

APPLIED SCIENCES, B.S.

As a Carolina engineering student, you'll build the fundamentals to become a modern problem solver. It's your chance to explore and work with the latest future-focused solutions, materials and technologies of today—while building the fundamentals you'll need to one day design possibilities not yet imagined. And because you'll earn this degree while immersed in the University's wider liberal arts environment, you gain more than excellent technical skills. You'll also hone the creative, critical thinking and analytical skills you need to address complicated challenges that are both pressing and practical.

This program is unique collaboration between the Department of Applied Physical Sciences (APS) in the College of Arts and Sciences and the Department of Environmental Sciences and Engineering (ESE) in the Gillings School of Global Public Health. APS is the home department for the major and all students will take their foundational engineering classes in APS. For the upper level engineering tracks, students in the materials engineering track will take classes in APS, and students in the Environmental Engineering track will take classes in ESE.






Admissions

Students may declare the Applied Sciences major as early as their first year. However, students who wish to complete the Applied Sciences major must apply for admission to the program. Admission to the university does not guarantee admission to the program.

Students will apply via a standard application that requests biographical information and an essay. The admissions committee will also seek academic records through the close of the semester, course data from required departmental courses, and any other information available on your contributions to the University community.

There are admissions deadlines each December and May. Students should apply by the Fall semester of their sophomore year at the latest. Please visit our website for more details on the application process.

Students will need to complete the following prerequisite or corequisite math and science courses during or before the semester that they apply for admission. These courses are similar to what students take for other STEM majors in the first year.

Code	Title	Hours
CHEM 101	 General Descriptive Chemistry I ^{1, H, F}	3
CHEM 101L	 Quantitative Chemistry Laboratory I ¹	1
MATH 231	 Calculus of Functions of One Variable I ^{1, H, F}	4
PHYS 118	 Introductory Calculus-based Mechanics and Relativity ^{1, H, F}	4
ENGL 105	 English Composition and Rhetoric	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.

F FY-Launch class sections may be available. A FY-Launch section fulfills the same requirements as a standard section of that course, but also fulfills the FY-SEMINAR/FY-LAUNCH First-Year Foundations requirement. Students can search for FY-Launch sections in ConnectCarolina using the FY-LAUNCH attribute.

¹ With a grade of C or better. AP, IB, or transfer credit will be accepted according to university policies.

Advising

First-year students receive advising through the UNC Advising Office. Once admitted to the program, students will be assigned to the academic advisor who is a faculty member in the Applied Physical Sciences Department. Students in the major will need to meet with their advisor each semester to get approval for their courses at the start of the registration process.

Student Learning Objectives

Upon completion of the applied sciences (B.S.) program, students should be able to:




1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. Communicate effectively with a range of audiences.
4. Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. Acquire and apply new knowledge as needed, using appropriate learning strategies.

Requirements

In addition to the program requirements, students must

- earn a minimum final cumulative GPA of 2.000
- complete a minimum of 45 academic credit hours earned from UNC–Chapel Hill courses
- take at least half of their major core requirements (courses and credit hours) at UNC–Chapel Hill
- earn a minimum cumulative GPA of 2.000 in the major core requirements. Some programs may require higher standards for major or specific courses.

For more information, please consult the degree requirements section of the catalog (<https://catalog.unc.edu/undergraduate/degree-requirements/>).

Code	Title	Hours
Core Requirements		
APPL 101	 Exploring Engineering	3
APPL 110	 Design and Making for Engineers: Developing Your Personal Design Potential ^F	3
COMP 110	 Introduction to Programming and Data Science ^H	3

or COMP 116	Introduction to Scientific Programming	
APPL 240	Electronics from Sensors to Indicators: Circuits that Interact with the Physical World	4
APPL 260	Materials Science and Engineering: Living in a Material World	4
APPL 285	Engineering Fundamentals of Force, Motion, and Energy	4
APPL 385	Thermodynamics for Engineers	4
Select one of the following tracks:		15-16
Environmental Engineering Track (16 credits), see details below		
Materials Engineering Track (15 credits), see details below		
APPL 697	Capstone Design I (pending approval)	2
APPL 698	Capstone Design II (pending approval)	4
Additional Requirements		
CHEM 101 & 101L	General Descriptive Chemistry I and Quantitative Chemistry Laboratory I ^{H, F}	4
CHEM 102 & 102L	General Descriptive Chemistry II and Quantitative Chemistry Laboratory II ^{H, F}	4
MATH 231	Calculus of Functions of One Variable I ^{H, F}	4
MATH 232	Calculus of Functions of One Variable II ^{H, F}	4
MATH 233	Calculus of Functions of Several Variables ^{H, F}	4
MATH 383 & 383L	First Course in Differential Equations and First Course in Differential Equations Laboratory ^H	4
PHYS 118	Introductory Calculus-based Mechanics and Relativity ^{H, F}	4
PHYS 119	Introductory Calculus-based Electromagnetism and Quanta ^{H, F}	4
Total Hours		78-79

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ECON 101 is recommended, but not required.

Environmental Engineering Track

Code	Title	Hours
ENVR 205 & 205L	Engineering Tools for Environmental Problem Solving and Engineering for Environmental Problem Solving: Advanced Problems Lab	4
Choose one foundational environmental engineering course:		3
ENVR 419	Chemical Equilibria in Natural Waters	
ENVR 421	Environmental Health Microbiology	
ENVR 548	Sustainable Energy Systems	
ENVR 675	Air Pollution, Chemistry, and Physics	
Choose one modelling course:		3
ENVR 451	Introduction to Environmental Modeling	

ENVR 453	Groundwater Hydrology	
ENVR 468	Temporal GIS and Space/Time Geostatistics for the Environment and Public Health	
ENVR 635	Energy Modeling for Environment and Public Health	
ENVR 730	Computational Toxicology and Exposure Science	
Choose two process engineering courses:		6
ENVR 710	Environmental Process Biotechnology	
ENVR 755	Analysis of Water Resource Systems	
ENVR 756	Physical/Chemical Treatment Processes	
Total Hours		16

Materials Engineering Track

Code	Title	Hours
APPL 4--	Materials Characterization (pending approval)	3
APPL 462	Engineering Materials: Properties, Selection and Design	3
Choose three advanced materials engineering courses. These courses can come from a combination of one or both categories:		9
APPL 430	Optoelectronics from Materials to Devices ¹	
APPL 435	Nanophotonics ¹	
APPL 463	Bioelectronic Materials ¹	
APPL 465	Engineering of Soft Materials: SpongeBob Squarepants and Other Squishy Things ²	
APPL 467	Materials Design for Biomedicine ²	

¹ Electronics and optics

² Soft materials

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.

Course	Title	Hours
First Year		
First-Year Foundation Courses		
First-Year Seminar or First-Year Launch (https://catalog.unc.edu/undergraduate/ideas-in-action/first-year-seminars-launches/)		3
ENGL 105	English Composition and Rhetoric	3
IDST 101	College Thriving	1
Triple-I and Data Literacy (https://catalog.unc.edu/undergraduate/ideas-in-action/triple-i/)		4
Lifetime Fitness (https://catalog.unc.edu/undergraduate/ideas-in-action/lifetime-fitness/)		1
Major courses		
FALL semester		
MATH 231	Calculus of Functions of One Variable I ^{H, F}	4

CHEM 101 & 101L	General Descriptive Chemistry I and Quantitative Chemistry Laboratory I ^{H, F}	4
SPRING semester		
MATH 232	Calculus of Functions of One Variable II ^{H, F}	4
PHYS 118	Introductory Calculus-based Mechanics and Relativity ^{H, F}	4
APPL 101	Exploring Engineering	3
Hours		31

Sophomore Year**Major courses****FALL semester**

CHEM 102 & 102L	General Descriptive Chemistry II and Quantitative Chemistry Laboratory II ^{H, F}	4
PHYS 119	Introductory Calculus-based Electromagnetism and Quanta ^{H, F}	4
APPL 110	Design and Making for Engineers: Developing Your Personal Design Potential ^F	3
APPL 285	Engineering Fundamentals of Force, Motion, and Energy	4

SPRING semester

MATH 233	Calculus of Functions of Several Variables ^{H, F}	4
APPL 240	Electronics from Sensors to Indicators: Circuits that Interact with the Physical World	4
APPL 260	Materials Science and Engineering: Living in a Material World	4
COMP 110	Introduction to Programming and Data Science ^H	3

Hours 30**Junior Year****Major courses & General Education courses****FALL semester**

MATH 383 & 383L	First Course in Differential Equations and First Course in Differential Equations Laboratory ^H	4
APPL 385	Thermodynamics for Engineers	4
T1 Track Gateway	Note that T1 is 4 credit hours in the Env Eng track and 3 credit hours in the Mat Eng track	4
Gen Ed #1		3

SPRING semester

T2 Track course #2		3
T3 Track course #3		3
Gen Ed #2		3
Gen Ed #3		3
Gen Ed #4		3

Hours 30**Senior Year****Major courses, General Education courses & Electives****FALL semester**

T4 Track course #4		3
APPL 697 Capstone Design I		3
Gen Ed #5		3
Gen Ed #6		3

Elective 3

SPRING semester

T5 Track course #5		3
APPL 698 Capstone Design II		3
Gen Ed #7		3
Elective		3
Elective		3

Hours 30**Total Hours** 121

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Department Programs

Minor

- Applied Sciences Major, B.S. (p. 1)
- Applied Sciences and Engineering Minor (<https://catalog.unc.edu/undergraduate/programs-study/applied-sciences-engineering-minor/>)

Graduate Programs

- Ph.D. in Materials Science (<https://catalog.unc.edu/graduate/schools-departments/applied-physical-sciences/#programstext>)

Contact Information

Department of Applied Physical SciencesVisit Program Website (<https://aps.unc.edu/apse-minor/>)

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