

# Physics (BS)

Physics provides the conceptual foundation for science and engineering. A physics degree is a mark of major intellectual achievement and a gateway to a thousand careers. The physics major at NC State combines the resources of a major research university with the ambience of a small college. Our ratio of physics majors to faculty of about 3 to 1 allows us to offer small classes, personal attention, and unparalleled opportunities for involvement in research.

Most physics majors are preparing for employment in a government or industrial laboratory, or with a company that provides STEM (science, technology, engineering and math) products or services. Other physics majors are preparing for graduate studies in physics or related sciences, or enrollment in professional schools (such as medicine or law). Some physics majors are preparing for a career as a high school teacher. The Bachelor of Science (B.S.) degree in physics is the appropriate choice if you're planning for graduate study in physics.

For more information about this program, visit our website (<https://physics.sciences.ncsu.edu/undergraduate/>).

Department of Physics  
NC State University  
Campus Box 8202  
Raleigh, NC 27695-8202

Dr. Dan Dougherty  
Professor and Director of Undergraduate Programs  
NC State University  
Riddick Hall 101  
Raleigh, NC 27695-8202  
Phone: 919.514.2610

Email: [dbdoughe@ncsu.edu](mailto:dbdoughe@ncsu.edu)

## Plan Requirements

Code	Title	Hours	Counts towards
<b>Orientation</b>			
COS 100	Science of Change (Verify Requirement)		
<b>Communication</b>			
Select one of the following		3	
Advanced Writing courses:			
ENG 331	Communication for Engineering and Technology		
ENG 332	Communication for Business and Management		
ENG 333	Communication for Science and Research		
ENG 101	Academic Writing and Research <sup>1</sup>	4	
<b>Physics</b>			
PY 201	University Physics I <sup>1</sup>	4	

PY 202	University Physics II <sup>1</sup>	4
PY 203	University Physics III <sup>1</sup>	4
PY 252	Instrumental and Data Analysis for Physics <sup>1</sup>	2
PY 401	Quantum Physics I <sup>1</sup>	3
PY 402	Quantum Physics II <sup>1</sup>	3
PY 411	Mechanics I <sup>1</sup>	3
PY 412	Mechanics II <sup>1</sup>	3
PY 413	Thermal Physics <sup>1</sup>	3
PY 414	Electromagnetism I <sup>1</sup>	3
PY 415	Electromagnetism II <sup>1</sup>	3

### Math / Statistics / Computing

MA 141	Calculus I <sup>1</sup>	4
MA 241	Calculus II <sup>1</sup>	4
MA 242	Calculus III <sup>1</sup>	4
MA 341	Applied Differential Equations I <sup>1</sup>	3
MA 401	Applied Differential Equations II <sup>1</sup>	3
MA 405	Introduction to Linear Algebra <sup>1</sup>	3
Statistics Elective (p. 2) <sup>1</sup>		3
PY 251	Introduction to Scientific Computing <sup>1</sup>	3

Computing / Numerical Methods Elective (p. 2) <sup>1</sup>		3
--	--	---

### Science/Tech Electives

CH 101	Chemistry - A Molecular Science <sup>1</sup>	3
CH 102	General Chemistry Laboratory <sup>1</sup>	1
Basic Science Elective (p. 2) <sup>1</sup>		3
Advanced Experimental Physics (p. 3) <sup>1</sup>		3
Technical Electives <sup>1</sup>		10

Technical Electives are courses at the 300 level or above in science, mathematics, technology, engineering, and in math and science education.

### GEP Courses

GEP Humanities ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/</a> )	6
GEP Social Sciences ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/</a> )	6
GEP Health and Exercise Studies ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/</a> )	2
GEP Elective ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/</a> )	3
GEP Interdisciplinary Perspectives ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/</a> )	5
GEP Global Knowledge ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-global-knowledge/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-global-knowledge/</a> ) (verify requirement)	
Foreign Language Proficiency (verify requirement)	
<b>Free Electives</b>	
Free Electives (12 Hr S/U Lmt) <sup>2</sup>	6
<b>Total Hours</b>	<b>120</b>

<sup>1</sup> A grade of C- or higher is required.

<sup>2</sup> Students should consult their academic advisors to determine which courses fill this requirement.

## Statistics Electives

Code	Title	Hours	Counts towards
BUS 350	Economics and Business Statistics	3	
EC 351	Econometrics I	3	
ST 305		4	
ST 307	Introduction to Statistical Programming-SAS	1	
ST 308	Introduction to Statistical Programming - R	1	
ST 311	Introduction to Statistics	3	
ST 312	Introduction to Statistics II	3	
ST 350	Economics and Business Statistics	3	

ST 370	Probability and Statistics for Engineers	3
ST 371	Introduction to Probability and Distribution Theory	3
ST 372	Introduction to Statistical Inference and Regression	3
ST 380		3

## Computing / Numerical Methods Electives

Code	Title	Hours	Counts towards
CSC 302	Introduction to Numerical Methods	3	
CSC 427	Introduction to Numerical Analysis I	3	
CSC 428	Introduction to Numerical Analysis II	3	
MA 402	Mathematics of Scientific Computing	3	
MA 427	Introduction to Numerical Analysis I	3	
MA 428	Introduction to Numerical Analysis II	3	
PY 525	Computational Physics	3	

## Basic Science Elective

Code	Title	Hours	Counts towards
BIO 165		5	
BIO 181	Introductory Biology: Ecology, Evolution, and Biodiversity	4	
BIO 183	Introductory Biology: Cellular and Molecular Biology	4	
BME 203		3	
CE 225	Mechanics of Solids	3	
CH 201	Chemistry - A Quantitative Science	3	
CH 202	Quantitative Chemistry Laboratory	1	

CH 203	General Chemistry II for Students in Chemical Sciences	3
CH 204	General Chemistry Laboratory II for Students in Chemical Sciences	1
CH 220	Introductory Organic Chemistry	3
CH 222	Organic Chemistry I Lab	1
CHE 205	Chemical Process Principles	4
GN 301	Genetics in Human Affairs	3
MAE 214	Solid Mechanics	3
MEA 101	Geology I: Physical	3
MEA 110	Geology I Laboratory	1
MEA 200	Introduction to Oceanography	3
MEA 210	Oceanography Lab	1
MEA 215	Introduction to Atmospheric Sciences	4
MEA 220	Marine Biology	3
MSE 200	Mechanical Properties of Structural Materials	3
MSE 201	Structure and Properties of Engineering Materials	3
MSE 203		3
NE 202	Radiation Sources, Interaction and Detection	4
TE 200	Introduction to Polymer Science and Engineering	3

## Advanced Experimental Physics

Code	Title	Hours	Counts towards
PY 452	Advanced Physics Laboratory	3	

PY 456	Senior Design Project in Physics	3
--------	----------------------------------	---

## Semester Sequence

To see more about what you will learn in this program, visit the Learning Outcomes website (<https://apps.oirp.ncsu.edu/pgas/>)!

### First Year

Fall Semester		Hours
PY 201	University Physics I (CP) <sup>1</sup>	4
MA 141	Calculus I (CP) <sup>2</sup>	4
ENG 101	Academic Writing and Research	4
GEP Health and Exercise Studies ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/</a> )		1
COS 100	Science of Change	2
<b>Hours</b>		<b>15</b>

### Spring Semester

PY 202	University Physics II (CP) <sup>1</sup>	4
MA 241	Calculus II (CP) <sup>2</sup>	4
CH 101	Chemistry - A Molecular Science <sup>3</sup>	3
CH 102	General Chemistry Laboratory <sup>3</sup>	1
GEP Humanities ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/</a> )		3
<b>Hours</b>		<b>15</b>

### Second Year

Fall Semester		Hours
PY 203	University Physics III (CP) <sup>1,3</sup>	4
PY 251	Introduction to Scientific Computing <sup>2</sup>	3
PY 252	Instrumental and Data Analysis for Physics <sup>1</sup>	2
MA 242	Calculus III (CP) <sup>2</sup>	4
GEP Social Sciences ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/</a> )		3
<b>Hours</b>		<b>16</b>

### Spring Semester

PY 411	Mechanics I (CP) <sup>1</sup>	3
PY 413	Thermal Physics <sup>1</sup>	3
MA 341	Applied Differential Equations I <sup>2</sup>	3
Basic Sciences (p. 2) <sup>3</sup>		3
GEP Humanities ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/</a> )		3
<b>Hours</b>		<b>15</b>

### Third Year

Fall Semester		Hours
PY 412	Mechanics II <sup>1</sup>	3
PY 414	Electromagnetism I <sup>1</sup>	3
MA 401	Applied Differential Equations II <sup>2</sup>	3
Statistics Elective (p. 2) <sup>2</sup>		3
Advanced Writing Elective (p. 1)		3
<b>Hours</b>		<b>15</b>

### Spring Semester

PY 401	Quantum Physics I <sup>1</sup>	3
PY 415	Electromagnetism II <sup>1</sup>	3

MA 405	Introduction to Linear Algebra <sup>2</sup>	3
Computing/Numerical Methods Elective (p. 2) <sup>2</sup>		3
Technical Elective (p. 1) <sup>3</sup>		1
GEP Health and Exercise Studies ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/</a> )		1
<b>Hours</b>		<b>14</b>
<b>Fourth Year</b>		
<b>Fall Semester</b>		
PY 402	Quantum Physics II <sup>1</sup>	3
GEP Interdisciplinary Perspectives ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/</a> )		3
Technical Elective (p. 1) <sup>3</sup>		3
Technical Elective (p. 1) <sup>3</sup>		3
Free Elective		3
<b>Hours</b>		<b>15</b>
<b>Spring Semester</b>		
Advanced Experimental Physics (p. 3) <sup>1</sup>		3
GEP Social Sciences ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/</a> )		3
GEP Elective ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/</a> )		3
Technical Elective (p. 1) <sup>3</sup>		3
Free Elective		3
<b>Hours</b>		<b>15</b>
<b>Total Hours</b>		<b>120</b>

<sup>1</sup> At most one passing grade below C- is permitted in the Physics category.

<sup>2</sup> At most one passing grade below C- is permitted in the Math/Statistics/Computing category.

<sup>3</sup> At most one passing grade below C- is permitted in the Sciences/Technical Electives category.

## Career Opportunities

### Career Titles

- Aeronautical & Aerospace Engineer
- Aerospace Engineering Technician
- Architect
- Astronomer
- Atmospheric and Space Scientist
- Biophysicist
- Cartographer and Photogrammetrists
- Environmental Engineer
- Environmental Research Analyst
- Fuel Cell Engineers
- Geologist
- Geophysicist
- Hazardous Waste Management Analyst
- Hydrographer
- Hydrologist
- Industrial Engineer

- Industrial Hygienist
- Materials Engineer
- Materials Scientist
- Mathematician
- Mechanical Engineer
- Meteorologist
- Nuclear Engineer
- Nuclear Fuels Research Engineer
- Oceanographer
- Optometrist
- Petroleum Engineer
- Photogrammetrist
- Physicist
- Physics Professor
- Radiation Protection Engineer
- Seismologist
- Soil Engineer
- Solar Energy Systems Designer
- Structural Engineer
- Sustainability Specialists
- Technical Publications Writer
- Water Pollution Control Inspector
- Weather Forecaster

## Learn More About Careers

NCcareers.org (<https://nccareers.org/>)

Explore North Carolina's central online resource for students, parents, educators, job seekers and career counselors looking for high quality job and career information.

Occupational Outlook Handbook (<https://www.bls.gov/ooh/>)

Browse the Occupational Outlook Handbook published by the Bureau of Labor Statistics to view state and area employment and wage statistics. You can also identify and compare similar occupations based on your interests.

Career One Stop Videos (<https://www.careeronestop.org/>)

View videos that provide career details and information on wages, employment trends, skills needed, and more for any occupation. Sponsored by the U.S. Department of Labor.

Focus 2 Career Assessment (<https://careers.dasa.ncsu.edu/explore-careers/career-assessments/>) (NC State student email address required)  
This career, major and education planning system is available to current NC State students to learn about how your values, interests, competencies, and personality fit into the NC State majors and your future career. An NC State email address is required to create an account. Make an appointment with your career counselor (<https://careers.dasa.ncsu.edu/about/hours-appointments/>) to discuss the results.

Focus 2 Apply Assessment (<https://www.focus2career.com/Portal/Register.cfm?SID=1929>) (Available to prospective students)

A career assessment tool designed to support prospective students in exploring and choosing the right major and career path based on your unique personality, interests, skills and values. Get started with Focus 2 Apply and see how it can guide your journey at NC State.

American Institute of Physics (<http://www.aip.org/>)

American Physical Society (<http://www.aps.org/>)