Physics Major with Concentration in Computational Neuroscience 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: PHYS 230 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 302 Classical Mechanics (3) PR: PHYS 301
- PHYS 308 Atmospheric Physics (3) PR: PHYS 112, PHYS 112L or HONS 158 or instructor permission
- PHYS 320 Intro to Electronics (4) PR: PHYS 102 and MATH 120 or PHYS 112 or HONS 158 or instructor permission
PHYS 331  Intro to Modern Physics II (3) PR: PHYS 230

PHYS 340  Photonics (4) PR: PHYS 112, PHYS 112L or HONS 158

PHYS 350  Energy Production (4) PR: CHEM 111, CHEM 111L; (PHYS 112, 112L or HONS 158) or (PHYS 102, 102L and MATH 120)

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 396  Biophysics Model and Excitable Cells (3) PR: BIOL 111 or HONS 151 and PHYS 112 or HONS 158 or permission of instructor

PHYS 397  Research Experience Physics and Astronomy (0) PR: Only declared majors can take a Zero Credit Research course. Instructor and department chair permission required.

PHYS 399  Tutorial (3, repeatable up to 12) PR: Junior standing and department chair and instructor permission

PHYS 405  Thermal Physics (3) PR: PHYS 230 and MATH 323 or PHYS 272, or instructor permission

PHYS 407  Introduction to Nuclear Physics (3) PR: PHYS 230 or instructor permission

PHYS 408  Introduction to Solid State Physics (3) PR: PHYS 230 and MATH 323 or PHYS 272, or instructor permission

PHYS 410  Electricity and Magnetism (3) PR: PHYS 409

PHYS 412  Special Topics (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

PHYS 460L  NASA Space Mission Design Leadership Lab (1) PR: Instructor permission; CO: PHYS 260

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.

Computational Neuroscience Concentration (Credit Hours: 18+)

Required Courses

☐ CSCI 220  Computer Programming I (3) PR: CSCI 120 or CSCI 180 or CSCI 210 or MATH 111 CO: CSCI 220L
Complete a minimum of 7 credit hours from the following electives (each elective must be from a different group):

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<th>Group I</th>
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<tr>
<td>BIOL 305 Genetics (3) PR: BIOL 111 and 111L or HONS 151 and 151L and BIOL 112 and 112L or HONS 152 and 152L; PR or CO: BIOL 211 and 211D and MATH 250 or instructor permission</td>
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<tr>
<td>BIOL 312 Molecular Biology (3) PR: One year of Chemistry and BIOL 111 and 111L or HONS 151 and 151L and BIOL 112 and 112L or HONS 152 and 152L; BIOL 211 and 211D and BIOL 305 or CHEM 232 and 232L; PR or CO: MATH 250</td>
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<tr>
<td>BIOL 313 Cell Biology (3) PR: One year of Chemistry and BIOL 111 and 111L or HONS 151 and 151L and BIOL 112 and 112L or HONS 152 and 152L; and BIOL 211 and 211D or CHEM 232 and 232L; PR or CO: MATH 250; BIOL 305 or CHEM 232 and 232L</td>
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<tr>
<td>BIOL 321 General and Comparative Physiology (4) PR: One year of Chemistry and BIOL 111 and 111L or HONS 151 and 151L and BIOL 112 and 112L or HONS 152 and 152L; BIOL 211 and 211D and BIOL 305 or CHEM 232 and 232L; PR or CO: MATH 250 or equivalent course in statistics or instructor permission</td>
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<tr>
<td>BIOL 343 Animal Behavior (4) PR: BIOL 111 and 111L or HONS 151 and 151L and BIOL 112 and 112L or HONS 152 and 152L and BIOL 211 and 211D and BIOL 305; PR or CO: MATH 250</td>
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<td>BIOL 351 Principles of Neurobiology (3) PR: PSYC 103 and BIOL 111 and 111L or HONS 151 and 151L and BIOL 112 and 112L or HONS 152 and 152L; BIOL 211 and 211D or PSYC 214; PR or CO: MATH 250</td>
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<td>PSYC 351 Principles of Neurobiology (3) PR: PSYC 103, BIOL 111, 112, and BIOL 211 or PSYC 214, or instructor permission. Note: This course is cross-listed with BIOL 351. If a student has received credit for BIOL 351, the student may not receive credit for PSYC 351.</td>
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<tr>
<td>BIOL 352 Neurobiology and Behavior (3) PR: BIOL 351 or PSYC 351 or PSYC 214; PR or CO: MATH 250</td>
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<td>OR</td>
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<tr>
<td>PSYC 352 Neurobiology and Behavior (3) PR: BIOL/PSYC 351 or PSYC 214, or instructor permission. Note: This course is cross-listed with BIOL 352. If a student has received credit for BIOL 352, the student may not receive credit for PSYC 352.</td>
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<td>BIOL 446 Special Topics in Neuroscience (3) PR: Junior or senior standing and instructor permission; PR or CO: MATH 250</td>
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<td>OR</td>
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<tr>
<td>PSYC 446 Special Topics in Neuroscience (3) PR: Junior or senior standing and instructor permission</td>
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<tr>
<td>BIOL 447 Seminar in Neuroscience (3) PR: BIOL 351 or PSYC 351 and BIOL 352 or PSYC 352; CO: BIOL 448 or PSYC 448; PR or CO: MATH 250</td>
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<td>OR</td>
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<td>PSYC 447 Seminar in Neuroscience (3) PR: BIOL/PSYC 351/352; CO: BIOL/PSYC 448 or instructor permission. Students engaged in independent research or a bachelor's essay will be given priority for enrollment.</td>
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<tr>
<td>PSYC 213 Conditioning and Learning (3) PR: PSYC 103</td>
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<td>PSYC 214 Behavioral Neuroscience (3) PR: PSYC 103</td>
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PSYC 215   Cognitive Psychology (3) PR: PSYC 103
PSYC 216   Sensation and Perception (formerly PSYC 313) (3) PR: PSYC 103
PSYC 221   Abnormal Psychology (formerly PSYC 307) (3) PR: PSYC 103
PSYC 318   Comparative Psychology (3) PR: PSYC 103
PSYC 353   Hormones and Behavior (Cross-listed with BIOL 353) (3) PR: PSYC 103 and 214 or 216, or instructor permission. Note: This course is cross-listed with BIOL 353. If a student has received credit for BIOL 353, the student may not receive credit for PSYC 353.
PSYC 386   Behavioral Pharmacology (3) PR: PSYC 103; PSYC 214 or BIOL/PSYC 351; PSYC 211 and 220 (or 250 in lieu of 211 and 220) or BIOL 211 and MATH 250; or instructor permission
PSYC 387   Neuropsychology (3) PR: PSYC 103; PSYC 214 or BIOL/PSYC 351; PSYC 211 and 220 (or 250 in lieu of 211 and 220) or BIOL 211 and MATH 250; or instructor permission
PSYC 464   Advanced Behavioral Neuroscience with Lab (3) PR: PSYC 103, 214, 211, 220 (or 250 in lieu of 211 and 220) and junior or senior status
PSYC 466   Advanced Sensation and Perception with Lab (3) PR: PSYC 103, 216, 211, 220 (or 250 in lieu of 211 and 220) and junior or senior status
PSYC 468   Advanced Cognitive Psychology with Lab (3) PR: PSYC 103, 215, 211, 220 (or 250 in lieu of 211 and 220) and junior or senior status

Group II

MATH 207   Discrete Structures I (3) PR: MATH 105, MATH 111, or MATH 120
MATH 245   Numerical Methods and Mathematical Computing (3) PR: MATH 203 or MATH 220 or instructor permission; CO: MATH 246
MATH 246   Mathematical Computing and Programming Lab (1) PR: MATH 220 or instructor permission
MATH 307   Discrete Structures II (3) PR: MATH 207 or MATH 295 or instructor permission
MATH 440   Statistical Learning I (3) PR: MATH 203 and MATH 220 and MATH 350
MATH 441   Statistical Learning II (3) PR: MATH 440
MATH 445   Numerical Analysis (3) PR: MATH 203 and MATH 245 and MATH 323
MATH 451   Linear Programming and Optimization (3) PR: MATH 203 and MATH 221 and CSCI 220 or MATH 245 or instructor permission
MATH 452   Operations Research (3) PR: MATH 203 and MATH 430 and CSCI 220 or MATH 245
MATH 470   Mathematical Modeling (3) PR: MATH 203 and MATH 323 and MATH 246 or CSCI 220 or instructor permission
CSCI 221   Computer Programming II (3) PR: CSCI 220, CSCI 220L; CO or PR: MATH 207
CSCI 230   Data Structures and Algorithms (3) PR: CSCI 221, MATH 207
CSCI 334   Data Mining (3) PR: CSCI 221, MATH 207, MATH 250
CSCI 360   Software Architecture and Design (3) PR: CSCI 230, MATH 207; CO: COMM 104
CSCI 362   Software Engineering (3) PR: CSCI 221, MATH 207, CO: COMM 104
CSCI 380   User Interface Development (3) PR: CSCI 221, MATH 207, or instructor permission
CSCI 470   Principles of Artificial Intelligence (3) PR: CSCI 230, MATH 307
CSCI 480  Principles of Computer Graphics (3) PR: CSCI 230, MATH 220, MATH 307

Group III

PHYS 203  Physics and Medicine (3) PR: PHYS 102, PHYS 102L or PHYS 112, PHYS 112L or HONS 158
PHYS 270  Nanotechnology and Medicine (3) CO or PR: PHYS 102 or PHYS 112 or HONS 158 or instructor permission
PHYS 298  Special Topics (1-3) PR: Instructor permission
PHYS 320  Intro to Electronics (4) PR: PHYS 102 and MATH 120 or PHYS 112 or PHYS 158 or instructor permission
PHYS 340  Photonics (4) PR: PHYS 112, PHYS 112L or HONS 158
PHYS 381*  Internship (1-4) PR: Coordinator and department chair permission
OR
PHYS 390*  Research (1-3; repeatable up to 6) PR: Department chair and instructor permission
HONS 390*  Special Topics (3 - 6) PR: None
PHYS 399  Tutorial (3; repeatable up to 12) PR: Junior standing and department chair and instructor permission
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
PHYS 412*  Special Topics (1-3) PR: Instructor permission
PHYS 415  Fluid Mechanics (3) PR: MATH 323 and PHYS 301 or instructor permission
PHYS 420*  Senior Research (3) PR: PHYS 419 and instructor and department chair permission
OR
PHYS 499*  Bachelor's Essay (6) PR: PHYS 419 or department chair permission; 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.