
Terms offered: Spring 2023, Fall 2022, Spring 2022
Random walks, discrete time Markov chains, Poisson processes. Further topics such as: continuous time Markov chains, queueing theory, point processes, branching processes, renewal theory, stationary processes, Gaussian processes.

Rules & Requirements
Prerequisites: 101 or 103A or 134

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

Additional Details
Subject/Course Level: Statistics/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.

STAT 151A Linear Modelling: Theory and Applications 4 Units
Terms offered: Spring 2023, Fall 2022, Fall 2021
A coordinated treatment of linear and generalized linear models and their application. Linear regression, analysis of variance and covariance, random effects, design and analysis of experiments, quality improvement, log-linear models for discrete multivariate data, model selection, robustness, graphical techniques, productive use of computers, in-depth case studies.

Rules & Requirements
Prerequisites: STAT 102 or STAT 135. STAT 133 recommended

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

Additional Details
Subject/Course Level: Statistics/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
STAT 152 Sampling Surveys 4 Units
Terms offered: Spring 2020, Spring 2019, Spring 2018
Sampling Surveys: Read More [+]
Rules & Requirements
Prerequisites: 101 or 134, 133 and 135 recommended
Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of laboratory per week
Additional Details
Subject/Course Level: Statistics/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Sampling Surveys: Read Less [-]

STAT 153 Introduction to Time Series 4 Units
Terms offered: Spring 2023, Fall 2022, Spring 2022
An introduction to time series analysis in the time domain and spectral domain. Topics will include: estimation of trends and seasonal effects, autoregressive moving average models, forecasting, indicators, harmonic analysis, spectra.
Introduction to Time Series: Read More [+]
Rules & Requirements
Prerequisites: 101, 134 or consent of instructor. 133 or 135 recommended
Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of laboratory per week
Summer: 10 weeks - 4.5 hours of lecture and 3 hours of laboratory per week
Additional Details
Subject/Course Level: Statistics/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Introduction to Time Series: Read Less [-]

STAT 154 Modern Statistical Prediction and Machine Learning 4 Units
Terms offered: Spring 2023, Fall 2022, Spring 2022
Modern Statistical Prediction and Machine Learning: Read More [+]
Rules & Requirements
Prerequisites: Mathematics 53 or equivalent; Mathematics 54, Electrical Engineering 16A, Statistics 89A, Mathematics 110 or equivalent linear algebra; Statistics 135, the combination of Data/Stat C140 and Data/Stat/Comp sci C100, or equivalent; experience with some programming language. Recommended prerequisite: Mathematics 55 or equivalent exposure to counting arguments
Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of laboratory per week
Summer: 10 weeks - 4.5 hours of lecture and 3 hours of laboratory per week
Additional Details
Subject/Course Level: Statistics/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Modern Statistical Prediction and Machine Learning: Read Less [-]

STAT 155 Game Theory 3 Units
Terms offered: Spring 2023, Fall 2022, Spring 2022
General theory of zero-sum, two-person games, including games in extensive form and continuous games, and illustrated by detailed study of examples.
Game Theory: Read More [+]
Rules & Requirements
Prerequisites: 101 or 134
Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Summer: 8 weeks - 6 hours of lecture per week
Additional Details
Subject/Course Level: Statistics/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Game Theory: Read Less [-]
STAT 156 Causal Inference 4 Units
Terms offered: Fall 2022, Fall 2021, Fall 2020
This course will focus on approaches to causal inference using the potential outcomes framework. It will also use causal diagrams at an intuitive level. The main topics are classical randomized experiments, observational studies, instrumental variables, principal stratification and mediation analysis. Applications are drawn from a variety of fields including political science, economics, sociology, public health, and medicine. This course is a mix of statistical theory and data analysis. Students will be exposed to statistical questions that are relevant to decision and policy making.

Causal Inference: Read More [+]

Rules & Requirements

Prerequisites: Statistics 135

Hours & Format

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

Additional Details

Subject/Course Level: Statistics/Undergraduate

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

Causal Inference: Read Less [-]

STAT 157 Seminar on Topics in Probability and Statistics 3 Units
Terms offered: Spring 2023, Spring 2022, Fall 2020
Substantial student participation required. The topics to be covered each semester that the course may be offered will be announced by the middle of the preceding semester; see departmental bulletins. Recent topics include: Bayesian statistics, statistics and finance, random matrix theory, high-dimensional statistics.

Seminar on Topics in Probability and Statistics: Read More [+]

Rules & Requirements

Prerequisites: Mathematics 53-54, Statistics 134, 135. Knowledge of scientific computing environment (R or Matlab) often required. Prerequisites might vary with instructor and topics

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

Hours & Format

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

Additional Details

Subject/Course Level: Statistics/Undergraduate

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

Seminar on Topics in Probability and Statistics: Read Less [-]

STAT 158 Experimental Design 4 Units
Terms offered: Spring 2023, Spring 2021, Spring 2020
This course will review the statistical foundations of randomized experiments and study principles for addressing common setbacks in experimental design and analysis in practice. We will cover the notion of potential outcomes for causal inference and the Fisherian principles for experimentation (randomization, blocking, and replications). We will also cover experiments with complex structures (clustering in units, factorial design, hierarchy in treatments, sequential assignment, etc). We will also address practical complications in experiments, including noncompliance, missing data, and measurement error.

Experimental Design: Read More [+]

Rules & Requirements

Prerequisites: Statistics 134 and Statistics 135 and experience with Software R, or consent of instructor

Hours & Format

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

Additional Details

Subject/Course Level: Statistics/Undergraduate

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

Experimental Design: Read Less [-]

STAT 159 Reproducible and Collaborative Statistical Data Science 4 Units
Terms offered: Spring 2023, Spring 2022, Spring 2021
A project-based introduction to statistical data analysis. Through case studies, computer laboratories, and a term project, students will learn practical techniques and tools for producing statistically sound and appropriate, reproducible, and verifiable computational answers to scientific questions. Course emphasizes version control, testing, process automation, code review, and collaborative programming. Software tools may include Bash, Git, Python, and LaTeX.

Reproducible and Collaborative Statistical Data Science: Read More [+]

Rules & Requirements

Prerequisites: Statistics 133, Statistics 134, and Statistics 135 (or equivalent)

Hours & Format

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

Additional Details

Subject/Course Level: Statistics/Undergraduate

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

Reproducible and Collaborative Statistical Data Science: Read Less [-]
STAT H195 Special Study for Honors Candidates 1 - 4 Units
Terms offered: Spring 2015, Fall 2014, Fall 2010
Special Study for Honors Candidates: Read More [+]
Rules & Requirements
Repeat rules: Course may be repeated for credit without restriction.

Hours & Format
Fall and/or spring: 15 weeks - 0 hours of independent study per week
Summer:
6 weeks - 1-5 hours of independent study per week
8 weeks - 1-4 hours of independent study per week

Additional Details
Subject/Course Level: Statistics/Undergraduate
Grading/Final exam status: Letter grade. Final exam not required.
Special Study for Honors Candidates: Read Less [-]

STAT 197 Field Study in Statistics 0.5 - 3 Units
Terms offered: Fall 2021, Fall 2020, Spring 2017
Supervised experience relevant to specific aspects of statistics in on-campus or off-campus settings. Individual and/or group meetings with faculty.
Field Study in Statistics: Read More [+]
Rules & Requirements
Credit Restrictions: Enrollment is restricted; see the Introduction to Courses and Curricula section of this catalog.
Repeat rules: Course may be repeated for credit without restriction.

Hours & Format
Fall and/or spring: 15 weeks - 2-9 hours of fieldwork per week
Summer:
6 weeks - 3-22 hours of fieldwork per week
8 weeks - 2-16 hours of fieldwork per week
10 weeks - 2-12 hours of fieldwork per week

Additional Details
Subject/Course Level: Statistics/Undergraduate
Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.
Field Study in Statistics: Read Less [-]

STAT 198 Directed Study for Undergraduates 1 - 3 Units
Terms offered: Fall 2022, Spring 2022, Fall 2021
Special tutorial or seminar on selected topics.
Directed Study for Undergraduates: Read More [+]
Rules & Requirements
Prerequisites: Consent of instructor
Repeat rules: Course may be repeated for credit without restriction.

Hours & Format
Fall and/or spring: 15 weeks - 1-3 hours of directed group study per week
Summer:
6 weeks - 2.5-7.5 hours of directed group study per week
8 weeks - 1.5-5.5 hours of directed group study per week

Additional Details
Subject/Course Level: Statistics/Undergraduate
Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.
Directed Study for Undergraduates: Read Less [-]

STAT 199 Supervised Independent Study and Research 1 - 3 Units
Terms offered: Fall 2019, Fall 2018, Spring 2017
Supervised Independent Study and Research: Read More [+]
Rules & Requirements
Repeat rules: Course may be repeated for credit without restriction.

Hours & Format
Fall and/or spring: 15 weeks - 1-3 hours of independent study per week
Summer:
6 weeks - 1-4 hours of independent study per week
8 weeks - 1-3 hours of independent study per week
10 weeks - 1-3 hours of independent study per week

Additional Details
Subject/Course Level: Statistics/Undergraduate
Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.
Supervised Independent Study and Research: Read Less [-]