

Physics Major with Concentration in Energy Production Requirements

Catalog Year: 2014-15

Degree: Bachelor of Science

Physics Major Credit Hours: 76+

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

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

 - PHYS 403 Introductory Quantum Mechanics (3) PR: PHYS 230 and MATH 323 or PHYS 272, or instructor permission

 - PHYS 409 Electricity and Magnetism (3) PR: PHYS 112 or HONS 158 and MATH 323 or PHYS 272 or permission of instructor

 - 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 or 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 15 credit hours from the following electives with department approval. Please note a maximum of 6 credit hours are allowed from PHYS 381, 390 and 399.

- ASTR 306 Planetary Astronomy (3) PR: ASTR 231
- ASTR 311 Stellar Astronomy and Astrophysics (3) PR: ASTR 231 and MATH 221
- ASTR 312 Galactic and Extragalactic Astronomy (3) PR: ASTR 231 and MATH 221
- ASTR 377 Experimental Astronomy (4) PR: ASTR 231
- ASTR 410 Black Holes: Advanced Topics (1) PR: PHYS 112, PHYS 112L or instructor permission; PR or CO: ASTR 210
- ASTR 413 Astrophysics (3) PR: PHYS 301 and MATH 323 or instructor permission
- ASTR 460L NASA Space Mission Design Leadership Lab (1) PR: Instructor permission; PR or CO: ASTR 260
- PHYS 296 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 302 Classical Mechanics (3) PR: PHYS 301

PHYS 308	Atmospheric Physics (3) <i>PR: PHYS 112, PHYS 112L or HONS 158 or instructor permission</i>
PHYS 320	Intro to Electronics (4) <i>PR: PHYS 102 and MATH 120 or PHYS 112 or HONS 158 or instructor permission</i>
PHYS 331	Intro to Modern Physics II (3) <i>PR: PHYS 230</i>
PHYS 340	Photonics (4) <i>PR: PHYS 112, PHYS 112L or HONS 158</i>
PHYS 350	Energy Production (4) <i>PR: CHEM 111, CHEM 111L; (PHYS 112, 112L or HONS 158) or (PHYS 102, 102L and MATH 120)</i>
PHYS 381	Internship (1-4) <i>PR: Declared PHYS major, PHYS 370, and coordinator permission</i>
PHYS 390	Research (1-3; repeatable up to 6) <i>PR: Department chair and instructor permission</i>
PHYS 394	Digital Signal and Image Processing with Biomedical Applications (3) <i>PR: PHYS 112 and 112L or HONS 158 and 158L; CO: PHYS 394L</i>
PHYS 394L	Digital Signal and Image Processing with Biomedical Applications Laboratory (1) <i>PR: PHYS 112 and 112L or HONS 158 and 158L; CO: PHYS 394</i>
PHYS 397	Research Experience Physics and Astronomy (0) <i>PR: Only declared majors can take a Zero Credit Research course. Instructor and department chair permission required.</i>
PHYS 399	Tutorial (3, repeatable up to 12) <i>PR: Junior standing and department chair and instructor permission</i>
PHYS 405	Thermal Physics (3) <i>PR: PHYS 230 and MATH 323 or PHYS 272, or instructor permission</i>
PHYS 407	Introduction to Nuclear Physics (3) <i>PR: PHYS 230 or instructor permission</i>
PHYS 408	Introduction to Solid State Physics (3) <i>PR: PHYS 230 and MATH 323 or PHYS 272, or instructor permission</i>
PHYS 410	Electricity and Magnetism (3) <i>PR: PHYS 409</i>
PHYS 412	Special Topics (1-3) <i>PR: Instructor permission</i>
PHYS 415	Fluid Mechanics (3) <i>PR: MATH 323 and PHYS 301 or instructor permission</i>
PHYS 456	Air Pollution Meteorology (4) <i>PR: PHYS 112, PHYS 112L or (PHYS 102, PHYS 102L and MATH 120) or HONS 158; CHEM 112, CHEM 112L or instructor permission</i>
PHYS 457	Satellite Meteorology (3) <i>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)</i>
PHYS 458	Climate Change (4) <i>PR: PHYS 112, PHYS 112L or HONS 158</i>
PHYS 460L	NASA Space Mission Design Leadership Lab (1) <i>PR: Instructor permission; CO: PHYS 260</i>

Mathematics Requirement:

- MATH 120 Introductory Calculus (4) *PR: Placement or C- or better in MATH 111*
- MATH 220 Calculus II (4) *PR: MATH 120 or HONS 115*
- MATH 221 Calculus III (4) *PR: MATH 220 or equivalent*
- MATH 323 Differential Equations (3) *PR: MATH 221 and MATH 203 or equivalent or permission of instructor*

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; (PHYS112, 112L or HONS 158) or (PHYS 102, 102L and MATH 120)*
- PHYS 350L Energy Production Lab (0) *PR: CHEM 111, CHEM 111L; (PHYS112, 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 Physical Chemistry I (3) *PR: CHEM 221 and MATH 220; CO: CHEM 341L (MATH 221 is strongly recommended.)*
- CHEM 341L Physical Chemistry I Laboratory (1) *CO: CHEM 341*
- CHEM 528 Nuclear and Radiochemistry (3) *PR: CHEM 221 or CHEM 231*
- GEOL 320 Earth Resources (3) *PR: GEOL 101, GEOL 101L or GEOL 103, GEOL 103L; GEOL 105, GEOL 105L or HONS 155 and 156 or instructor permission*
- 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, and 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*

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.