# BS in PHYSICS–ASTRONOMY (694832) MAP Sheet

**Department of Physics and Astronomy**

For students entering the degree program during the 2016–2017 curricular year.

## UNIVERSITY CORE AND GRADUATION REQUIREMENTS

<table>
<thead>
<tr>
<th>Requirements</th>
<th>#Classes</th>
<th>Hours</th>
<th>Classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Religion Cornerstones</td>
<td></td>
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</tr>
<tr>
<td>Teachings and Doctrine, Book of Mormon</td>
<td>1</td>
<td>2.0</td>
<td>Rel A 275</td>
</tr>
<tr>
<td>Jesus Christ &amp; the Everlasting Gospel</td>
<td>1</td>
<td>2.0</td>
<td>Rel A 250</td>
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<tr>
<td>Foundations of the Restoration</td>
<td>1</td>
<td>2.0</td>
<td>Rel C 225</td>
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<tr>
<td>The Eternal Family</td>
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<td>2.0</td>
<td>Rel C 200</td>
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<tr>
<td>The Individual and Society</td>
<td></td>
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<tr>
<td>Citizenship</td>
<td></td>
<td></td>
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<tr>
<td>American Heritage</td>
<td>1–2</td>
<td>3–6.0</td>
<td>from approved list</td>
</tr>
<tr>
<td>Global &amp; Cultural Awareness</td>
<td>1</td>
<td>3.0</td>
<td>from approved list</td>
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<tr>
<td>Skills</td>
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<tr>
<td>Effective Communication</td>
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<tr>
<td>First-Year Writing</td>
<td>1</td>
<td>3.0</td>
<td>from approved list</td>
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<tr>
<td>Adv Written &amp; Oral Communication</td>
<td>1</td>
<td>3.0</td>
<td>Phscs 416 or Engl 316</td>
</tr>
<tr>
<td>Quantitative Reasoning</td>
<td>1</td>
<td>4.0</td>
<td>Math 113*</td>
</tr>
<tr>
<td>Languages of Learning (Math or Language)</td>
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<td>4.0</td>
<td>Math 113*</td>
</tr>
<tr>
<td>Arts, Letters, and Sciences</td>
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<tr>
<td>Civilization 1 and 2</td>
<td>2</td>
<td>6.0</td>
<td>from approved list</td>
</tr>
<tr>
<td>Arts</td>
<td>1</td>
<td>3.0</td>
<td>from approved list</td>
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<tr>
<td>Letters</td>
<td>1</td>
<td>3.0</td>
<td>from approved list</td>
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<tr>
<td>Scientific Principles &amp; Reasoning</td>
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<tr>
<td>Biological Science</td>
<td>1–2</td>
<td>3–5.0</td>
<td>from approved list</td>
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<tr>
<td>Physical Science</td>
<td>1</td>
<td>3.0</td>
<td>Phscs 222*</td>
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<tr>
<td>Social Science</td>
<td>1</td>
<td>3.0</td>
<td>from approved list</td>
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<tr>
<td>Core Enrichment: Electives</td>
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<tr>
<td>Religion Electives</td>
<td>3–4</td>
<td>6.0</td>
<td>from approved list</td>
</tr>
<tr>
<td>Open Electives</td>
<td>Variable</td>
<td>Variable</td>
<td>personal choice</td>
</tr>
</tbody>
</table>

## PROGRAM REQUIREMENTS (67–70 total hours)

No more than 3 hours of D credit is allowed in major courses.

### Complete the following:

- **C S** 142 Introduction to Computer Programming 3.0
- Phscs 121 Introduction to Newtonian Mechanics 3.0
- Phscs 123 Intro to Waves, Optics, & Thermodynamics 3.0
- Phscs 127 Descriptive Astronomy 3.0
- Phscs 191 Intro to Physics Careers & Research 0.5
- Phscs 220 Intro to Electricity & Magnetism 3.0
- Phscs 222* Modern Physics 3.0
- Phscs 227 Solar System Astronomy 3.0
- Phscs 228 Stellar and Extragalactic Astronomy 3.0
- Phscs 230 Computational Physics Lab 1 1.0
- Phscs 291 Intro to Physics Careers & Research 2 0.5
- Phscs 318 Introduction to Mathematical Physics 3.0
- Phscs 321 Mechanics 3.0
- Phscs 329 Observational Astronomy 3.0
- Phscs 330 Computational Physics Lab 2 1.0
- Phscs 427 Introduction to Astrophysics 3.0
- Phscs 428 Introduction to Astrophysics 3.0
- Phscs 441 Electrostatics & Magnetism 3.0
- Phscs 451 Quantum Mechanics 3.0

**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
- Phscs 442 Electrodynamics 3.0
- Phscs 452 Applications of Quantum Mechanics 3.0
- Phscs 471 Principles of Optics 3.0

### Complete one of the following options:

**Either**

- Math 113* Calculus 2 4.0
- Math 302 Mathematics for Engineering 1 4.0

**Or**

- Math 113* Calculus 2 4.0
- Math 313 Elem Linear Algebra 3.0
- Math 314 Calculus of Several Variables 3.0

### Complete one course from the following:

- Math 303 Math for Engineering 2 4.0
- Math 334 Ordinary Differential Equations 3.0

### 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 3.0V

**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) and Me En 373 (Introduction to Scientific Computing).

## GRADUATION REQUIREMENTS:

- Minimum residence hours required 30.0
- Minimum hours needed to graduate 120.0

*THESE CLASSES FILL BOTH UNIVERSITY CORE AND PROGRAM REQUIREMENTS (7 hours overlap)

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FOR UNIVERSITY CORE OR PROGRAM QUESTIONS CONTACT THE ADVISEMENT CENTER
Physical and Mathematical Sciences College Advisement Center
N-181 ESC
Brigham Young University, Provo, UT 84602
Telephone: (801) 422-2674

FACULTY ADVISORS ASSIGNED BY LAST TWO DIGITS OF BYU ID NUMBER, CONTACT:
Department of Physics and Astronomy
N-283 ESC
Brigham Young University, Provo, UT 84602
Telephone: (801) 422-4361
Suggested Sequence of Courses:

FRESHMAN YEAR
1st Semester
First-year Writing 3.0
or A Htg 100 (3.0)
Math 113 (FWSpSu) 4.0
Phscs 121 (FWSp) 3.0
Phscs 127 3.0
Phscs 191 (F) 0.5
Religion Cornerstone course 2.0
Total Hours 15.5

2nd Semester
A Htg 100 3.0
or First-year Writing (3.0)
C S 142 3.0
Math 302 (FW) 4.0
Phscs 123 (FWSp) 3.0
Religion Cornerstone course 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
Religion Cornerstone course 2.0
General Elective 3.0
Total Hours 15.5

4th Semester
Math 303 (FW) 4.0
Phscs 222 (FW) 3.0
Phscs 228 (FW) 3.0
Biological Science 3.0
Religion Cornerstone course 2.0
Total Hours 15.0

JUNIOR YEAR
5th Semester
Phscs 318 (FWSp) 3.0
Phscs 321 (FSp) 3.0
Phscs 330 (FSp) 1.0
Civilization 1 3.0
Social Science 3.0
Religion Elective 2.0
Total Hours 15.0

6th Semester
Phscs 329 (W) 3.0
Phscs 360 (W) or 471 (WSu) 3.0
Arts 3.0
Civilization 2 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 (WSu) or 471 (FW) 3.0
Phscs 498R (FWSpSu) 2.0
Global and Cultural Awareness 3.0
Total Hours 14.0

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 example, 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 experiences can provide excellent preparation for employment of undergraduate 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/careers.

Note: Students are encouraged to complete an average of 15 credit hours each semester or 30 credit hours each year, which could include spring and/or summer terms. Taking fewer credits substantially increases the cost and the number of semesters to graduate.

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