

Degree Requirements for B.S. in Engineering Physics (Plan 4)

This program leads to a Bachelor of Science degree in four years.

The purpose of Plan 4 is to give the Engineering student a thorough, fundamental training in physics and in its applications. With this preparation a student can proceed to graduate work or to professional employment. Students intending to graduate under this program must complete 128 credit hours, including courses as detailed below.

Physics (45 hours):

| Course # & Credit Hours | Course Name | |
|---|--|---|
| PHYS 1110-4 ¹ | Gen. Physics 1 | Corequisite: MATH 1300 or APPM 1350 |
| PHYS 1120-4 ² | General Physics 2 | Prerequisite: PHYS 1110 Corequisite: MATH 2300 or APPM 1360 Normally taken concurrently with PHYS 1140 |
| PHYS 1140-1 ² | Experimental Physics 1 | Prerequisite: PHYS1110 Prerequisite or Corequisite: PHYS1120 |
| PHYS 2150-1 | Experimental Physics | Corequisite: PHYS 2170 |
| PHYS 2170-3 ³ or PHYS 2130 ³ (by petition) | Found. of Modern Physics General Physics 3 | Prerequisite: PHYS 1120 Corequisite: MATH 2400 or APPM 2350 Prerequisites: PHYS1120 and PHYS1140 or ECEN 2250 and ECEN 3400 Corequisite: MATH2400 Normally taken with PHYS 2150 |
| PHYS 2210-3 | Class Mech & Math Methods I | Prerequisites: PHYS 2130 or PHYS 2170 and MATH 2400 or APPM 2350 Corequisite: APPM 2360 ⁴ |
| PHYS 3210-3 | Class Mech & Math Methods 2 (PHYS 3210, Analytical Mechanics, will be taught the last time in Fall '05) * | Prerequisite: PHYS 2210 and APPM 2360 ⁴ or equivalent |
| PHYS 3220-3 | Quantum Mechanics 1 | Prerequisites: PHYS 2210, PHYS 3210 and one of the following: PHYS 2130 or PHYS 2170 |
| PHYS 3310-3 | Electricity & Magnetism 1 | Prerequisite: PHYS 2210 and one of the following: PHYS 2130 or PHYS 2170 |
| PHYS 3320-3 | Electricity & Magnetism 2 | Prerequisite: PHYS 3310 |
| PHYS 3330-2 | Junior Laboratory Electronics for Phys. Sciences | Prerequisites: PHYS 2130 and PHYS 2150 |
| PHYS 4230-3 | Thermodynamics & Statistical Mechanics | Prerequisites: PHYS 3220 and APPM 2360 ⁴ |
| PHYS 4410-3 | Quant. Mech. & Atom. Phys. 2 | Prerequisites: PHYS 3220 and PHYS 3320 |

¹ Students with advanced high school physics credit (see University Catalog on advanced placement) may choose to skip PHYS 1110.

² It is acceptable for students who started with PHYS 2010 and then decide to become physics majors to go into PHYS 1120. Similarly, it is not essential for students who have completed PHYS 2020 to take PHYS 1120 and PHYS 1140.

³ PHYS 2170 is the recommended third semester modern physics course; however, students who have taken PHYS 2130 (a course designed for engineering students) can petition to substitute this course for PHYS 2170.

⁴ The combination MATH 3130-3 and MATH 4430-3 may be substituted for APPM 2360-4 and the upper division mathematics elective; however, both should be completed before taking PHYS 3210-3.

In addition, **9 credit hours** from the following list of courses are required.

Three of the nine hours must be one of the courses PHYS 3340, PHYS 4430, or PHYS 5430; or a research activity of 3 credit hours. This research may be completed in one of the following ways: (1) under either 4610, 4620, 4630 (Honors) or 4840, 4850 (Independent Study); or (2) by documentation of your accomplishments as an intern with a research group within the Physics Department or a suitable cognate department, institute, or external entity such as NCAR, NIST, NOAA, etc. Approval by a Physics Department advisor is required for option (2) and should be obtained in advance.

Up to 3 credit hours earned under choice (1) may be counted toward the electives requirement. No academic credit is earned under the internship option (2).

| Course # & Credit Hours | Course Name | |
|---|------------------------------|--|
| PHYS 3340-3 | Research/Optical Phys. | Prerequisite: PHYS 3330 |
| PHYS 4150-3 | Plasma Physics | Prerequisites: PHYS 1110 and PHYS 1120 and one of the following: MATH 2400 or APPM 2350 Corequisite: PHYS 3310 |
| PHYS 4340-3 | Intro to Solid State Physics | Prerequisite: PHYS 3220 Same as ECEN 4345 |
| PHYS 4420-3 | Nuclear & Particle Physics | Prerequisite: PHYS 4410 |
| PHYS 4430-3 | Modern Physics Lab | Prerequisites: PHYS 3220 and PHYS 3320 Corequisite: PHYS 4410 Same as PHYS 5430 |
| PHYS 4510-3 | Optics | Prerequisite: PHYS 3320 |
| PHYS 4610-2 PHYS 4620-2 PHYS 4630-2 | Physics Honors | Permission of Instructor |
| PHYS 4801-3 | Computational Physics | Prerequisites: PHYS 2170, PHYS 3210 and CSCI 1200 or programming experience or instructor consent Recommended prerequisite: PHYS 4230 Same as PHYS 5001 |
| PHYS 4810 1-3 PHYS 4820 1-3 PHYS 4830 1-3 | Special Topics in Physics | Permission of Instructor May take up to 7 total credit hours of Special Topics |
| PHYS 4840 1-3 PHYS 4850 1-3 | Independent Study | Permission of Instructor May take up to 7 total credit hours of Independent Study |
| PHYS 5030-3 | Intermediate Math Physics 1 | Prerequisites: MATH 4310 and MATH 4320 Same as MATH 5030 |
| PHYS 5040-3 | Intermediate Math Physics 2 | Prerequisite: PHYS 5030 Same as MATH 5040 |
| PHYS 5770-3 | Gravitational Theory | Prerequisites: PHYS 3220 and PHYS 3320 |

The following ancillary courses are also required.

Chemistry (10 hours):

| Course # & Credit Hours | Course Name | |
|--|--|--|
| CHEM 1111-5 and CHEM 1131-5 or CHEM 1151-5 and CHEM 1171-5 | General Chemistry 1 General Chemistry 2 Honors Gen Chemistry 1 Honors Gen Chemistry 2 | Prerequisites: 1 yr. h.s. chem. or min. grade C- in CHEM 1001 or 1021 and h.s. math through pre-calculus Prerequisites: 1 yr. h.s. chem, 4 yrs. h.s. math and/or high score on SAT or ACT math exam & 1 yr. h.s. physics Prerequisites: 1 yr. h.s. chem, 4 yrs. h.s. math and/or high score on SAT or ACT math exam & 1 yr. h.s. physics Prerequisite: CHEM 1151 with grade of C- or higher |

Students may take Physical Chemistry (CHEM 4521 & CHEM 4541) in place of (or in addition to) Chemistry 2.

Mathematics (19 hours):

| Course # & Credit Hours | Course Name | |
|-------------------------|--|--|
| APPM 1350-4 | Calculus 1 for Engineers | Prerequisites: 2 yrs. h.s. algebra, 1 yr. geometry and ½ yr. trigonometry or approval of faculty advisor |
| APPM 1360-4 | Calculus 2 for Engineers | Prerequisite: APPM 1350 or MATH 1300 with a min. grade of C- |
| APPM 2350-4 | Calculus 3 for Engineers | Prerequisite: APPM 1360 or MATH 2300 with a min. grade of C- |
| APPM 2360-4 | Intro. to Differential Equations with Linear Algebra | Prerequisite: APPM 1360 or MATH 2300 with a min. grade of C- |

An upper division Math or Applied Math course of at least 3 hours

Computer Science/Drafting (5-7 hours):

| | | |
|---|--|---|
| CSCI 1300-4 or CSCI 1200-4 or GEEN 1300-3 | Computer Science 1: Programming Intro. to Programming Intro. to Engineering Computing | |
| AREN 1017-2 or MCEN 1025-3 or 2 nd C.S. Course | Engineering Drawing Computer-Aided Drawing and Fabrication other than those listed above | Course must be a least three (3) credit hours |

The following courses are also required:

Engineering Electives (18-20 hours):

18 - 20 hours of courses offered by any department in the College of Engineering, or the Applied Math Department, in addition to the required courses listed above, including one upper division laboratory course. **Total hours required in Engineering electives plus Computer Science plus Drafting = 25.**

Humanities (18 hours):

For more details on the College Of Engineering Humanities requirements visit:

engineering.colorado.edu/homer

Free Electives (11 hours minimum):

After completing the above requirements, students must take at least 11 hours of free electives to meet the minimum 128 credit hours required for the B.S. degree.

To qualify for a Bachelor of Science degree in the College of Engineering, students must pass at least 128 hours with a grade point average of at least 2.0 for all courses attempted at the University of Colorado, and a 2.0 average for all Physics courses.

For students majoring in Physics under Plan 4, a recommended course sequence is as follows:

FRESHMAN YEAR

Fall
PHYS 1110¹
APPM 1350

Spring
PHYS 1120² and PHYS 1140²
APPM 1360

SOPHOMORE YEAR

Fall
PHYS 2170³ and PHYS 2150
APPM 2350

Spring
PHYS 2210
APPM 2360

JUNIOR YEAR

Fall
PHYS 3210, PHYS 3310 and PHYS 3330

Spring
PHYS 3220, PHYS 3320 and Elective

SENIOR YEAR

Fall
PHYS 4230 and PHYS 4410

Spring
Two electives⁵

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³ PHYS 2170 is the recommended third semester modern physics course; however, students who have taken PHYS 2130 (a course designed for engineering students) can petition to substitute this course for PHYS 2170.

⁴ The combination MATH 3130-3 and MATH 4430-3 may be substituted for APPM 2360-4 and the upper division mathematics elective; however, both should be completed before taking PHYS 3210-3

⁵ Some courses may only be offered during fall term.