Statistics

The Bachelor of Science degree in Statistics is designed to provide foundations that include basic statistical concepts and methodologies, and to expose students to the role of statistical thinking and analysis in interdisciplinary research and in the public sphere. To ensure deep rigorous understanding of the foundations and main methods of analysis in statistics, the program is composed of three parts: a) foundations in mathematics and computing, combined with an introduction to statistical thinking and practice; b) four core courses on the fundamentals of statistical theory and data analysis; and c) more advanced material covering important areas of statistical methodology. A capstone project involving substantial data analysis or focused on methodology/theory is required. Students also have opportunities to acquire practical experience in study design, data management, and statistical analysis by working as undergraduate research assistants in projects in one of the participating academic departments or Research Centers at Brown.

The Concentration is based on several premises: that statistics is a scientific discipline in its own right, with specialized methodologies and body of knowledge; that it is essentially concerned with the art and science of data analysis; and that it is best taught in conjunction with specific, substantive applications. To this end, the Concentration is designed to provide foundations that include basic statistical concepts and methodologies, and to expose students to the role of statistical thinking and analysis in interdisciplinary research and in the public sphere. The Concentration prepares students for careers in industry and government, for graduate study in statistics or biostatistics and other sciences, as well as for professional study in law, medicine, business, or public administration. The undergraduate concentration guide is available here (https://www.brown.edu/academics/public-health/biostatistics/undergraduate-statistics-concentration).

The Undergraduate Concentration in Statistics is administered by the Department of Biostatistics and leads to a Sc.B. degree. To ensure deep rigorous understanding of the foundations and main methods of analysis in statistics, the program is composed of three parts: The first part entails foundations in mathematics and computing, combined with an introduction to statistical thinking and practice. The second part includes four core courses that provide a comprehensive account of the fundamentals of statistical theory and data analysis. The third part delves into more advanced material covering important areas of statistical methodology. In addition to the formal coursework, students are required to complete a capstone project that involves a substantial data analysis or a methodological/theoretical project. Students also have opportunities to acquire practical experience in study design, data management, and statistical analysis by working as undergraduate research assistants in projects in one of the participating academic departments or Research Centers at Brown. Please note that only the required Calculus courses may be accepted with P/F grades. All other required courses must be taken for a grade.

The program requires thirteen one-semester courses. The required courses are as follows:

**LEVEL I: Foundations in Mathematics - Calculus**
- MATH 0100  Introductory Calculus, Part I
- MATH 0180  Intermediate Calculus

**LEVEL I - Foundations in Mathematics - Linear Algebra**
- MATH 0520  Linear Algebra

**Computing**
- APMA 0160  Introduction to Scientific Computing
- or CSCI 0040  Introduction to Scientific Computing and Problem Solving

**Introduction to Statistical Thinking and Practice**
- PHP 1501  Essentials of Data Analysis

With the approval of the Director of the Statistics Concentration, one of the following courses may serve as replacement:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>SOC 1100</td>
<td>Introductory Statistics for Social Research</td>
</tr>
<tr>
<td>ECON 1620</td>
<td>Introduction to Econometrics</td>
</tr>
<tr>
<td>APMA 0650</td>
<td>Essential Statistics</td>
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<tr>
<td>BIOL 0495</td>
<td>Statistical Analysis of Biological Data</td>
</tr>
<tr>
<td>EDUC 1110</td>
<td>Introductory Statistics for Education Research and Policy Analysis</td>
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<tr>
<td>CLPS 0900</td>
<td>Statistical Methods</td>
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**LEVEL II - Core Courses in Theory and Data Analysis**
- APMA 1650  Statistical Inference I
- or APMA 1655  Statistical Inference I
- APMA 1660  Statistical Inference II

**OR**
- MATH 1610  Probability
- MATH 1620  Mathematical Statistics

**Introduction to Biostatistics**
- PHP 1510  Principles of Biostatistics and Data Analysis

**LEVEL III: Advanced Courses in Statistical Methods**
- PHP 1560  Statistical Programming in R

**OR**
- PHP 2560  Statistical Programming with R
- PHP 1511  Applied Regression Analysis

**AND**
- PHP 2511  Applied Regression Analysis

**Capstone Project**
- PHP 1970  Independent Study

**Electives in Social Science and Biostatistics (Students must choose 2)**
- SOC 1120  Market and Social Surveys
- SOC 1340  Principles and Methods of Geographic Information Systems
- SOC 2230  Techniques of Demographic Analysis
- CSCI 1420  Machine Learning
- CSCI 1810  Computational Molecular Biology
- CSCI 1820  Algorithmic Foundations of Computational Biology
- CSCI 1951A  Data Science
- PHP 0850  Fundamentals of Epidemiology
- PHP 2030  Clinical Trials Methodology
- PHP 2120  Introduction to Methods in Epidemiologic Research
- PHP 2200  Intermediate Methods in Epidemiologic Research
- PHP 2515  Fundamentals of Probability and Statistical Inference
- PHP 2520  Statistical Inference I
- PHP 2530  Bayesian Statistical Methods
- PHP 2550  Practical Data Analysis
- PHP 2580  Statistical Inference II
- PHP 2602  Analysis of Lifetime Data
- PHP 2601  Linear Models
- PHP 2604  Statistical Methods for Spatial Data
- PHP 2610  Causal Inference and Missing Data
- PHP 2620  Statistical Methods in Bioinformatics, I
- APMA 1070  Quantitative Models of Biological Systems
Prospective students will be able to obtain Advanced Placement credit for the requirements in mathematics. Students who have already completed an introductory course in statistics will be granted permission to proceed to Level II core courses if they meet the prerequisites in mathematics and computing.

**Senior Thesis:** A senior honors thesis is not a requirement for graduation, but concentrators who choose to write one are required to write a manuscript that describes a major project of statistical data analysis that they performed or a simulation study to evaluate the performance of a statistical method. Students that decide to write an honor thesis will generally integrate their capstone project into their thesis. Generally, writing a senior thesis includes two semesters of independent study (PHP 1980), the capstone project may serve as one of those.

**Honors:** Statistics requires the completion of a senior thesis and a superior record in the program.

**Study Abroad/Study Away:** Up to two courses taken elsewhere (study abroad or other transfer) may be applied to required courses. Meet with a concentration adviser to discuss; provide a syllabus for each course to be considered for transfer to your concentration plan.

The program is administered by the Department of Biostatistics, located at 121 South Main Street, 7th floor.

For additional information please contact: Roee Gutman, Box G-S-121-7; Telephone: 401-863-2682; Fax: 401-863-9182; e-mail: Roee Gutman (rgutman@stat.brown.edu)
Font Notice

This document should contain certain fonts with restrictive licenses. For this draft, substitutions were made using less legally restrictive fonts. Specifically:

Helvetica was used instead of Arial.
The editor may contact Leepfrog for a draft with the correct fonts in place.