

**EXECUTIVE COMMITTEE  
COLLEGE OF NATURAL AND AGRICULTURAL SCIENCES  
REPORT TO THE RIVERSIDE DIVISION  
DECEMBER 3, 2019**

**To be adopted:**

Proposed changes to the B.S. in Physics

**PRESENT:**

**PROPOSED:**

**Major Requirements**

The major requirements consist of a core curriculum and additional requirements for various B.S. degrees. The core requirements for the B.A. and B.S. degrees in Physics are as follows:

- |   |                |
|---|----------------|
| 1. Lower-division requirements (70 units)   | 1. (No Change) |
| a) one of the following sequences: PHYS 041A, PHYS 041B, PHYS 041C, or PHYS 040A or PHYS 40HA, PHYS 040B or PHYS 40HB, PHYS 040C or PHYS 40HC, PHYS 040D, PHYS 040E. The first sequence is preferred for the B.S. in Physics. | a) (No Change) |
| b) PHYS 39  | b) PHYS 039    |
| c) MATH 007A or MATH 009A or MATH 09HA, MATH 007B or MATH 009B or MATH 09HB, MATH 009C, MATH 010A, MATH 010B, MATH 046  | c) (No Change) |
| d) CHEM 001A, CHEM 001B, CHEM 001C, CHEM 01LA, CHEM 01LB, CHEM 01LC   | d) (No Change) |
| e) CS 010. A higher-level CS course may satisfy the CS 010 requirement with approval.   | e) (No Change) |
| 2. Upper-division requirements (41 to 42 units)   | 2. (No Change) |
| a) PHYS 130A, PHYS 130B, PHYS 132, PHYS 135A, PHYS 135B, PHYS 156A, PHYS 156B   | a. (No Change) |

b) PHYS 139L (5 units), PHYS 142L (4 units) or PHYS 142W (5 units). Note that PHYS142W satisfies the ENGL 1C requirement.

c) 4 units of upper division Physics electives. Upper division math, science or engineering may be substituted with approval.

b. (No Change)

c. 4 units of upper division Physics electives. Upper division math, science or engineering may be substituted with approval.

### Physics: Standard Track (B.S. degree)

1. Additional upper-division requirements (16 to 17 units)

a) PHYS 136

~~b) One additional quarter of either PHYS 142L (4 units) or PHYS 142W (5 units). Approved undergraduate research (PHYS 195A, PHYS 195B, PHYS 195C, PHYS 195D) in physics or an internship (PHYS 198 D) in physics at a government or industrial laboratory can be used in place of up to 4 units of PHYS 142L.~~

c) 8 additional units of upper division Physics electives. PHYS 156C is highly recommended for those planning to go to graduate school in physics.

1. (No Change)

a) (No Change)

b) One of the following: one additional quarter of PHYS 142L (4 units) or PHYS 142W (5 units); at least 4 units of Senior Thesis (PHYS 195A, PHYS 195B, PHYS 195C, PHYS 195D); at least 4 units of Internship in Physics (PHYS 198D); participation in an approved summer research program, such as a NSF REU, and an additional 4 units of upper division physics elective.

c) (No Change)

### Physics: Biophysics Track (B.S. degree)

1. Additional lower-division requirements (25 units)

a) BIOL 005A, BIOL 005B, BIOL 005C, BIOL 05LA or BIOL 020.

b) CHEM 008A, or CHEM 08HA, CHEM 008B or CHEM 08HB, CHEM 008C or CHEM 08HC, CHEM 08LA or CHEM 08HLA, CHEM 08LB or CHEM 08HLB, CHEM 08LC or CHEM 08HLC

1. (No Change)

a. (No Change)

b. (No Change)

2. Additional upper-division requirements (8 units)
  - a) 8 additional upper-division units taken from BCH 110A, BCH 110B, BCH 110C or BIOL 107A (other upper division CHEM/BIOL/BCH may be substituted upon approval)

2. (No Change)
  - a. (No Change)

**Physics Education Track (B.S. degree ~~only~~)**

1. Additional lower-division requirements (~~40 units~~)
  - a) EDUC 003, EDUC 004
2. Additional upper-division requirements (8 units)
  - a) Choose two courses from the following list: ~~EDUC 109 or EDUC 109S, EDUC 110 or EDUC 110S, EDUC 116 or EDUC 116S, EDUC 174 or EDUC 174S, EDUC 175 or EDUC 175S~~

**Physics Education Track (B.S. degree)**

1. Additional lower-division requirements (6 units)
  - a) EDUC 003, EDUC 004
2. Additional upper-division requirements (8 units)
  - a) Choose two courses from the following list: EDUC 105 (highly recommended), EDUC 147, EDUC 162, EDUC 132, EDUC 178 or EDUC 177, EDUC 179A

**Physics: Applied Physics and Engineering Track (B.S degree)**

1. 16 additional units of approved Engineering electives including a minimum of 8 units at the upper-division level. A list of approved CS, EE, ME, CEE, CHE, and BIEN courses is available upon request from your physics faculty academic advisor or your advisor in the CNAS Advising Center. Example course plans can be found in the department web pages.

1. (No Change)

Students continuing on to graduate school are encouraged to take additional upper-division courses in Mathematics, such as MATH 146A, MATH 146B, MATH 146C, MATH 165A, MATH 165B, and ~~MATH 113~~.

Students continuing on to graduate school are encouraged to take additional upper-division courses in Mathematics, such as MATH 146A, MATH 146B, MATH 146C, MATH 165A, MATH 165B, and MATH 131.

Students may wish to earn a Minor in Mathematics which requires an additional 24 units of upper division math.

(No Change)

To graduate, a minimum grade point average of

(No Change)

2.00 (C) is necessary overall and in the upper-division courses taken for the major (courses listed under 2.).

**Justification:**

- 1) The department wants to encourage students to participate in summer research. The capstone Advanced Lab class (PHYS 142) has limited capacity. All students must take it once. We feel participation in a high-quality summer research program, such as a NSF REU, the SULI program, or the NASA/JPL/UCR FIELDS program, at least meets and often surpasses the value of the research experience they would get from a second quarter of PHYS 142. By allowing a summer research program, approved by a faculty academic advisor, to substitute for the second quarter of PHYS 142, we will add flexibility, incentivize research, and relieve enrollment pressure on PHYS 142, which is now a bottleneck for the major due to its limited capacity. Note that if a student uses a summer research experience in place of the second quarter of PHYS 142, they must take an additional 4-unit physics elective.
- 2) The first change is correcting an error. For the second change, EDUC 105 is a new course with the title "Introduction to Science Pedagogy", which covers contemporary pedagogical teaching strategies, including the Common Core State Standards and the new Next Generation Science Standards. This is an ideal course for the Physics Education Track.
- 3) We are adapting to the EDUC course's renumbering and discontinuing changes and we want the text of the catalog to be correct. Not changing it wouldn't make sense.
- 4) The only difference is changing MATH 113 to MATH 131 at the end of the sentence. This is a correction of an error. When the math department changed the course number for Linear Algebra I from 113 to 131, the text here wasn't updated. The course MATH 113 no longer exists. The correct course is MATH 131.

**Approvals:**

|   |                  |
|---|------------------|
| Approved by the Faculty of the Department of Physics and Astronomy:               | October 23, 2018 |
| Approved by the College of Natural and Agricultural Sciences Executive Committee: | October 1, 2019  |
| Approved by the Committee on Educational Policy:                                  | October 11, 2019 |