STATISTICS AND ANALYTICS
MAJOR, B.S.

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Department of Statistics and Operations Research
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The major in statistics and analytics is an excellent program for students interested in statistical data science, operations research, and actuarial science, as well as in fields such as business, economics, public policy and health, psychology, and biomedicine where the decision and statistical sciences play an increasingly important role.

Department Programs

Major
- Statistics and Analytics Major, B.S. (p. 1)

Minor

Graduate Programs
- M.S. in Statistics and Operations Research (http://catalog.unc.edu/graduate/schools-departments/statistics-operations-research)
- Ph.D. in Statistics and Operations Research (http://catalog.unc.edu/graduate/schools-departments/statistics-operations-research)

Student Learning Outcomes

Upon completion of the statistics and analytics program, students should be able to:
- Demonstrate knowledge of the basic foundations of calculus, probability, statistics, and discrete mathematics
- Apply the analytical and computational skills needed to formulate and solve basic problems in the decision sciences
- Communicate the major ideas of the decision sciences, orally and in writing
- Find appropriate employment with academic institutions, government agencies, and industry, or continue their education in related graduate programs

Requirements

In addition to the program requirements listed below, students must
- take at least half of their major course requirements (courses and credit hours) at UNC–Chapel Hill
- earn a minimum of 18 hours of C or better in the major core requirements (some majors require 21 hours).

For more information, please consult the degree requirements section of the catalog (http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/#degreerequirementstext).

Core Requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 547</td>
<td>Linear Algebra for Applications</td>
<td>3</td>
</tr>
<tr>
<td>STOR 415</td>
<td>Introduction to Optimization</td>
<td>3</td>
</tr>
<tr>
<td>STOR 435</td>
<td>Introduction to Probability</td>
<td>3</td>
</tr>
<tr>
<td>STOR 445</td>
<td>Stochastic Modeling</td>
<td>3</td>
</tr>
<tr>
<td>STOR 455</td>
<td>Statistical Methods I</td>
<td>3</td>
</tr>
<tr>
<td>Five courses from Group A and Group B, including at least three courses from Group A (see lists below)</td>
<td></td>
<td>15</td>
</tr>
</tbody>
</table>

Additional Requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP 116</td>
<td>Introduction to Scientific Programming (COMP 110 may be substituted)</td>
<td>3</td>
</tr>
<tr>
<td>MATH 231</td>
<td>Calculus of Functions of One Variable I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 232</td>
<td>Calculus of Functions of One Variable II</td>
<td>4</td>
</tr>
<tr>
<td>MATH 233</td>
<td>Calculus of Functions of Several Variables H</td>
<td>4</td>
</tr>
<tr>
<td>STOR 155 &amp; STOR 215</td>
<td>Introduction to Data Models and Inference and Foundations of Decision Sciences</td>
<td>6</td>
</tr>
<tr>
<td>or MATH 381</td>
<td>Discrete Mathematics</td>
<td></td>
</tr>
</tbody>
</table>

Remaining General Education (http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements) courses and electives to reach 123 hours.

Total Hours: 123

H Honors version available. An honors course fulfills the same requirements as the nonhonors version of that course. Enrollment and GPA restrictions may apply.

Group A

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>STOR 305</td>
<td>Decision Making Using Spreadsheet Models</td>
<td>3</td>
</tr>
<tr>
<td>STOR 465</td>
<td>Simulation for Analytics</td>
<td>3</td>
</tr>
<tr>
<td>STOR 471</td>
<td>Long-Term Actuarial Models</td>
<td>3</td>
</tr>
<tr>
<td>STOR 472</td>
<td>Short Term Actuarial Models</td>
<td>3</td>
</tr>
<tr>
<td>STOR 555</td>
<td>Mathematical Statistics</td>
<td>3</td>
</tr>
<tr>
<td>STOR 556</td>
<td>Advanced Methods of Data Analysis</td>
<td>3</td>
</tr>
<tr>
<td>STOR 565</td>
<td>Machine Learning</td>
<td>3</td>
</tr>
</tbody>
</table>

Group B

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOS 511</td>
<td>Introduction to Statistical Computing and Data Management</td>
<td>4</td>
</tr>
<tr>
<td>BIOS 664</td>
<td>Sample Survey Methodology</td>
<td>4</td>
</tr>
<tr>
<td>BUSI 403</td>
<td>Operations Management</td>
<td>3</td>
</tr>
<tr>
<td>BUSI 408</td>
<td>Corporate Finance</td>
<td>3</td>
</tr>
<tr>
<td>BUSI 410</td>
<td>Business Analytics</td>
<td>3</td>
</tr>
<tr>
<td>BUSI 532</td>
<td>Service Operations H</td>
<td>3</td>
</tr>
<tr>
<td>BUSI 533</td>
<td>Supply Chain Management H</td>
<td>3</td>
</tr>
<tr>
<td>COMP 401</td>
<td>Foundation of Programming H</td>
<td>4</td>
</tr>
<tr>
<td>COMP 410</td>
<td>Data Structures</td>
<td>3</td>
</tr>
<tr>
<td>COMP 521</td>
<td>Files and Databases</td>
<td>3</td>
</tr>
</tbody>
</table>
ECON 410  Intermediate Theory: Price and Distribution H 3
ECON 420  Intermediate Theory: Money, Income, and Employment H 3
ECON 511  Game Theory in Economics H 3
INLS 523  Introduction to Database Concepts and Applications 3
MATH 383  First Course in Differential Equations H 3
MATH 521  Advanced Calculus I H 3
MATH 522  Advanced Calculus II H 3
MATH 523  Functions of a Complex Variable with Applications 3
MATH 524  Elementary Differential Equations 3
MATH 548  Combinatorial Mathematics 3
MATH 566  Introduction to Numerical Analysis 3

H Honors version available. An honors course fulfills the same requirements as the nonhonors version of that course. Enrollment and GPA restrictions may apply.

Statistics and analytics majors must complete 123 academic hours. They also must attain at least a grade of C (not C-) in 18 hours of the courses listed under Core Requirements.

Sample Plan of Study

Sample plans can be used as a guide to identify the courses required to complete the major and other requirements needed for degree completion within the expected eight semesters. The actual degree plan may differ depending on the course of study selected (second major, minor, etc.). Students should meet with their academic advisor to create a degree plan that is specific and unique to their interests. The sample plans represented in this catalog are intended for first-year students entering UNC–Chapel Hill in the fall term. Some courses may not be offered every term.

In the first two years, students are required to complete the standard calculus sequence as well as introductory courses in statistics, operations research, and computer science. At the beginning of their third year, students take advanced courses in statistics, probability, and operations research. They have a great deal of flexibility in tailoring their program to meet their individual interests.

First and Second Years

COMP 116  Introduction to Scientific Programming (COMP 110 may be substituted) 3
MATH 231  Calculus of Functions of One Variable I 4
MATH 232  Calculus of Functions of One Variable II 4
MATH 233  Calculus of Functions of Several Variables H 4
STOR 155  Introduction to Data Models and Inference H 3
STOR 215  Foundations of Decision Sciences H 3
STOR 305  or MATH 381  Discrete Mathematics 3

Third and Fourth Years

MATH 547  Linear Algebra for Applications 3
STOR 415  Introduction to Optimization 3
STOR 435  Introduction to Probability 3
STOR 445  Stochastic Modeling 3
STOR 455  Statistical Methods I 3
STOR 471  Introduction to Data Models and Inference 3
STOR 472  Introduction to Statistical Computing and Data Management 3
STOR 481  Introduction to Data Models and Inference 3
STOR 482  Introduction to Data Models and Inference 3
STOR 483  Introduction to Data Models and Inference 3
STOR 555  Advanced Methods of Data Analysis 3
STOR 565  Machine Learning 3

Five courses from the following two groups of courses, including at least three from Group A H

Group A

STOR 305  Decision Making Using Spreadsheet Models 3
STOR 465  Simulation for Analytics 3
STOR 471  Long-Term Actuarial Models 3
STOR 472  Short Term Actuarial Models 3
STOR 555  Mathematical Statistics 3
STOR 556  Advanced Methods of Data Analysis 3
STOR 565  Machine Learning 3

Group B

BIOS 511  Introduction to Statistical Computing and Data Management 4
BIOS 664  Sample Survey Methodology 4
BUSI 403  Operations Management 3
BUSI 408  Corporate Finance 3
BUSI 410  Business Analytics 3
BUSI 532  Service Operations H 3
BUSI 533  Supply Chain Management H 3
COMP 401  Foundation of Programming H 4
COMP 410  Data Structures 3
COMP 521  Files and Databases 3
ECON 410  Intermediate Theory: Price and Distribution H 3
ECON 420  Intermediate Theory: Money, Income, and Employment H 3
ECON 511  Game Theory in Economics H 3
INLS 523  Introduction to Database Concepts and Applications 3
MATH 383  First Course in Differential Equations H 3
MATH 521  Advanced Calculus I H 3
MATH 522  Advanced Calculus II H 3
MATH 523  Functions of a Complex Variable with Applications 3
MATH 524  Elementary Differential Equations 3
MATH 548  Combinatorial Mathematics 3
MATH 566  Introduction to Numerical Analysis 3

H Honors version available. An honors course fulfills the same requirements as the nonhonors version of that course. Enrollment and GPA restrictions may apply.

1 Prospective statistics and analytics majors are encouraged to take STOR 155, and STOR 215 or MATH 381 as early as possible in their college careers. Each has a prerequisite of MATH 110 or its equivalent and may be taken before, or concurrently with, MATH 231.

2 Students wishing to prepare for an actuarial career should include STOR 471, STOR 472, STOR 555 and STOR 556 from Group A in their program and take ECON 410 and ECON 420 and BUSI 408 and BUSI 588 as electives. Students who plan to attend graduate school in statistics, operations research, analytics, or a related field, should include in their program COMP 401, STOR 555, STOR 565, and MATH 521.
Honors version available. An honors course fulfills the same requirements as the nonhonors version of that course. Enrollment and GPA restrictions may apply.

It is recommended that all statistics and analytics majors take ECON 101 as a social and behavioral sciences Approaches course. Students interested in the actuarial profession also should take BUSI 101 as a general elective.

Dual Bachelor’s – Master’s Degree Program
The Department of Statistics and Operations Research offers a dual bachelor’s – master’s degree program. Interested students should consult the graduate program director.

Special Opportunities in Statistics and Analytics

Honors in Statistics and Analytics
Candidates for honors or highest honors must secure approval from the program director. They must take STOR 691H and STOR 692H, and maintain an overall grade point average of 3.3 and a grade point average in statistics and analytics courses of at least 3.3 at the end of the semester preceding the semester in which they graduate.

Departmental Involvement
The Department of Statistics and Operations Research sponsors Carolina’s Actuarial Student Organization (CASO), for students interested in careers in the actuarial sciences. CASO organizes study groups for the actuarial exams, sponsors talks by professional actuaries, keeps members aware of employment opportunities, and maintains contact with alumni and corporations in the field. The department is also a co-sponsor of Carolina Analytics and Data Science (CADS) student organization, which aims to foster communication among the students who are interested in careers in data science and analytics and contribute to their intellectual growth by hosting speakers from industry as well as academia.

Experiential Education
When arranged in advance with a supervising faculty member, STOR 493 can be used to earn credit for appropriate work experience in the summer or during the academic year. STOR 493 satisfies the experiential education requirement. Students interested in STOR 493 should secure approval from the program director before starting their work. STOR 496 can also be used to satisfy the experiential education requirement.

Undergraduate Awards
Two undergraduate awards for graduating seniors are given each year by the statistics and analytics program. One is the Statistics and Analytics Award, given to the outstanding graduating senior, and the second is the W. Robert Mann Award, given for excellence in actuarial science. Plaques bearing the names of winners are located in the undergraduate study room in Hanes Hall.

Undergraduate Research
Undergraduate research under the direction of faculty members from the Department of Statistics and Operations Research is offered through the independent study and research course, STOR 496, and the senior honors thesis courses, STOR 691H and STOR 692H.