# Required courses for physics majors

*(On next page: BS Engineering Sciences!)*

**BS Physics**

<table>
<thead>
<tr>
<th>Course</th>
<th>Type</th>
<th>Semester</th>
<th>Major</th>
<th>Exclusively BS Physics</th>
<th>BS Physics &amp; Astro.</th>
<th>BS Biophys.</th>
<th>BA Physics</th>
<th>BA Physics &amp; Astro.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phys 116: Introductory Astronomy</td>
<td>F</td>
<td>yes</td>
<td>recommended</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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</tr>
<tr>
<td>Phys 151*: Phys. for Sci. and Eng. I</td>
<td>S</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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<tr>
<td>Phys 152*: Phys. for Sci. and Eng. II</td>
<td>F</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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<tr>
<td>Phys 212: Comp. Modeling for Sci., Eng.</td>
<td>S</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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<tr>
<td>Phys 220**: Math for Sci. and Eng.</td>
<td>F</td>
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<td>yes</td>
<td>yes</td>
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<tr>
<td>Phys 253: Modern Physics</td>
<td>F</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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<tr>
<td>Phys 311: Astrophysics I</td>
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<tr>
<td>Phys 312: Astrophysics II</td>
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<tr>
<td>Phys 361: Classical Mechanics</td>
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<tr>
<td>Phys 365: Electricity and Magnetism</td>
<td>S</td>
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<td>yes</td>
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<tr>
<td>Phys 421: Thermo. and Stat. Physics</td>
<td>F</td>
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<td>yes</td>
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<tr>
<td>Phys 461: Quantum Mechanics</td>
<td>S</td>
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<td>yes</td>
<td>yes</td>
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<tr>
<td>Phys 444W: Advanced Lab</td>
<td>S</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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<td>yes</td>
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<tr>
<td>Phys 434, 552, 554, 556: biophysics electives</td>
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<td>yes</td>
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<tr>
<td>Phys 397R, 495R or 499R:</td>
<td></td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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</tbody>
</table>

*ADDITIONAL PHYSICS ELECTIVES:* (One elective may be four credits of 397R, 495R, or 499R, as a single course)

**must be at 200 level or higher**

**must be at 300 level or higher**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Level</th>
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</thead>
<tbody>
<tr>
<td>Phys 422</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Phys 463</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

**COURSES IN OTHER DEPARTMENTS:**

<table>
<thead>
<tr>
<th>Course</th>
<th>Major</th>
<th>(one of these two)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem 150 w/lab</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bio 141 w/lab</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math 111: Calculus I</td>
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<td>yes</td>
</tr>
<tr>
<td>Math 112: Calculus II</td>
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<td>yes</td>
</tr>
<tr>
<td>Math 211: Multivariable Calculus</td>
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<td>yes</td>
</tr>
<tr>
<td>Math 212: Differential Equations</td>
<td>yes</td>
<td>yes</td>
</tr>
</tbody>
</table>

*With permission of the Director of Undergraduate Studies, Phys 141/142 may replace Phys 151/152

**Taking both MATH221 (Linear Algebra) and MATH351 (Partial Differential Equations) would excuse any BS major from the PHYS220 requirement. But please note: PHYS220 is a pre-req for many upper-level PHYS classes...you should **not** put off PHYS220 in, say, your second year in exchange for a nebulous I’ll-take-two-extra-MATH-courses-in-Senior-year plan.
BS Engineering Sciences
all engineering sciences students take the core classes, and then pick one “track” to complete

Core classes
- PHYS 151 & 152
- CHEM 150/150L
- MATH 111, 112, 211, 212
- PHYS 212: Computational modeling for scientists & engineers
- PHYS 220**: Math methods for scientists & engineers  ** See footnote on previous page
- PHYS 222: Fundamentals of engineering design

**Engineering physics track**
PHYS 253: Modern Physics
PHYS 234: Digital electronics
PHYS 361: Classical mechanics
PHYS 365: Electricity & magnetism
PHYS 421: Thermo & stat physics
PHYS 461: Quantum mechanics
PHYS 444W: Advanced lab

1 elective from:
MATH 315 (numerical analysis)
MATH 345 (math modeling)
MATH 351 (partial diff. eq.)
MATH 361 (prob & stats)
PHYS 422 (applied solid state phys)
PHYS 432 (optics)
PHYS 525 (solid state physics)
PHYS 564 (polymer physics)
PHYS 528 (continuum mechanics)
PHYS 495 or 499 (research†)

**Engineering science track**
Two semesters of Reactivity lectures & labs:
CHEM 202, 202L, 203, and 203L

AND

Two semesters of Quantum Mechanics lectures & labs:
Taken either in the Chemistry Department:
CHEM 205, 205L, 333, and (335L or 330L)
...be careful with CHEM pre-reqs for those

Or taken in the Physics Department:
PHYS 253, 421, and 444W

AND

2 Electives from:
CHEM 340 (biochemistry)
CHEM 350 (inorganic chemistry)
PHYS 422 (applied solid state phys)
PHYS 461 (quantum)
CHEM 571 (biomolecular chemistry)
CHEM 572 (adv. biophysical chem)
PHYS 525 (solid state physics)
PHYS 528 (continuum mechanics)
PHYS 554 (molecular biophysics)
PHYS 564 (polymer physics)
PHYS 562 (soft condensed matter)
PHYS 552 (biomacromolecules)

1 elective may be Phys or Chem 495 or 499 (research†)

†must be 4 research credits as a single course in a single semester

**Geoscience track**
ENVS 120 or 130
ENVS 131 or ENVS OX 131Q: Intro Env. Studies
ENVS 331: Earth Systems Science
PHYS 253: Modern Physics
PHYS 421: Thermo & Stat Physics

5 electives, including at least one with lab (marked *), from:
ENVS 222* (Evolution of the Earth w/ Lab)
ENVS 229* (Atmos. Science) / GEOL OX 115*
ENVS 230* (Fund. Geo.) / GEOL OX 141*
ENVS 235 (Eng. Geo.)
ENVS 239 (Physical Oceanography)
ENVS 250* (Cartography)
GEOL OX 250* (Mineral Resources)
ENVS 270 (Env. Data Science)
ENVS 326 (Climate Change & Society)
ENVS 328 (Intro Atmos Chem)
ENVS 330 (Climatology)
ENVS 347 (Landscapes & Geomorphology)
(counts as * if taken with ENVS 347L)
ENVS 348* (Sust. Water Res.)
ENVS 365 (Urban Geography)
CS 170* (Intro to Computer Science)
PHYS 528 (Continuum Mechanics)

Notes: The ENVS OX editions of 222*, 229*, 230*
are equally acceptable
1 elective may be 399, 494, 498, or 499 (research†)