Physics Major with Concentration in Energy Production Requirements
Catalog Year: 2015-16
Degree: Bachelor of Arts
Physics Major Credit Hours: 60+

“PR” indicates a pre-requisite. “CO” indicates a co-requisite.

Courses within this major may also satisfy general education requirements. Please consult http://registrar.cofc.edu/general-edu for more information.

Required Courses

☐ PHYS 111 General Physics I (3) PR or CO: MATH 120 or equivalent or instructor permission; CO: PHYS 111L
☐ PHYS 111L General Physics I Lab (1) CO: PHYS 111

☐ PHYS 112* General Physics II (3) PR: PHYS 111 or HONS 157; CO or PR: MATH 220 or equivalent or instructor permission; CO: PHYS 112L
☐ PHYS 112L General Physics II Lab (1) CO: PHYS 112

☐ PHYS 230 Introduction to Modern Physics I (3) PR: PHYS 112 or HONS 158; CO or PR: MATH 211 or instructor permission

☐ PHYS 370 Experimental Physics (4) PR: PHYS 230 or instructor permission

☐ PHYS 419 Research Seminar (1) PR or CO: PHYS 370 or ASTR 377 or instructor and department chair permission

☐ PHYS 420** Senior Research (3) PR: PHYS 419 and instructor and department chair permission

OR

☐ PHYS 499** Bachelor’s Essay (1-6) PR: PHYS 419 and instructor and department chair permission. Credit will not be awarded for both PHYS 420 and PHYS 499

Notes: * Upon completion of PHYS 101 with a grade of B or better and successful completion of MATH 120, a student may transfer to PHYS 112. **Credit will not be awarded for both PHYS 420 and PHYS 499.

☐ Select 11 credit hours from the following electives with department approval. Please note a maximum of 3 credit hours from each of the following groups are allowed (PHYS 381, PHYS 390 and PHYS 399) and (PHYS 260, PHYS 260L, PHYS 460L).

Physics Electives List

PHYS 203 Physics and Medicine (3) PR: PHYS 102, PHYS 102L or PHYS 112, PHYS 112L or HONS 158

PHYS 260 NASA Space Mission Design (2) PR: ASTR 130 or ASTR 306 or HONS 160 or GEOL 206 or PHYS 102 or PHYS 112 or HONS 158 or instructor permission; CO: PHYS 260L or 460L

PHYS 260L NASA Space Mission Design Laboratory (1) CO: PHYS 260

PHYS 296 Biophysics Model and Excitable Cells (3) PR: (BIOL 111 or HONS 152 or PHYS 112 or HONS 158) OR (BIOL 211 and BIOL 305 and PHYS 102) or instructor permission

PHYS 298 Special Topics (1-3) PR: Instructor permission

PHYS 301 Classical Mechanics (3) PR: PHYS 112 or HONS 158 and MATH 323 or PHYS 272 or permission of instructor

PHYS 302 Classical Mechanics (3) PR: PHYS 301

PHYS 308 Atmospheric Physics (3) PR: PHYS 112, PHYS 112L or HONS 158 or instructor permission
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites</th>
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<tbody>
<tr>
<td>PHYS 320</td>
<td>Intro to Electronics (4)</td>
<td>PHYS 102 and MATH 120 or PHYS 112 or HONS 158 or instructor permission</td>
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<td>PHYS 331</td>
<td>Intro to Modern Physics II (3)</td>
<td>PHYS 230</td>
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<tr>
<td>PHYS 340</td>
<td>Photonics (4)</td>
<td>PHYS 112, PHYS 112L or HONS 158</td>
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<tr>
<td>PHYS 350</td>
<td>Energy Production (4)</td>
<td>CHEM 111, CHEM 111L; (PHYS 112, 112L or HONS 158) or (PHYS 102, 102L and MATH 120)</td>
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<tr>
<td>PHYS 381</td>
<td>Internship (1-4)</td>
<td>Coordinator and department chair permission</td>
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<td>PHYS 390</td>
<td>Research (1-3; repeatable up to 6)</td>
<td>Department chair and instructor permission</td>
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<tr>
<td>PHYS 394</td>
<td>Digital Signal and Image Processing with Biomedical Applications (3)</td>
<td>PHYS 112 and 112L or HONS 158 and 158L; CO: PHYS 394L</td>
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<tr>
<td>PHYS 394L</td>
<td>Digital Signal and Image Processing with Biomedical Applications Laboratory (1)</td>
<td>PHYS 112 and 112L or HONS 158 and 158L; CO: PHYS 394</td>
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<tr>
<td>PHYS 397</td>
<td>Research Experience Physics and Astronomy (0)</td>
<td>Only declared majors can take a Zero Credit Research course. Instructor and department chair permission required.</td>
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<td>PHYS 399</td>
<td>Tutorial (3; repeatable up to 12)</td>
<td>Junior standing and department chair and instructor permission</td>
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<tr>
<td>PHYS 403</td>
<td>Introductory Quantum Mechanics (3)</td>
<td>PHYS 230 and MATH 323 or PHYS 272, or instructor permission</td>
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<tr>
<td>PHYS 405</td>
<td>Thermal Physics (3)</td>
<td>PHYS 230 and MATH 323 or PHYS 272, or instructor permission</td>
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<tr>
<td>PHYS 407</td>
<td>Introduction to Nuclear Physics (3)</td>
<td>PHYS 230 or instructor permission</td>
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<tr>
<td>PHYS 408</td>
<td>Introduction to Solid State Physics (3)</td>
<td>PHYS 230 and MATH 323 or PHYS 272, or instructor permission</td>
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<tr>
<td>PHYS 409</td>
<td>Electricity and Magnetism (3)</td>
<td>PHYS 112 or HONS 158 and MATH 323 or PHYS 272 or permission of instructor</td>
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<tr>
<td>PHYS 410</td>
<td>Electricity and Magnetism (3)</td>
<td>PHYS 409</td>
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<td>PHYS 412</td>
<td>Special Topics (1-3)</td>
<td>Instructor permission</td>
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<tr>
<td>PHYS 415</td>
<td>Fluid Mechanics (3)</td>
<td>MATH 323 and PHYS 301 or instructor permission</td>
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<td>PHYS 456</td>
<td>Air Pollution Meteorology (4)</td>
<td>PHYS 112, PHYS 112L or (PHYS 102, PHYS 102L and MATH 120) or HONS 158; CHEM 112, CHEM 112L or instructor permission</td>
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<td>PHYS 457</td>
<td>Satellite Meteorology (3)</td>
<td>PHYS 308 or PHYS 456 or (PHYS 105 and PHYS 112, PHYS 112L) or (PHYS 105 and PHYS 102, PHYS 102L and MATH 120) or (PHYS 105 and HONS 158)</td>
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<tr>
<td>PHYS 458</td>
<td>Climate Change (4)</td>
<td>PHYS 112, PHYS 112L or HONS 158</td>
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<td>PHYS 460L</td>
<td>NASA Space Mission Design Leadership Lab (1)</td>
<td>Instructor permission; CO: PHYS 260</td>
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**Mathematics Requirement**

- **MATH 120** Introductory Calculus (4) | Placement or C or better in MATH 111
- **MATH 220** Calculus II (4) | MATH 120 or HONS 115
Optional: Students may also select a concentration in Computational Neuroscience, Energy Production or Meteorology.

Energy Production Concentration (Credit Hours: 18+)

Required Courses

- CHEM 111 Principles of Chemistry (3) PR or CO: MATH 111 or equivalent; CO: CHEM 111L
- CHEM 111L Principles of Chemistry Lab (1) CO: CHEM 111
- PHYS 350 Energy Production (4) PR: CHEM 111, CHEM 111L; (PHYS 112, 112L or HONS 158) or (PHYS 102, 102L; MATH 120)
- PHYS 350L Energy Production Lab (0) Energy Production (4) PR: CHEM 111, CHEM 111L; (PHYS 112, 112L or HONS 158) or (PHYS 102, 102L and MATH 120); CO: PHYS 350

Complete 10 credit hours from the following PHYS electives groups including at least two courses totaling a minimum of 6 credit hours from Group I.

Group I

- PHYS 320 Intro to Electronics (4) PR: PHYS 102, PHYS 102L or PHYS 112, PHYS 112L or HONS 158
- PHYS 340 Photonics (4) PR: PHYS 112, PHYS 112L or HONS 158
- PHYS 405 Thermal Physics (3) PR: PHYS 230
- PHYS 407 Introduction to Nuclear Physics (3) PR: PHYS 230 or instructor permission
- PHYS 408 Introduction to Solid State Physics (3) PR: PHYS 230 or instructor permission

Group II

- CHEM 341 Thermodynamics, Statistical Thermodynamics and Chemical Kinetics (3) PR: CHEM 220/220L, MATH 229 or (MATH 220 and MATH 221); CO: CHEM 341L
- CHEM 341L Thermodynamics, Statistical Thermodynamics and Chemical Kinetics Laboratory (1) CO: CHEM 341
- GEOL 320 Earth Resources (3) PR: GEOL 103, GEOL 103L and GEOL 105, GEOL 105L or HONS 155 and 156 and GEOL 256
- PHYS 308 Atmospheric Physics (3) PR: PHYS 112, PHYS 112L or HONS 158 or instructor permission
- PHYS 381 Internship (1-4) PR: Declared PHYS major, PHYS 370, or coordinator permission
- PHYS 390 Research (1-3; repeatable up to 6) PR: Department chair and instructor permission
- PHYS 409 Electricity and Magnetism (3) PR: PHYS 112, PHYS 112L or HONS 158 and MATH 323 or instructor permission
- PHYS 412 Special Topics (Energy Related) (1-3) PR: Instructor permission
- PHYS 415 Fluid Mechanics (3) PR: MATH 323 and PHYS 301 or instructor permission
- PHYS 456 Air Pollution Meteorology (4) PR: PHYS 112, PHYS 112L or (PHYS 102, PHYS 102L and MATH 120) or HONS 158; CHEM 112, CHEM 112L or instructor permission
PHYS 457  Satellite Meteorology (3) PR: PHYS 308 or PHYS 456 or (PHYS 105 and PHYS 112, PHYS 112L) or (PHYS 105 and PHYS 102, PHYS 102L and MATH 120) or (PHYS 105 and HONS 158)

PHYS 458  Climate Change (4) PR: PHYS 112, PHYS 112L or HONS 158

Note: * These courses must involve meteorology and be approved by the Program Director. *Credit will not be awarded for both PHYS 420 and PHYS 499.

Notes:

• With department approval, completion with grades of at least “B” in PHYS 101/101L and PHYS 102/102L, together with MATH 120 and MATH 220 may be substituted for PHYS 111/111L and PHYS 112/112L.

• Suggested programs of study leading to graduate school in physics, astronomy, astrophysics, meteorology and engineering are available from the department.