APPLIED SCIENCES AND ENGINEERING MINOR

Are you interested in using technology to make a difference in the world? From big problems like global warming to focused needs in your home or community, engineering is all about solving problems. The applied sciences and engineering minor trains students with an engineering and entrepreneurial mindset. You will build on the foundation from your math and science courses, and engage in hands-on engineering applications of real-world challenges.

Join the minor to learn about materials sciences, optics, fluid mechanics, sensors, and more.

- Model and simulate systems using modern engineering tools and software
- Design and build systems for real-world applications using engineering tools in the BeAM makerspace and across campus
- Use fundamental principles in math and sciences to address applications in at least one area of engineering, such as material science, environmental engineering, instrumentation, or optics
- Communicate to a wide range of audiences in both oral and written form
- Understand the ethical and professional responsibilities of engineers
- Work within teams to design solutions and solve problems

Requirements

In addition to the program requirements listed below, students must:

- take at least nine hours of their minor "core" requirements at UNC–Chapel Hill
- earn a minimum cumulative GPA of 2.000 in the minor core requirements. Some programs may require higher standards for minor or specific courses.

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

Prerequisite Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 101 &amp; 101L</td>
<td>General Descriptive Chemistry I and Quantitative Chemistry Laboratory</td>
<td>4</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>Select one:</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>PHYS 114</td>
<td>General Physics I: For Students of the Life Sciences</td>
<td></td>
</tr>
<tr>
<td>PHYS 118</td>
<td>Introductory Calculus-based Mechanics and Relativity</td>
<td></td>
</tr>
<tr>
<td>Select one:</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>PHYS 115</td>
<td>General Physics II: For Students of the Life Sciences</td>
<td></td>
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</tbody>
</table>

Core Courses

The minor consists of five courses for a total of 15 credit hours.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>APPL 101</td>
<td>Exploring Engineering</td>
<td>3</td>
</tr>
<tr>
<td>APPL 110</td>
<td>Introduction to Design and Making: Developing Your Personal Design Potential</td>
<td>3</td>
</tr>
</tbody>
</table>

Select one course from the following list: 3-4

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>APPL 240</td>
<td>Developing Your Sixth Sense: Designing Sensors and Electrical Circuits to Make Measurements</td>
<td></td>
</tr>
<tr>
<td>APPL 260</td>
<td>Materials Science and Engineering: Living in a Material World</td>
<td></td>
</tr>
<tr>
<td>APPL 285</td>
<td>Fluid Relationships: An Intuition Building Approach to Fluid Mechanics</td>
<td></td>
</tr>
<tr>
<td>APPL 385</td>
<td>Transport: Flow of Force, Matter, and Energy through the Biosphere</td>
<td></td>
</tr>
<tr>
<td>PHYS 231</td>
<td>Physical Computing</td>
<td></td>
</tr>
<tr>
<td>ENVR 205</td>
<td>Engineering Tools for Environmental Problem Solving</td>
<td></td>
</tr>
</tbody>
</table>

Select two engineering topic courses from the list below. 6

Total Hours 15-16

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

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.

Engineering Topic Classes

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>APPL 350</td>
<td>Data Science for Applied Science and Engineering</td>
<td>3</td>
</tr>
</tbody>
</table>
APPL 405  Convergent Engineering: Team-Science Approaches to Discovery and Innovation  3
APPL 412  Turning Your Entrepreneurial Ideas Into Reality  3
APPL 430  Optical Instrumentation for Scientists and Engineers  3
APPL 435  Nanophotonics  3
APPL 462  Engineering Materials: Properties, Selection and Design  3
APPL 463  Bioelectronic Materials  3
APPL 465  Sponge Bob Square Pants and Other Soft Materials  3
APPL/CHEM 470  Fundamentals of Materials Science  3
APPL/CHEM/PHYS 472  Chemistry and Physics of Electronic Materials Processing  3
APPL 495  Mentored Research in Applied Physical Sciences  3

Biology
BIOL 226  Mathematical Methods for Quantitative Biology  3
BIOL 431/BMME 435/PHYS 405  Biophysical Chemistry  3
BIOL 534/MATH 564  Mathematical Modeling in the Life Sciences  3
BIOL 537  Biotechnology and Synthetic Biology  3
BIOL 551  Comparative Biomechanics  3
BIOL/MATH 553  Mathematical and Computational Models in Biology  3
BIOL 554  Introduction to Computational Neuroscience  3

Chemistry
CHEM 441 & 441L  Intermediate Analytical Chemistry and Intermediate Analytical Chemistry Laboratory  5
CHEM 445  Electroanalytical Chemistry  3
CHEM 448  Mass Spectrometry  3
CHEM 449  Microfabricated Chemical Measurement Systems  3
CHEM/APPL 470  Fundamentals of Materials Science  3
CHEM/APPL/PHYS 472  Chemistry and Physics of Electronic Materials Processing  3

Computer Science
COMP 433  Mobile Computing Systems  3
COMP/PHYS 447  Quantum Computing  3
COMP 523  Introduction to Computer Systems  4
COMP 541  Digital Logic and Computer Design  4
COMP 560  Artificial Intelligence  3
COMP 562  Introduction to Machine Learning  3
COMP 581  Introduction to Robotics  3

Earth, Marine, and Environmental Science
EMES 415  Environmental Systems Modeling  3
EMES 560  Fluid Dynamics  3
EMES 561  Time Series and Spatial Data Analysis  3

Environmental Sciences and Engineering
ENVR 451  Introduction to Environmental Modeling  3
ENVR 452/EMES 560/PHYS 660  Fluid Dynamics  3
ENVR 453  Groundwater Hydrology  3
ENVR/ENEC 468  Temporal GIS and Space/Time Geostatistics for the Environment and Public Health  3
ENVR/ENEC 470  Environmental Risk Assessment  3
ENVR 671  Environmental Physics I  3
ENVR 672  Environmental Physics II  3

Mathematics
MATH 347  Linear Algebra for Applications  3
MATH 528  Mathematical Methods for the Physical Sciences I  3
MATH 529  Mathematical Methods for the Physical Sciences II  3
MATH/BIOL 553  Mathematical and Computational Models in Biology  3
MATH/BIOL 534  Elements of Modern Algebra  3

Neurosciences (restricted to NSCI minors and majors)
NSCI 421  Principles of Brain Circuits  3
NSCI 423  Neurotechnology in Modern Neuroscience Research  3

Physics
PHYS 331  Numerical Techniques for the Sciences I  4
PHYS 332  Numerical Techniques for the Sciences II  4
PHYS 401  Mechanics I  3
PHYS 405/BIOL 431/BMME 435  Biophysical Chemistry  3
PHYS/BMME 441  Thermal Physics  3
PHYS/COMP 447  Quantum Computing  3
PHYS 461  Introduction to Medical Physics  3
PHYS/APPL/PHYS 472  Chemistry and Physics of Electronic Materials Processing  3
PHYS 515  Optics  3
PHYS 529  Introduction to Magnetic Resonance  3
PHYS 660/ENVR 452/EMES 560  Fluid Dynamics  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.

Contact Information
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