PHYSICS, B.S.

A Bachelor of Science degree provides a strong foundation in the central areas of physics, such as Newtonian mechanics, electricity and magnetism, statistical physics and quantum mechanics. This degree path is flexible, allowing students to tailor their course of study to their unique interests by choosing from specialized experimental courses or by designing a research program in consultation with faculty researchers.

Many of our students go on to pursue graduate studies or careers in physics or astronomy. A physics degree also prepares students for careers in other sciences, making it an ideal choice for a double major. The degree also provides the educational background students need to enter professional schools, such as medicine and law. Through a suitable selection of electives, students may also be prepared to enter USC’s teacher education program that leads to a master’s degree and teacher certification.

Engineering Physics Concentration

Our interdisciplinary engineering physics program bridges physics and engineering. This program, which culminates in a Bachelor of Science in Physics with a concentration in Engineering, is designed for physics students interested in learning more about the applications of physics and for engineering students interested in exploring the fundamental sciences. Through this interdisciplinary program, students master foundational physics and the practical pursuits of engineering.

Undergraduates in this program have a choice of two tracks: electrical and mechanical. These applied tracks add a coherent program of engineering courses to basic physics degree requirements. While immersed in the culture of engineering, students learn to solve the practical problems that engineers typically encounter. Graduates are uniquely positioned to enter a variety of careers or to pursue graduate studies in physics or engineering.

Learning Outcomes

1. Students will demonstrate an understanding of the physical phenomena and the use of scientific methods and theories.
2. Students will demonstrate their ability to communicate effectively through written reports, which exhibit their ability to comprehend, analyze, and interrogate critically.
3. Students will demonstrate their ability to communicate effectively through oral presentations, which exhibit their ability to comprehend, analyze, interrogate critically and present their work to others.
4. Students will demonstrate effective use of computers and other technology.

Admissions

Entrance Requirements

New freshmen who meet University admissions standards are eligible for admission to degree programs offered by the college. A student who wishes to enter the College of Arts and Sciences from another college on the Columbia campus must be in good standing and have a cumulative GPA of 2.00 or higher. A student who wishes to enter the College of Arts and Sciences from another USC campus must fulfill one of the following requirements:

1. Be in good standing, meet the admission requirements for a baccalaureate degree on the Columbia campus, and have a cumulative GPA of 2.00 or higher.
2. Be in good standing and have completed 30 semester hours with a GPA of 2.00 or higher on a USC campus.

Some programs in the College of Arts and Sciences have special admission requirements established by the department or committee that supervises the specific degree program, for example, Cardiovascular Technology, Biological Sciences, Chemistry, Biochemistry and Molecular Biology, Economics, Environmental Science, the Bachelor of Arts in Interdisciplinary Studies, and the Bachelor of Science in Interdisciplinary Studies. These requirements are listed in the sections of this bulletin that describe department and special degree programs.

Transfer Requirements

In addition to the minimum University and College of Arts and Sciences requirements, a student seeking to transfer to the physics major from another program within the University, or from another accredited college or university, is required to have earned a grade of “C” or higher in MATH 141.

Note: An AP or IB exam score that provides credit for MATH 141 also satisfies this requirement.

Degree Requirements (120 hours)

Program of Study

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Carolina Core</td>
<td>34-46</td>
</tr>
<tr>
<td>2. College Requirements</td>
<td>16-19</td>
</tr>
<tr>
<td>3. Program Requirements</td>
<td>23-38</td>
</tr>
<tr>
<td>4. Major Requirements</td>
<td>32-54</td>
</tr>
</tbody>
</table>

Founding Documents Requirement

All undergraduate students must take a 3-credit course or its equivalent with a passing grade in the subject areas of History, Political Science, or African American Studies that covers the founding documents including the United State Constitution, the Declaration of Independence, the Emancipation Proclamation and one or more documents that are foundational to the African American Freedom struggle, and a minimum of five essays from the Federalist papers. This course may count as a requirement in any part of the program of study including the Carolina Core, the major, minor or cognate, or as a general elective. Courses that meet this requirement are listed here (https://academicbulletins.sc.edu/undergraduate/founding-document-courses/).

1. Carolina Core Requirements (33-45 hours)

Effective, Engaged, and Persuasive Communication: Written – CMW (6 hours)

*must be passed with a grade of C or higher

- any CC-CMW courses (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)
ARP – Analytical Reasoning and Problem Solving (8 hours)
*must be passed with a grade of C or higher*
- MATH 141*
- MATH 142*

SCI – Scientific Literacy (7 hours)
*must be passed with a grade of C or higher*
- CHEM 111* & CHEM 111L*  
- CHEM 112* & CHEM 112L*

GFL – Global Citizenship and Multicultural Understanding: Foreign Language (0-6 hours)
Demonstration of proficiency in one foreign language equivalent to the minimal passing grade on the exit examination in the 122 course is required. Students can demonstrate this proficiency by successfully completing Phase II of the Proficiency Test or by successfully completing the 122 course, including the exit exam administered as part of that course.

- CC-GFL courses (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)

It is strongly recommended that students continuing the study of a foreign language begin college-level study of that language in their first semester and continue in that language until their particular foreign language requirement is completed.

GHS – Global Citizenship and Multicultural Understanding: Historical Thinking (3 hours)
*any CC-GHS course (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)*

GSS – Global Citizenship and Multicultural Understanding: Social Sciences (3 hours)
*any CC-GSS course (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)*

AIU – Aesthetic and Interpretive Understanding (3 hours)
*any CC-AIU course (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)*

CMS – Effective, Engaged, and Persuasive Communication: Spoken Component 1 (0-3 hours)
*any overlay or stand-alone CC-CMS course (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)*

INF – Information Literacy 1 (0-3 hours)
*any overlay or stand-alone CC-INF course (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)*

VSR – Values, Ethics, and Social Responsibility 1 (0-3 hours)
*any overlay or stand-alone CC-VSR course (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)*

---

1 Carolina Core Stand Alone or Overlay Eligible Requirements — Overlay-approved courses offer students the option of meeting two Carolina Core components in a single course. A maximum of two overlays is allowed. The total Carolina Core credit hours must add up to a minimum of 31 hours. Some programs may have a higher number of minimum Carolina Core hours due to specified requirements.

---

2. College Requirements (16-19 hours)

Foreign Language (0-3 hours)
- only if needed to meet 122-level proficiency

Analytical Reasoning (7 hours)
*must be passed with a grade of C or higher*

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCE 145</td>
<td>Algorithmic Design I (*)</td>
<td>4</td>
</tr>
<tr>
<td>STAT 509</td>
<td>Statistics for Engineers (*)</td>
<td>3</td>
</tr>
<tr>
<td>or STAT 515</td>
<td>Statistical Methods I</td>
<td></td>
</tr>
</tbody>
</table>

Total Credit Hours 7

History (3 hours)
The College of Arts and Sciences requires one additional GHS course beyond the Carolina Core GHS requirement.

- If the Carolina Core GHS requirement is fulfilled by a U.S. history course, the College of Arts and Sciences history requirement must be fulfilled by a non-U.S. history course.
- If the Carolina Core GHS requirement is fulfilled by a non-U.S. history course, the College of Arts and Sciences history requirement must be fulfilled by a U.S. history course.

Please select the College of Arts and Sciences history requirement from the approved list of U.S. and non-U.S. history courses (https://academicbulletins.sc.edu/undergraduate/arts-sciences/history-requirement/).

Social Science and Fine Arts or Humanities (6 hours)

- Social Science (3 hours)
  - The College of Arts and Science requires one 3-hour Social Science Course (https://academicbulletins.sc.edu/undergraduate/arts-sciences/courses-acceptable-social-science/)
- Fine Arts/Humanities (3 hours)
  - A Bachelor of Science from the College of Arts and Sciences requires one 3-hour Fine Arts/Humanities Course (https://academicbulletins.sc.edu/undergraduate/arts-sciences/courses-acceptable-fine-arts-humanities/)

---

3. Program Requirements (23-38 hours)

Supporting Courses (23 hours)
*must be passed with a grade of C or higher*

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 199</td>
<td>Measurement and Analysis in Physics (*)</td>
<td>2</td>
</tr>
<tr>
<td>PHYS 211</td>
<td>Essentials of Physics I</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 212</td>
<td>Essentials of Physics II (*)</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 306</td>
<td>Principles of Physics III (*)</td>
<td>3</td>
</tr>
</tbody>
</table>
Major Courses (32 hours)

A minimum grade of C is required in all major courses.

Sciences.

on inapplicable courses can be obtained from the College of Arts and Sciences. The College of Arts and Sciences allows acquiring, or vocational nature may apply as credit toward degrees in the primary program.

No courses of a remedial, developmental, skill-acquiring, or vocational nature may apply as credit toward degrees in the College of Arts and Sciences. The College of Arts and Sciences allows the use of the Pass-Fail option on elective courses. Further clarification on inapplicable courses can be obtained from the College of Arts and Sciences.

4. Major Requirements (32-54 hours)

A minimum grade of C is required in all major courses.

Major Courses (32 hours)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 241</td>
<td>Vector Calculus (*)</td>
<td>3</td>
</tr>
<tr>
<td>MATH 242</td>
<td>Elementary Differential Equations (*)</td>
<td>3</td>
</tr>
<tr>
<td>or MATH 520</td>
<td>Ordinary Differential Equations</td>
<td></td>
</tr>
</tbody>
</table>

Select six hours of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 300</td>
<td>Transition to Advanced Mathematics (*)</td>
<td>3</td>
</tr>
<tr>
<td>MATH 344</td>
<td>Applied Linear Algebra (*)</td>
<td>3</td>
</tr>
</tbody>
</table>

MATH 500-level and above (selected with advisor)*

Total Credit Hours 23

Cognate or Minor (0-18 hours)

The required mathematics courses satisfy the cognate requirement.

An optional minor may be added to a student’s program of study. A minor is intended to develop a coherent basic preparation in a second area of study. Courses applied toward general education requirements cannot be counted toward the minor. No course may satisfy both major and minor requirements. All minor courses must be passed with a grade of C or higher. At least half of the courses in the minor must be completed in residence at the University. A list of minor programs of study can be found at Programs A-Z. An optional additional major may also be added to a student’s program of study. Additional majors must include all major courses as well as any prescribed courses noted (*) in the bulletin. Prescribed courses noted in the bulletin may be shared with Carolina Core, College requirements, and Program requirements in the primary program.

A list of minor programs of study can be found at Programs A-Z (https://academicbulletins.sc.edu/undergraduate/programs-az/).

Electives (0-15 hours)

120 (or 128) degree applicable credits are required to complete any degree at UofSC. After the cognate, minor or second major is complete, any additional credits needed to reach 120 (or 128) total credits can be fulfilled by electives. No courses of a remedial, developmental, skill-acquiring, or vocational nature may apply as credit toward degrees in the College of Arts and Sciences. The College of Arts and Sciences allows the use of the Pass-Fail option on elective courses. Further clarification on inapplicable courses can be obtained from the College of Arts and Sciences.

Engineering Physics Concentration (52-54 hours) optional

In order to select the Engineering Physics Concentration a student must have achieved a minimum overall GPA of 2.5 with at least 15 hours taken at UofSC-Columbia. In addition, the student must have passed MATH 141 with a grade of “C” or higher. (An AP or IB exam score that provides credit for MATH 141 also satisfies this requirement.)

Select either the Electrical or Mechanical Option.

Electrical Option (52-53 hours)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCE 211</td>
<td>Digital Logic Design</td>
<td>3</td>
</tr>
<tr>
<td>ELCT 102</td>
<td>Electrical Science</td>
<td>3</td>
</tr>
<tr>
<td>ELCT 201</td>
<td>Introductory Electrical Engineering Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>ELCT 221</td>
<td>Circuits</td>
<td>3</td>
</tr>
<tr>
<td>ELCT 222</td>
<td>Signals and Systems</td>
<td>3</td>
</tr>
<tr>
<td>ELCT 301</td>
<td>Electronics Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>ELCT 371</td>
<td>Electronics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 307</td>
<td>Introduction to Modern Physics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 310</td>
<td>Intermediate Experimental Physics</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 311</td>
<td>Introduction to Applied Numerical Methods</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 501</td>
<td>Quantum Physics I</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 503</td>
<td>Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 504</td>
<td>Electromagnetic Theory</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 506</td>
<td>Thermal Physics and Statistical Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 541</td>
<td>Advanced Experimental Physics I</td>
<td>4</td>
</tr>
</tbody>
</table>

Total Credit Hours 52-53

Mechanical Option (52-54 hours)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMCH 200</td>
<td>Statics</td>
<td>3</td>
</tr>
<tr>
<td>EMCH 260</td>
<td>Solid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>EMCH 290</td>
<td>Thermodynamics</td>
<td>3</td>
</tr>
</tbody>
</table>

Select four courses (at least 12 hours) from EMCH 300 and above 12

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 307</td>
<td>Introduction to Modern Physics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 310</td>
<td>Intermediate Experimental Physics</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 311</td>
<td>Introduction to Applied Numerical Methods</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 501</td>
<td>Quantum Physics I</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 503</td>
<td>Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 504</td>
<td>Electromagnetic Theory</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 541</td>
<td>Advanced Experimental Physics I</td>
<td>4</td>
</tr>
</tbody>
</table>

Select two of the following Physics electives: 6-8

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 502</td>
<td>Quantum Physics II</td>
<td></td>
</tr>
<tr>
<td>PHYS 506</td>
<td>Thermal Physics and Statistical Mechanics</td>
<td></td>
</tr>
<tr>
<td>PHYS 511</td>
<td>Nuclear Physics</td>
<td></td>
</tr>
<tr>
<td>PHYS 542</td>
<td>Advanced Experimental Physics II</td>
<td></td>
</tr>
</tbody>
</table>

Total Credit Hours 52-54
Major Map

A major map is a layout of required courses in a given program of study, including critical courses and suggested course sequences to ensure a clear path to graduation.

Major maps are only a suggested or recommended sequence of courses required in a program of study. Please contact your academic advisor for assistance in the application of specific coursework to a program of study and course selection and planning for upcoming semesters.

Physics, B.S. No Concentration

Physics, B.S. Engineering Physics (Electrical Option) Concentration

Physics, B.S. Engineering Physics (Mechanical Option) Concentration