

Department of

# Physics

**Stephen Turcotte, Department Chair**

Rodney Bain, Richard Hatt, Evan Hansen, Stephen McNeil, Kevin Kelley, Todd Lines, Ryan Nielson, David Oliphant, Brian Pyper, Brian Tonks, Stephen Turcotte  
 Melanie Nelson, Secretary (208) 496-1913  
<http://www.byui.edu/Physics/>

## Introduction

“The most incomprehensible thing about the universe is that it is comprehensible.” - Albert Einstein

Physics is devoted to the study of matter and energy on a range of scales extending from the size of the atom to the size of the entire universe. Advances in our understanding of matter and its interactions have led to great scientific and technological progress. This progress will continue in the future as physicists refine their tools and techniques of inquiry.

A background in Physics opens up a wide variety of career opportunities. Solid state physicists are involved in the semiconductor industry and the development of a wide range of materials such as superconductors, ceramics, and conducting polymers. Nuclear physicists are in high demand in nuclear medicine, now used extensively for diagnosis and treatment. The nuclear energy industry is poised to experience rapid growth in the next few years. A background in optics can be applied in fiber optic communication and the design of optical instruments for astronomy and the aerospace industry. In addition, physics is applied in a variety of scientific and engineering fields including astronomy, biology, geology, and acoustics.

Physicists have the scientific and technological versatility that allows them to work in a wide range of levels and disciplines. In recent years, physicists have been utilized in areas outside of science and The Bachelor of Science (B.S.) degree in physics at BYU-Idaho of-

fers students a solid foundation in both classical and modern physics. Students take a range of introductory and advanced classes in mechanics, electricity and magnetism, quantum mechanics, and thermal physics. In addition, the laboratory courses give students valuable skills and knowledge in experimental physics, extensive experience in modeling and simulations, and computer control of devices and data acquisition.

In addition to the knowledge that students gain in the physics program at BYU-Idaho, students develop a comprehensive set of valuable skills that can be applied to many career paths. These skills include (but are not limited to) critical thinking, reading, and writing skills, mathematical and conceptual reasoning, computer skills, leadership and communication skills, problem solving, creativity, synthesizing results and applying theory to real world problems.

After completing their B.S. in physics from BYU-Idaho, students will have a wide range of opportunities. These include the following:

- Graduate school: students can continue their studies in physics or a number of other disciplines
- Professional school: students can go on to medical school, dental school, business school or law school
- Industry: Physicists are hired by a number of companies and government labs throughout the country

The Bachelor of Science in Physics Education at BYU-Idaho prepares students to teach physics in high school. Each Physics Education major must complete the Secondary Education Core and carefully select an approved education minor. Please discuss your choice of an Education minor with your advisor.

## Supported Tracks

The physics department supports all three tracks (FW, WS, SF) during the freshman and sophomore years. Before the junior year, a student will need to switch to the FW track.

## Technical Industrial Science Majors

These majors take a two semester Introductory Applied Physics course (PH 105 and 106, which includes a lab component). These courses require extensive use of Algebra and Trigonometry. CHECK WITH ADVISOR TO ENSURE THAT YOU ARE ENROLLED IN THE CORRECT COURSE.

## Life Science/ Pre-Medicine, Architecture Majors

These majors take a two semester Pre-Medical Professional Physics course (PH 115 and PH 116, which includes a lab component). These courses require extensive use of Algebra and Trigonometry. CHECK WITH ADVISOR TO ENSURE THAT YOU ARE ENROLLED IN THE CORRECT COURSE.

## Physics/Chemistry/Engineering/Mathematics/Computer Science Majors

These majors take one to four calculus based Principles of Physics courses (Ph 121, 123, 220, 279), and two one-semester labs (Ph 150 & Ph 250). CHECK WITH YOUR ADVISOR TO ENSURE THAT YOU ARE ENROLLED IN THE CORRECT COURSE.

Physics

Brigham Young University-Idaho 2008-2009

**BS in Physics (770)**

Take required Foundations courses

**Major Requirements**

*No Double Counting of Major Courses - No Grade Less Than C- in Major Courses*

|   |          |   |          |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |   |        |   |        |   |        |   |        |   |  |   |         |     |        |   |  |   |                              |
|---|----------|---|----------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--|----|---|--------|---|--------|---|--------|---|--------|---|--|---|---------|-----|--------|---|--|---|------------------------------|
| <p><i>Take these courses:</i></p> <table style="width: 100%; border-collapse: collapse;"> <tr><td>MATH 215</td><td style="text-align: right;">4</td></tr> <tr><td>MATH 316</td><td style="text-align: right;">4</td></tr> <tr><td>PH 121</td><td style="text-align: right;">3</td></tr> <tr><td>PH 123</td><td style="text-align: right;">3</td></tr> <tr><td>PH 150</td><td style="text-align: right;">1</td></tr> <tr><td>PH 220</td><td style="text-align: right;">3</td></tr> <tr><td>PH 250</td><td style="text-align: right;">1</td></tr> <tr><td>PH 279</td><td style="text-align: right;">3</td></tr> <tr><td>PH 291</td><td style="text-align: right;">2</td></tr> <tr><td>PH 314</td><td style="text-align: right;">3</td></tr> <tr><td>PH 328</td><td style="text-align: right;">2</td></tr> <tr><td>PH 332</td><td style="text-align: right;">4</td></tr> <tr><td>PH 333</td><td style="text-align: right;">4</td></tr> <tr><td>PH 336</td><td style="text-align: right;">2</td></tr> <tr><td>PH 372</td><td style="text-align: right;">3</td></tr> <tr><td>PH 405</td><td style="text-align: right;">2</td></tr> <tr><td>PH 433</td><td style="text-align: right;">3</td></tr> <tr><td>PH 473</td><td style="text-align: right;">3</td></tr> <tr><td>PH 488</td><td style="text-align: right;">1</td></tr> <tr><td style="border-top: 1px solid black;"></td><td style="text-align: right; border-top: 1px solid black;">51</td></tr> </table> | MATH 215 | 4 | MATH 316 | 4 | PH 121 | 3 | PH 123 | 3 | PH 150 | 1 | PH 220 | 3 | PH 250 | 1 | PH 279 | 3 | PH 291 | 2 | PH 314 | 3 | PH 328 | 2 | PH 332 | 4 | PH 333 | 4 | PH 336 | 2 | PH 372 | 3 | PH 405 | 2 | PH 433 | 3 | PH 473 | 3 | PH 488 | 1 |  | 51 | <p><i>Take 1 courses:</i></p> <table style="width: 100%; border-collapse: collapse;"> <tr><td>PH 323</td><td style="text-align: right;">3</td></tr> <tr><td>PH 324</td><td style="text-align: right;">3</td></tr> <tr><td>PH 374</td><td style="text-align: right;">3</td></tr> <tr><td>PH 375</td><td style="text-align: right;">3</td></tr> <tr><td style="border-top: 1px solid black;"></td><td style="text-align: right; border-top: 1px solid black;">3</td></tr> </table> <p><i>Take 1 course:</i></p> <table style="width: 100%; border-collapse: collapse;"> <tr><td>PH 398R</td><td style="text-align: right;">1-3</td></tr> <tr><td>PH 406</td><td style="text-align: right;">1</td></tr> <tr><td style="border-top: 1px solid black;"></td><td style="text-align: right; border-top: 1px solid black;">1</td></tr> </table> | PH 323 | 3 | PH 324 | 3 | PH 374 | 3 | PH 375 | 3 |  | 3 | PH 398R | 1-3 | PH 406 | 1 |  | 1 | <p><i>Program Notes:</i></p> |
| MATH 215  | 4        |   |          |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |   |        |   |        |   |        |   |        |   |  |   |         |     |        |   |  |   |                              |
| MATH 316  | 4        |   |          |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |   |        |   |        |   |        |   |        |   |  |   |         |     |        |   |  |   |                              |
| PH 121  | 3        |   |          |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |   |        |   |        |   |        |   |        |   |  |   |         |     |        |   |  |   |                              |
| PH 123  | 3        |   |          |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |   |        |   |        |   |        |   |        |   |  |   |         |     |        |   |  |   |                              |
| PH 150  | 1        |   |          |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |   |        |   |        |   |        |   |        |   |  |   |         |     |        |   |  |   |                              |
| PH 220  | 3        |   |          |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |   |        |   |        |   |        |   |        |   |  |   |         |     |        |   |  |   |                              |
| PH 250  | 1        |   |          |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |   |        |   |        |   |        |   |        |   |  |   |         |     |        |   |  |   |                              |
| PH 279  | 3        |   |          |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |   |        |   |        |   |        |   |        |   |  |   |         |     |        |   |  |   |                              |
| PH 291  | 2        |   |          |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |   |        |   |        |   |        |   |        |   |  |   |         |     |        |   |  |   |                              |
| PH 314  | 3        |   |          |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |   |        |   |        |   |        |   |        |   |  |   |         |     |        |   |  |   |                              |
| PH 328  | 2        |   |          |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |   |        |   |        |   |        |   |        |   |  |   |         |     |        |   |  |   |                              |
| PH 332  | 4        |   |          |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |   |        |   |        |   |        |   |        |   |  |   |         |     |        |   |  |   |                              |
| PH 333  | 4        |   |          |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |   |        |   |        |   |        |   |        |   |  |   |         |     |        |   |  |   |                              |
| PH 336  | 2        |   |          |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |   |        |   |        |   |        |   |        |   |  |   |         |     |        |   |  |   |                              |
| PH 372  | 3        |   |          |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |   |        |   |        |   |        |   |        |   |  |   |         |     |        |   |  |   |                              |
| PH 405  | 2        |   |          |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |   |        |   |        |   |        |   |        |   |  |   |         |     |        |   |  |   |                              |
| PH 433  | 3        |   |          |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |   |        |   |        |   |        |   |        |   |  |   |         |     |        |   |  |   |                              |
| PH 473  | 3        |   |          |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |   |        |   |        |   |        |   |        |   |  |   |         |     |        |   |  |   |                              |
| PH 488  | 1        |   |          |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |   |        |   |        |   |        |   |        |   |  |   |         |     |        |   |  |   |                              |
|   | 51       |   |          |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |   |        |   |        |   |        |   |        |   |  |   |         |     |        |   |  |   |                              |
| PH 323  | 3        |   |          |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |   |        |   |        |   |        |   |        |   |  |   |         |     |        |   |  |   |                              |
| PH 324  | 3        |   |          |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |   |        |   |        |   |        |   |        |   |  |   |         |     |        |   |  |   |                              |
| PH 374  | 3        |   |          |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |   |        |   |        |   |        |   |        |   |  |   |         |     |        |   |  |   |                              |
| PH 375  | 3        |   |          |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |   |        |   |        |   |        |   |        |   |  |   |         |     |        |   |  |   |                              |
|   | 3        |   |          |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |   |        |   |        |   |        |   |        |   |  |   |         |     |        |   |  |   |                              |
| PH 398R   | 1-3      |   |          |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |   |        |   |        |   |        |   |        |   |  |   |         |     |        |   |  |   |                              |
| PH 406  | 1        |   |          |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |   |        |   |        |   |        |   |        |   |  |   |         |     |        |   |  |   |                              |
|   | 1        |   |          |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |   |        |   |        |   |        |   |        |   |  |   |         |     |        |   |  |   |                              |

**Total Major Credits=55**

**This major also requires a minor or 2 clusters**

This major is available on the following tracks:

Fall-Winter---- YES                      Winter-Spring/Spring-Fall----                      Freshman Sophomore YES/Junior Senior NO

**BS in Physics Education (870)**

Take required Foundations courses

**Major Requirements**

*No Double Counting of Major Courses - No Grade Less Than C- in Major Courses*

|  |        |   |        |   |        |   |        |   |        |    |          |   |  |    |   |           |   |          |   |        |   |        |   |        |   |         |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |                              |
|--|--------|---|--------|---|--------|---|--------|---|--------|----|----------|---|--|----|---|-----------|---|----------|---|--------|---|--------|---|--------|---|---------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--|----|------------------------------|
| <p>Education Core</p> <p><i>Take these courses:</i></p> <table style="width: 100%; border-collapse: collapse;"> <tr><td>ED 200</td><td style="text-align: right;">2</td></tr> <tr><td>ED 304</td><td style="text-align: right;">3</td></tr> <tr><td>ED 361</td><td style="text-align: right;">3</td></tr> <tr><td>ED 461</td><td style="text-align: right;">3</td></tr> <tr><td>ED 492</td><td style="text-align: right;">10</td></tr> <tr><td>SPED 360</td><td style="text-align: right;">2</td></tr> <tr><td style="border-top: 1px solid black;"></td><td style="text-align: right; border-top: 1px solid black;">23</td></tr> </table> | ED 200 | 2 | ED 304 | 3 | ED 361 | 3 | ED 461 | 3 | ED 492 | 10 | SPED 360 | 2 |  | 23 | <p><i>Take these courses:</i></p> <table style="width: 100%; border-collapse: collapse;"> <tr><td>FDMAT 112</td><td style="text-align: right;">4</td></tr> <tr><td>MATH 113</td><td style="text-align: right;">3</td></tr> <tr><td>PH 121</td><td style="text-align: right;">3</td></tr> <tr><td>PH 123</td><td style="text-align: right;">3</td></tr> <tr><td>PH 127</td><td style="text-align: right;">3</td></tr> <tr><td>PH 127L</td><td style="text-align: right;">1</td></tr> <tr><td>PH 150</td><td style="text-align: right;">1</td></tr> <tr><td>PH 220</td><td style="text-align: right;">3</td></tr> <tr><td>PH 250</td><td style="text-align: right;">1</td></tr> <tr><td>PH 279</td><td style="text-align: right;">3</td></tr> <tr><td>PH 311</td><td style="text-align: right;">3</td></tr> <tr><td>PH 314</td><td style="text-align: right;">3</td></tr> <tr><td>PH 403</td><td style="text-align: right;">3</td></tr> <tr><td>PH 411</td><td style="text-align: right;">3</td></tr> <tr><td style="border-top: 1px solid black;"></td><td style="text-align: right; border-top: 1px solid black;">37</td></tr> </table> | FDMAT 112 | 4 | MATH 113 | 3 | PH 121 | 3 | PH 123 | 3 | PH 127 | 3 | PH 127L | 1 | PH 150 | 1 | PH 220 | 3 | PH 250 | 1 | PH 279 | 3 | PH 311 | 3 | PH 314 | 3 | PH 403 | 3 | PH 411 | 3 |  | 37 | <p><i>Program Notes:</i></p> |
| ED 200   | 2      |   |        |   |        |   |        |   |        |    |          |   |  |    |   |           |   |          |   |        |   |        |   |        |   |         |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |                              |
| ED 304   | 3      |   |        |   |        |   |        |   |        |    |          |   |  |    |   |           |   |          |   |        |   |        |   |        |   |         |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |                              |
| ED 361   | 3      |   |        |   |        |   |        |   |        |    |          |   |  |    |   |           |   |          |   |        |   |        |   |        |   |         |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |                              |
| ED 461   | 3      |   |        |   |        |   |        |   |        |    |          |   |  |    |   |           |   |          |   |        |   |        |   |        |   |         |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |                              |
| ED 492   | 10     |   |        |   |        |   |        |   |        |    |          |   |  |    |   |           |   |          |   |        |   |        |   |        |   |         |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |                              |
| SPED 360   | 2      |   |        |   |        |   |        |   |        |    |          |   |  |    |   |           |   |          |   |        |   |        |   |        |   |         |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |                              |
|  | 23     |   |        |   |        |   |        |   |        |    |          |   |  |    |   |           |   |          |   |        |   |        |   |        |   |         |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |                              |
| FDMAT 112  | 4      |   |        |   |        |   |        |   |        |    |          |   |  |    |   |           |   |          |   |        |   |        |   |        |   |         |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |                              |
| MATH 113   | 3      |   |        |   |        |   |        |   |        |    |          |   |  |    |   |           |   |          |   |        |   |        |   |        |   |         |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |                              |
| PH 121   | 3      |   |        |   |        |   |        |   |        |    |          |   |  |    |   |           |   |          |   |        |   |        |   |        |   |         |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |                              |
| PH 123   | 3      |   |        |   |        |   |        |   |        |    |          |   |  |    |   |           |   |          |   |        |   |        |   |        |   |         |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |                              |
| PH 127   | 3      |   |        |   |        |   |        |   |        |    |          |   |  |    |   |           |   |          |   |        |   |        |   |        |   |         |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |                              |
| PH 127L  | 1      |   |        |   |        |   |        |   |        |    |          |   |  |    |   |           |   |          |   |        |   |        |   |        |   |         |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |                              |
| PH 150   | 1      |   |        |   |        |   |        |   |        |    |          |   |  |    |   |           |   |          |   |        |   |        |   |        |   |         |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |                              |
| PH 220   | 3      |   |        |   |        |   |        |   |        |    |          |   |  |    |   |           |   |          |   |        |   |        |   |        |   |         |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |                              |
| PH 250   | 1      |   |        |   |        |   |        |   |        |    |          |   |  |    |   |           |   |          |   |        |   |        |   |        |   |         |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |                              |
| PH 279   | 3      |   |        |   |        |   |        |   |        |    |          |   |  |    |   |           |   |          |   |        |   |        |   |        |   |         |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |                              |
| PH 311   | 3      |   |        |   |        |   |        |   |        |    |          |   |  |    |   |           |   |          |   |        |   |        |   |        |   |         |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |                              |
| PH 314   | 3      |   |        |   |        |   |        |   |        |    |          |   |  |    |   |           |   |          |   |        |   |        |   |        |   |         |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |                              |
| PH 403   | 3      |   |        |   |        |   |        |   |        |    |          |   |  |    |   |           |   |          |   |        |   |        |   |        |   |         |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |                              |
| PH 411   | 3      |   |        |   |        |   |        |   |        |    |          |   |  |    |   |           |   |          |   |        |   |        |   |        |   |         |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |                              |
|  | 37     |   |        |   |        |   |        |   |        |    |          |   |  |    |   |           |   |          |   |        |   |        |   |        |   |         |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |    |                              |

**Total Major Credits=37**

**Total Education Core Credits=23**

This major is available on the following tracks:

Fall-Winter---- YES                      Winter-Spring---- NO                      Spring-Fall---- YES

### Minor in Physics (104)

#### Minor Requirements

*No Double Counting of Minor Courses*

|                            |    |
|----------------------------|----|
| <i>Take these courses:</i> |    |
| MATH 215                   | 4  |
| PH 121                     | 3  |
| PH 123                     | 3  |
| PH 150                     | 1  |
| PH 220                     | 3  |
| PH 250                     | 1  |
| PH 279                     | 3  |
| PH 311                     | 3  |
| PH 314                     | 3  |
|                            | 24 |

|                       |
|-----------------------|
| <i>Program Notes:</i> |
|-----------------------|

**Total Minor Credits=24**

This minor is available on the following tracks:

Fall-Winter---- YES

Winter-Spring---- YES

Spring-Fall---- YES

### Minor in Physics Education (178)

#### Minor Requirements

*No Double Counting of Minor Courses*

|                            |    |
|----------------------------|----|
| <i>Take these courses:</i> |    |
| PH 121                     | 3  |
| PH 123                     | 3  |
| PH 150                     | 1  |
| PH 220                     | 3  |
| PH 250                     | 1  |
| PH 279                     | 3  |
| PH 311                     | 3  |
| PH 314                     | 3  |
|                            | 20 |

|                       |
|-----------------------|
| <i>Program Notes:</i> |
|-----------------------|

**Total Minor Credits=20**

This minor is available on the following tracks:

Fall-Winter---- YES

Winter-Spring---- YES

Spring-Fall---- YES

### Minor in Physical Science Education (182)

#### Minor Requirements

*No Double Counting of Minor Courses*

|                            |   |                       |   |                            |   |
|----------------------------|---|-----------------------|---|----------------------------|---|
| <i>Take these courses:</i> |   | <i>Take 1 course:</i> |   | <i>Take these courses:</i> |   |
| CHEM 105                   | 4 | CHEM 150              | 5 | PH 105                     | 4 |
| CHEM 106                   | 4 | CHEM 220              | 5 | PH 106                     | 4 |
|                            | 8 | CHEM 351              | 4 |                            | 8 |
|                            |   |                       | 4 | OR                         |   |
|                            |   |                       |   | Take these courses:        |   |
|                            |   |                       |   | PH 115                     | 4 |
|                            |   |                       |   | PH 116                     | 4 |
|                            |   |                       |   |                            | 8 |

|                       |
|-----------------------|
| <i>Program Notes:</i> |
|-----------------------|

**Total Minor Credits=20**

This minor is available on the following tracks:

Fall-Winter---- YES

Winter-Spring---- YES

Spring-Fall---- YES

# Physics

Brigham Young University-Idaho 2008-2009

## Physics Pre-approved Clusters

| Technical Physics       |   |                  |
|-------------------------|---|------------------|
| <i>Take 12 Credits:</i> |   |                  |
| PH 121                  | Principles of Physics I   | 3                |
| PH 123                  | Principles of Physics II  | 3                |
| PH 150                  | Beginning Physics Lab   | 1                |
| PH 220                  | Principles of Physics III   | 3                |
| PH 250                  | Intermediate Physics Laboratory for<br>Physics and Physical Science | 1                |
| PH 279                  | Modern Physics  | 3                |
| PH 311                  | Physics by Inquiry I  | 3                |
| PH 314                  | History/Philosophy of Science                                       | <u>3</u>         |
| <b>Total Credits</b>    |   | <b><u>12</u></b> |

| Physics Exposure     |                                 |                  |
|----------------------|---------------------------------|------------------|
| <i>Take either</i>   |                                 |                  |
| PH 105               | Introductory Applied Physics I  | 4                |
| PH 106               | Introductory Applied Physics II | 4                |
| OR                   |                                 |                  |
| PH 115               | Pre-Med Professional Physics I  | 4                |
| PH 116               | Pre-Med Professional Physics II | 4                |
| AND                  |                                 |                  |
| PH 311               | Physics by Inquiry I            | 3                |
| PH 314               | History/Philosophy of Science   | <u>3</u>         |
| <b>Total Credits</b> |                                 | <b><u>14</u></b> |

## Physical Science Pre-approved Clusters

| Pre-Medical Professional |                                 |                  |
|--------------------------|---------------------------------|------------------|
| <i>Take 12 credits:</i>  |                                 |                  |
| PH 105                   | Introductory Applied Physics I  | 4                |
| PH 106                   | Introductory Applied Physics I  | 4                |
| OR                       |                                 |                  |
| PH 115                   | Pre-Med Professional Physics I  | 4                |
| PH 116                   | Pre-Med Professional Physics II | 4                |
| AND                      |                                 |                  |
| <i>Take 1 course:</i>    |                                 |                  |
| CHEM 105                 | General Chemistry               | 4                |
| CHEM 106                 | General Chemistry               | <u>4</u>         |
| <b>Total Credits</b>     |                                 | <b><u>12</u></b> |

| Physical Science and Mathematics                               |                                  |                  |
|--|----------------------------------|------------------|
| <i>Take 12 credits from at least 2 of the following areas:</i> |                                  |                  |
| <b>Chemistry</b>   |                                  |                  |
| CHEM 105   | General Chemistry                | 4                |
| CHEM 106   | General Chemistry                | 4                |
| <b>Physics</b>   |                                  |                  |
| PH 105   | Introductory Applied Physics I   | 4                |
| PH 106   | Introductory Applied Physics I   | 4                |
| OR   |                                  |                  |
| PH 115   | Pre-Med Professional Physics I   | 4                |
| PH 116   | Pre-Med Professional Physics II  | 4                |
| OR   |                                  |                  |
| PH 121   | Principles of Physics I          | 3                |
| PH 123   | Principles of Physics II         | 3                |
| PH 220   | Principles of Physics III        | 3                |
| <b>Geology</b>   |                                  |                  |
| <i>Take 1 course:</i>  |                                  |                  |
| GEOL 101   | Introduction to Physical Geology | 3                |
| GEOL 104   | Natural Disasters and Resources  | 3                |
| GEOL 111   | Physical Geology                 | 3                |
| <i>Take these courses:</i>                                     |                                  |                  |
| GEOL 111L  | Physical Geology Lab             | 1                |
| GEOL 112   | Historical Geology               | 3                |
| GEOL 112L  | Historical Geology Lab           | 1                |
| <b>Mathematics</b>   |                                  |                  |
| Take any Math class numbered 111 or higher                     |                                  | <u>3</u>         |
| <b>Total Credits</b>   |                                  | <b><u>12</u></b> |

| Course Descriptions  | Credits*       |   |
|--|----------------|---|
| <b>PH 101 Fundamentals of Physics</b><br>Fullfills GE Physical Science requirement.<br>Principles of classical and modern physics as they relate to current concepts of the physical environment.<br>(Fall, Winter, Spring)  | <b>(3:3:0)</b> | <b>PH 123 Principles of Physics II</b> <b>(3:5:0)</b><br>Prerequisite: PH 121 or ME 204. Concurrent Registration or completion of Math 113 or Math 215<br>This course is the second semester of the Principles of Physics sequence. The course is designed for students majoring in physics, engineering, chemistry and mathematics. The course covers topics in waves, thermodynamics, and optics. These areas of study are important in a wide variety of engineering and scientific disciplines. For example, an understanding of wave properties is essential in various electrical engineering applications such as wireless communication as well as all aspects of acoustics and vibration analysis. Thermodynamics has a variety of applications in engine design and heat transfer. Finally, principles of optics are involved in fiber-optic communication, instrument design, scanners, surveillance, etc.<br>(Fall, Winter, Spring) |
| <b>PH 101L Fundamentals of Physics Lab</b><br>Fullfills GE Physical Science requirement.<br>Prerequisite: Concurrent Registration: PH 101, Competency with High School Algebra is assumed<br>This laboratory is designed to provide students with experience in making and analyzing measurements of the physical environment at a fundamental level. Must be taken concurrently with Fundamentals of Physics PH 101.<br>(Fall, Winter, Spring)  | <b>(1:0:3)</b> | <b>PH 127 Descriptive Astronomy</b> <b>(3:3:0)</b><br>Fullfills GE Physical Science requirement.<br>Prerequisite: Math level: High School Algebra. Must be taken concurrently with PH 127L<br>Astronomy is the study of the heavens and the Earth as a planet. This course introduces students to the wonders of the heavens and the fundamental observation concepts, and theories of modern astronomy. Students also learn how scientists discover this information. Occasional use is made of the planetarium and observatory.<br>(Fall, Winter, Spring)   |
| <b>PH 105 Introctory Applied Physics I</b><br>Fullfills GE Physical Science requirement.<br>Prerequisite: FDMAT 108 or FDMAT 110 and Math 111.<br>This course is the first semester of the algebra and trigonometry based Applied Physics sequence. While this course satisfies the physics requirement for most medical schools, it does not specifically address preparation for the MCAT exam. This course includes a three-hour lab.<br>(Fall, Winter, Spring)   | <b>(4:3:3)</b> | <b>PH 127L Astronomy Lab</b> <b>(1:0:3)</b><br>Fullfills GE Physical Science requirement.<br>Prerequisite: Math level: Extensive use of High School Algebra. Must be taken concurrently with PH 127.<br>This laboratory is designed to give the student experience in observing and analyzing basic astronomical phenomena. Students more deeply appreciate how scientists learn information about the stars and planets.<br>(Fall, Winter, Spring)   |
| <b>PH 106 Introductory Applied Physics II</b><br>Fullfills GE Physical Science requirement.<br>Prerequisite: Ph 105<br>This course is the second semester of the algebra and trigonometry based Applied Physics sequence. This course includes a three-hour lab.<br>(Fall, Winter, Spring)   | <b>(4:3:3)</b> | <b>PH 150 Beginning Physics Lab</b> <b>(1:0:3)</b><br>Fullfills GE Physical Science requirement.<br>Prerequisite: Completion of or concurrent enrollment in Physics 121.<br>This course introduces students to the basics of experimental physics. It is designed to help students learn to think analytically and to gain experience in doing common experiments in physics. It teaches students how to analyze data and numerically model common physics problems.<br>(Fall, Winter, Spring)  |
| <b>PH 115 Pre-Medical Professional Physics I</b><br>Fullfills GE Physical Science requirement.<br>Prerequisite: FDMAT 110 and Math 111 or High School Trigonometry. Math Level: Extensive use of college algebra, trigonometry.<br>A general course particularly designed for pre-medical students, but also appropriate for architecture and biology students. It is designed to address the concepts and topics needed to prepare students for the MCAT and entrance into professional schools. The style of MCAT physics questions is addressed directly.<br>(Fall, Winter, Spring) | <b>(4:3:3)</b> | <b>PH 220 Principles of Physics III</b> <b>(3:5:0)</b><br>Prerequisite: Physics 121 or ME 204 (Dynamics)<br>Concurrent Registration or completion of Math 113 or Math 215.<br>Math Level: Extensive use of College Algebra, Trigonometry, and single and multi-variable Calculus.<br>Third of a four semester sequence. Principles of Electricity and Magnetism with emphasis on combining intuition and past experience with mathematics to understand the laws of electricity and magnetism.<br>(Fall, Winter, Spring)  |
| <b>PH 116 Pre-Medical Professional Physics II</b><br>Fullfills GE Physical Science requirement.<br>Prerequisite: PH 115 or equivalent experience and permission of the instructor.<br>Second course in sequence of general physics particularly designed for pre-medical students, but also appropriate for architecture and biology students. It is designed to address the concepts and topics needed to prepare students for the MCAT and entrance into professional schools. The style of MCAT physics questions is addressed directly.<br>(Fall, Winter, Spring)                  | <b>(4:3:3)</b> | <b>PH 250 Intermediate Physics Laboratory for Physics and Physical Science</b> <b>(1:0:3)</b><br>Prerequisite: FDMAT 112, Physics 150. Completion of or concurrent enrollment in Physics 220. Math Level: Extensive use of college algebra, trigonometry, and elementary calculus.<br>Intermediate Physics Laboratory for Physics and Physical Science Teaching Majors. Experimental investigations into electricity and magnetism.<br>(Fall, Winter)   |
| <b>PH 117 Descriptive Acoustics of Music and Speech</b><br>Fullfills GE Physical Science requirement.<br>Introductory acoustics course surveying the physical principles underlying the production and perception of sound, music and speech.<br>(Fall, Winter)  | <b>(3:3:0)</b> | <b>PH 279 Modern Physics</b> <b>(3:3:0)</b><br>Prerequisite: PH 121, PH 123, Math 113 or Math 215 & concurrent registration or completion of PH 220.<br>Fourth of the Principles of Physics sequence. Introductory course dealing with the fundamental topics of modern physics, including special relativity, elementary quantum mechanics, nuclear physics, and some particle physics.<br>(Fall, Winter, Spring)  |
| <b>PH 117L Acoustics Lab</b><br>Fullfills GE Physical Science requirement.<br>This lab addresses basic measurements, vibrations, wave properties, superposition and spectra, perception and measurement, and room properties. Emphasis is placed on the experience, reasoning, and observations that support understanding in the course. Must be taken with Descriptive Acoustics of Music and Speech, PH 117<br>(Fall, Winter)   | <b>(1:0:3)</b> |   |
| <b>PH 121 Principles of Physics I</b><br>Fullfills GE Physical Science requirement.<br>Prerequisite: Concurrent Registration or completion of FDMAT 112. Math Level: Extensive use of College Algebra, Trigonometry, and Elementary Calculus.<br>Classical Mechanics with emphasis on combining intuition and past experience with mathematics to understand the fundamental laws of nature.<br>(Fall, Winter, Spring)   | <b>(3:5:0)</b> |   |

# Physics

Brigham Young University-Idaho 2008-2009

|  |   |
|--|---|
| <p><b>PH 291 Wave Physics</b> (2:2:0)<br/>           Prerequisite: Concurrent registration or completion of Math 316 or Math 371 and PH 279.<br/>           Physics course that reviews mathematical methods in the context of wave phenomena. Prepares students for the mathematical rigors of upper division physics. (Winter, Spring)</p> <p><b>PH 311 Physics By Inquiry I</b> (3:2:3)<br/>           Prerequisite: Junior level standing or permission of the instructor.<br/>           This hands-on course covers selected topics in physics with emphasis on depth of understanding and developing skills essential to the scientific process. The skills include observation, interpretation, reasoning, generalizing, predicting, questioning and related communication skills. It provides an experience in education by inquiry, and background for teaching as a process of inquiry. (Fall)</p> <p><b>PH 314 History/Philosophy of Science</b> (3:3:0)<br/>           Fulfills GE Letters requirement.<br/>           Prerequisite: Completion of Physical Science GE class and its associated lab.<br/>           Math Level: Some use of high school algebra I<br/>           This course discusses the philosophical foundations of modern science, including the relationship between observations and theory, criteria for theory selection, and the assumptions upon which science is built. It traces the historical development of this foundation and describes the strengths and limitations of modern science. It also describes the historical development of fundamental scientific ideas. (Fall, Winter)</p> <p><b>PH 323 Solid State Physics</b> (3:3:0)<br/>           Prerequisite: PH 279, Math 316<br/>           This in-depth course introduces the basic mathematical and conceptual tools necessary to study the structural, electrical, thermal, and mechanical properties of matter in the solid state. (Fall)</p> <p><b>PH 324 Nuclear and Particle Physics</b> (3:3:0)<br/>           Prerequisite: PH 279<br/>           This is a junior level survey course which introduces the physics of atomic nuclei and elementary particles. (Fall)</p> <p><b>PH 328 Introduction to Physics Research</b> (2:2:0)<br/>           Prerequisite: PH 220, Math 214 or Math 316, &amp; Professional Communication Course.<br/>           Introduces students to the research process in physics. Acquaints students with possible career tracks in physics. Begins or models the senior thesis or internship process. (Fall)</p> <p><b>PH 332 Classical Mechanics</b> (4:4:0)<br/>           Prerequisite: Math 316 or Math 371<br/>           This is a junior level course applying Newton's Laws of Motion in a wide variety of applications. (Fall)</p> <p><b>PH 333 Electricity &amp; Magnetism</b> (4:4:0)<br/>           Prerequisite: Physics 220, Math 316 or Math 371<br/>           This is a junior level course which covers electromagnetic theory. (Fall)</p> <p><b>PH 336 Advanced Physics Lab</b> (2:1:5)<br/>           Prerequisite: Physics 250<br/>           Completion of or current enrollment in PH 332<br/>           Advanced Physics Laboratory for Physics Majors. This course introduces students to important experimental methods and technologies used in physics research. This lab will aid in preparing students for the experimental aspect of their senior research project and/or their internship. (Winter)</p> <p><b>PH 372 Thermal and Statistical Physics</b> (3:3:0)<br/>           Prerequisite: Physics 220. Math 316 or 371.<br/>           This is a junior level course covering classical thermodynamics and statistical mechanics. This class builds upon and expands some of the material that was covered in Physics 123. (Winter)</p> | <p><b>PH 374 Astrophysics</b> (3:3:0)<br/>           Prerequisite: PH 279, PH 332<br/>           This is a junior level course which exposes the student to the field of introductory astrophysics. (Winter)</p> <p><b>PH 375 Principles of Optics</b> (3:3:0)<br/>           Prerequisite: PH 291, PH 333, and Math 316 or Math 472<br/>           This course covers the fundamental principles of optics. Beginning with Maxwell's Equations, the electromagnetic theory of light is studied. Fundamentals of geometric optics are revisited using electromagnetic theory. Phenomena such as polarization, interference, diffraction, and coherence are discussed. The course will also cover linear systems, and the techniques of Fourier Optics. (Winter)</p> <p><b>PH 398R Physics Internship</b> (1-3:0:0)<br/>           Prerequisite: PH 324 or Instructor Permission<br/>           A professional internship providing the student with job experience in a physics-related field. (Fall, Winter, Spring)</p> <p><b>PH 403 Methods of Physics Teaching</b> (3:3:0)<br/>           Prerequisite: PH 279 and PH 314<br/>           Methods and philosophy of teaching physics principles in a high school setting. (Fall)</p> <p><b>PH 405 Numerical Modeling in Physics</b> (2:1:3)<br/>           Prerequisite: PH 279, PH 336<br/>           A lab course that applies numerical modeling and methods to a variety of modern topics in physics. MATLAB is used in the course. (Fall)</p> <p><b>PH 406 Physics Senior Research</b> (1:1:0)<br/>           Prerequisite: PH 328 &amp; Consent of Instructor.<br/>           Students propose, develop the background for, and execute a research project culminating in production of a thesis (written in PH 488), either individually or in cooperation with other students. This project is in lieu of (or in addition to with approval) a professional internship. (Fall)</p> <p><b>PH 411 Physics by Inquiry II</b> (3:2:3)<br/>           Prerequisite: Ph 311<br/>           This hands-on course continues coverage in selected topics in physics with emphasis on depths of understanding and developing skills essential to the scientific process. These skills include observation, interpretation, reasoning, generalizing predicting, questioning, and related communication skills. It provides an experience in education by inquiry and background for teaching as a process of inquiry. Opportunity may exist to practice appropriate questioning skills. (Fall)</p> <p><b>PH 433 Quantum Mechanics</b> (3:3:0)<br/>           Prerequisite: Physics 279. Math 316 or 371.<br/>           This is a senior-level course which covers an introduction to the theory of quantum mechanics. (Fall)</p> <p><b>PH 473 Atomic and Solid State Physics</b> (3:3:0)<br/>           Prerequisite: Physics 433<br/>           This is a senior-level course which covers applications of the theory of quantum mechanics to atomic and solid state physics topics. (Winter)</p> <p><b>PH 488 Senior Thesis</b> (1:1:0)<br/>           Prerequisite: Ph 398R, PH 406<br/>           A course focused on bringing a student's research experience to conclusion by writing the formal thesis and presenting its contents to the faculty and other students. (Winter)</p> |
|--|---|

**PH.S 100 Physical Science****(3:3:0)**

Fulfills GE Physical Science requirement.

Prerequisite: Concurrent registration with PH.S 100L

This course is designed to be a survey class covering all of physical science. Physical science includes various subjects in the disciplines of physics, chemistry, astronomy, meteorology, and geology. The course is designed for students majoring in non-scientific disciplines. The course will give students a background in science that will help them better appreciate and understand the technological advances that are transforming society. (Fall, Winter, Spring)

**PH.S 100L Physical Science Laboratory****(1:0:3)**

Fulfills GE Physical Science requirement.

Prerequisite: Concurrent registration with PH.S 100.

This course consists of a series of twenty-six laboratory assignments. The assignments are drawn from a variety of topics related to physical science. Students will have an opportunity to gain "hands-on" experience applying some of the concepts learned in Ph.S 100. For example, students will make measurements of objects in motion and describe the motion in terms of displacement, velocity, and acceleration. Students will investigate electrical circuits and learn about the terminology used to describe the flow of electricity. In one of the experiments, students will determine the speed of sound and learn about properties of waves including resonance and harmonics. In all of the assignments, students will learn about the process of collecting, analyzing, and presenting data. Microsoft Excel will be used throughout the course for the purposes of data analysis and presentation. Many of the skills developed in this course will be applicable to a variety of careers unrelated to science. (Fall, Winter, Spring)

**PH.S 110 Physical Science for Teachers****(4:3:3)**

Fulfills GE Physical Science requirement.

Prerequisite: Elementary Education Major

Math Level: Moderate use of high school algebra

Physical Science for Elementary Education Majors.

(Fall, Winter, Spring)