BS in PHYSICS–ASTRONOMY (694832) MAP Sheet  
Department of Physics and Astronomy  
For students entering the degree program during the 2013–2014 curricular year.

<table>
<thead>
<tr>
<th>UNIVERSITY CORE AND GRADUATION REQUIREMENTS</th>
<th>PROGRAM REQUIREMENTS (66–69 total hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>UNIVERSITY CORE REQUIREMENTS</strong></td>
<td><strong>Complete one of the following options:</strong></td>
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<tr>
<td><strong>Requirements</strong></td>
<td>#Classes</td>
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<tr>
<td><strong>Core Enrichment: Electives</strong></td>
<td></td>
</tr>
<tr>
<td>Religion Electives</td>
<td>3–4</td>
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<tr>
<td>Open Electives</td>
<td>Variable</td>
</tr>
<tr>
<td><strong>GRADUATION REQUIREMENTS:</strong></td>
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<tr>
<td>Minimum residence hours required</td>
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<tr>
<td>Minimum hours needed to graduate</td>
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</tbody>
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**UNIVERSITY CORE REQUIREMENTS**

- **Doctrinal Foundation**
  - Book of Mormon: 2 classes, 4.0 hours
  - New Testament: 1 class, 2.0 hours
  - Doctrine and Covenants: 1 class, 2.0 hours

- **The Individual and Society**
  - Citizenship: 1–2 classes, 3–6.0 hours from approved list
  - Global & Cultural Awareness: 1 class, 3.0 hours from approved list

- **Skills**
  - Effective Communication: 1 class, 3.0 hours from approved list
  - Adv Written & Oral Communication: 1 class, 3.0 hours from approved list

- **Arts, Letters, and Sciences**
  - Civilization 1 and 2: 2 classes, 6.0 hours from approved list
  - Arts: 1 class, 3.0 hours from approved list
  - Letters: 1 class, 3.0 hours from approved list
  - Scientific Principles & Reasoning
    - Biological Science: 1–2 classes, 3–5.0 hours from approved list
    - Physical Science: 1 class, 3.0 hours from approved list
    - Social Science: 1 class, 3.0 hours from approved list

- **Core Enrichment: Electives**
  - Religion Electives: 3–4 classes, 6.0 hours from approved list
  - Open Electives: Variable classes, Variable hours from personal choice

**PROGRAM REQUIREMENTS (66–69 total hours)**

- **No more than 3 hours of D credit is allowed in major courses.**
- **Complete the following:**
  - **Phscs**
    - 121 Introduction to Newtonian Mechanics: 3.0 hours
    - 123 Intro to Waves, Optics, & Thermodynamics: 3.0 hours
    - 127 Descriptive Astronomy: 3.0 hours
    - 140 Electrons Lab: 1.0 hour
    - 145 Experimental Methods in Physics: 1.0 hour
    - 191 Intro to Physics Careers & Research: 0.5 hour
    - 220 Intro to Electricity & Magnetism: 3.0 hours
    - 222* Modern Physics: 3.0 hours
    - 227 Solar System Astronomy: 3.0 hours
    - 228 Stellar and Extragalactic Astronomy: 3.0 hours
    - 230 Computational Physics Lab 1: 1.0 hour
    - 291 Intro to Physics Careers & Research 2: 0.5 hour
    - 318 Introduction to Mathematical Physics: 3.0 hours
    - 321 Mechanics: 3.0 hours
    - 329 Observational Astronomy: 3.0 hours
    - 330 Computational Physics Lab 2: 1.0 hour
    - 427 Introduction to Astrophysics: 3.0 hours
    - 428 Introduction to Astrophysics: 3.0 hours
    - 441 Electrostatics & Magnetism: 3.0 hours
    - 451 Quantum Mechanics: 3.0 hours

  - **Note:** Phscs 191 should be taken the first semester as a freshman. Phscs 291 should be taken the first semester as a sophomore.

- **Complete two courses from the following:**
  - Phscs 360 Statistical and Thermal Physics: 3.0 hours
  - Phscs 442 Electrodynamics: 3.0 hours
  - Phscs 452 Applications of Quantum Mechanics: 3.0 hours
  - Phscs 471 Principles of Optics: 3.0 hours

- **Complete one of the following options:**
  - **Either**
    - Math 113* Calculus 2: 4.0 hours
    - Math 302 Mathematics for Engineering 1: 4.0 hours
  - **Or**
    - Math 113* Calculus 2: 4.0 hours
    - Math 313 Elem Linear Algebra: 3.0 hours
    - Math 314 Calculus of Several Variables: 3.0 hours

- **Complete one course from the following:**
  - Math 303 Math for Engineering 2: 4.0 hours
  - Math 334 Ordinary Differential Equations: 3.0 hours

- **Complete a senior thesis, including the following:**
  - a. Choose a research mentor and group as early as possible, starting with information in Phscs 191 and 291, and discussions with faculty, your advisor, and the senior thesis coordinator. It is best to start as a freshman or sophomore. Some internships may qualify for your project.
  - b. Complete 2 hours of the following:
    - Phscs 498R Senior Thesis: 3.0 hours

- **Note:** Students planning on graduate school in astronomy should consider taking all four of PHSCS 360, 442, 452, 471, instead of only two. Gain statistics and computer programming skills beyond what you get in this major by taking courses such as STAT 201 (Statistics for Engineers and Scientists) and courses such as PHSCS 430 (Computational Physics 3), CS 142 (Introduction to Programming), and Me En 373 (Introduction to Scientific Computing).
**Suggested Sequence of Courses:**

### FRESHMAN YEAR

1st Semester
- First-year Writing 3.0
- Math 113 (FWSpSu) 4.0
- Phscs 121 (FWSp) 3.0
- Phscs 127 3.0
- Phscs 140 (FSp) 1.0
- Phscs 191 (F) 0.5
- Rel A 121 2.0
  **Total Hours 16.5**

2nd Semester
- A Htg 100 3.0
  or First-year Writing (3.0)
- Math 302 (FW) 4.0
- Phscs 123 3.0
- Phscs 145 1.0
- Rel A 122 2.0
  **General electives 2.0**
  **Total Hours 15.0**

### SOPHOMORE YEAR

3rd Semester
- Phscs 220 (FWSu) 3.0
- Phscs 227 (F) 3.0
- Phscs 230 (FW) 1.0
- Phscs 291 (F) 0.5
- Physical Science (Chem or Geol) 3.0
- General Elective 3.0
  **Total Hours 15.5**

4th Semester
- Math 303 (FW) 4.0
  or Math 334 (FWSp) (3.0)
- Phscs 222 (FW) 3.0
- Phscs 228 (W) 3.0
- Biological Science 3.0
- Rel C 324/324 2.0
- General elective (if Math 334 taken) 1.0
  **Total Hours 15-16.0**

### JUNIOR YEAR

5th Semester
- Phscs 318 (FWSp) 3.0
- Phscs 321 (FSp) 3.0
- Phscs 330 (FSp) 1.0
- Civilizations 1 3.0
- Social Science 3.0
- Religion Elective 2.0
  **Total Hours 15.0**

### SENIOR YEAR

7th Semester
- Phscs 427 (F) 3.0
- Phscs 441 (F) 3.0
- Phscs 451 (F) 3.0
- Letters 3.0
- Religion Elective 2.0
  **Total Hours 14.0**

8th Semester
- Phscs 416 (W) 3.0
- Phscs 428 (W) 3.0
- Phscs 442 (W) or 452 (WSpSu) or 471 (FW) 3.0
- Arts 3.0
- Global and Cultural Awareness 3.0
  **Total Hours 15.0**

### THE DISCIPLINE:

Over the centuries physicists and astronomers have studied the fundamental principles that govern the structure and dynamics of matter and energy in the physical world, from subatomic particles to the cosmos. Physicists also apply this understanding to the development of new technologies. For examples, physicists invented the first lasers and semiconductor electronic devices.

Physics and astronomy students learn to approach complex problems in science and technology from a broad background in mechanics, electricity and magnetism, statistical and thermal physics, quantum mechanics, relativity, and optics. The tools they develop at BYU include problem solving by mathematical and computational modeling, as well as experimental discovery and analysis. All students gain professional experience in a research, capstone, or internship project, usually in close association with faculty. Together these experience can provide excellent preparation for employment of for graduate studies in physics, other sciences, engineering, medicine, law, or business.

Most physicists and astronomers work in research and development in industrial, government, or university labs to solve new problems in technology and science. They also share the beauty discovered in our physical universe by teaching in high schools, colleges, and universities.

### CAREER OPPORTUNITIES:

A degree in physics or physics-astronomy can provide:

1. Preparation for those who intend to enter industrial or governmental service as physicists or astronomers.
2. Education for those who intend to pursue graduate work in physics or astronomy.
3. Education in the subject matter of physics for prospective teachers of the physical sciences.
4. Undergraduate education for those who will pursue graduate work in the professions: business (e.g., an MBA), law, medicine, etc.
5. Fundamental background for other physical sciences and engineering, in preparation for graduate study in these fields.
6. Physics fundamentals required by the biological science, medical, dental, nursing, and related programs.

For more information, see physics.byu.edu/undergraduate.

For more information on careers in your major, please refer to From Major to Career, a publication which is located in all college advisement centers, and see physics.byu.edu/undergraduate/careers.