### University Core and Graduation Requirements

#### University Core Requirements:

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Classes</th>
<th>Hours</th>
<th>Classes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Religion Cornerstones</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teachings and Doctrine of The Book of Mormon</td>
<td>1</td>
<td>2.0</td>
<td>REL A 275</td>
</tr>
<tr>
<td>Jesus Christ and 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><strong>The Individual and Society</strong></td>
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<td></td>
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</tr>
<tr>
<td>American Heritage</td>
<td>1-2</td>
<td>3-6.0</td>
<td>from approved list</td>
</tr>
<tr>
<td>Global and Cultural Awareness</td>
<td>1</td>
<td>3.0</td>
<td>from approved list</td>
</tr>
<tr>
<td><strong>Skills</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First Year Writing</td>
<td>1</td>
<td>3.0</td>
<td>from approved list</td>
</tr>
<tr>
<td>Advanced Written and Oral Communications</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>
<td>1</td>
<td>4.0</td>
<td>MATH 113*</td>
</tr>
<tr>
<td><strong>Arts, Letters, and Sciences</strong></td>
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</tr>
<tr>
<td>Civilization 1</td>
<td>1</td>
<td>3.0</td>
<td>from approved list</td>
</tr>
<tr>
<td>Civilization 2</td>
<td>1</td>
<td>3.0</td>
<td>from approved list</td>
</tr>
<tr>
<td>Arts</td>
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<td>3.0</td>
<td>from approved list</td>
</tr>
<tr>
<td>Letters</td>
<td>1</td>
<td>3.0</td>
<td>from approved list</td>
</tr>
<tr>
<td>Biological Science</td>
<td>1</td>
<td>3-4.0</td>
<td>from approved list</td>
</tr>
<tr>
<td>Physical Science</td>
<td>1</td>
<td>3.0</td>
<td>PHSCS 222*</td>
</tr>
<tr>
<td>Social Science</td>
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<td>3.0</td>
<td>from approved list</td>
</tr>
<tr>
<td><strong>Core Enrichment: Electives</strong></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>Variables</td>
<td>Variables</td>
<td>personal choice</td>
</tr>
</tbody>
</table>

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

#### Graduation Requirements:

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

### Suggested Sequence of Courses

#### FRESHMAN YEAR

<table>
<thead>
<tr>
<th>1st Semester</th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>First-year Writing</td>
<td>3.0</td>
<td>MATH 112 (FWSpSu)</td>
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<tr>
<td>MATH 112 (FWSpSu)</td>
<td>4.0</td>
<td>PHSCS 227 (F)</td>
</tr>
<tr>
<td>PHSCS 230 (FW)</td>
<td>3.0</td>
<td>PHSCS 417 (F)</td>
</tr>
<tr>
<td>PHSCS 291 (F)</td>
<td>0.5</td>
<td>PHSCS 451 (F)</td>
</tr>
<tr>
<td>MATH 302</td>
<td>4.0</td>
<td>Letters</td>
</tr>
<tr>
<td>Religion Cornerstone course</td>
<td>2.0</td>
<td>Religion Elective</td>
</tr>
</tbody>
</table>

**Total Hours:** 15.0

#### 2nd Semester

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>American Heritage</td>
<td>3.0</td>
</tr>
<tr>
<td>C S 142</td>
<td>3.0</td>
</tr>
<tr>
<td>MATH 113 (FW)</td>
<td>4.0</td>
</tr>
<tr>
<td>PHSCS 123 (FWSp)</td>
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</tr>
<tr>
<td>Religion Cornerstone course</td>
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**Total Hours:** 15.0

#### SOPHOMORE YEAR

<table>
<thead>
<tr>
<th>3rd Semester</th>
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</thead>
<tbody>
<tr>
<td>PHSCS 220 (FWSp)</td>
<td>3.0</td>
<td>PHSCS 418 (F)</td>
</tr>
<tr>
<td>PHSCS 227 (F)</td>
<td>3.0</td>
<td>PHSCS 428 (W)</td>
</tr>
<tr>
<td>PHSCS 230 (FW)</td>
<td>3.0</td>
<td>PHSCS 360 (W) or 442 (W) or 452 (WSu) or 471 (FW) (requirement 2)</td>
</tr>
<tr>
<td>PHSCS 291 (F)</td>
<td>0.5</td>
<td>Biological Science</td>
</tr>
<tr>
<td>MATH 302</td>
<td>4.0</td>
<td>Religion Cornerstone course</td>
</tr>
<tr>
<td>Religion Cornerstone course</td>
<td>2.0</td>
<td>Global and Cultural Awareness</td>
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</table>

**Total Hours:** 15.0

#### 4th Semester

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>PHSCS 220 (FW)</td>
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<tr>
<td>PHSCS 227 (FW)</td>
<td>3.0</td>
</tr>
<tr>
<td>PHSCS 228 (W)</td>
<td>3.0</td>
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<tr>
<td>Biological Science</td>
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<tr>
<td>Religion Cornerstone course</td>
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**Total Hours:** 15.0

#### JUNIOR YEAR

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<thead>
<tr>
<th>5th Semester</th>
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<tbody>
<tr>
<td>PHSCS 318 (FWSp)</td>
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<td>PHSCS 321 (FSp)</td>
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<tr>
<td>PHSCS 321 (FSp)</td>
<td>3.0</td>
<td>PHSCS 330 (FSp)</td>
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<tr>
<td>MATH 302</td>
<td>4.0</td>
<td>Social Science</td>
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<tr>
<td>Religion Elective</td>
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</table>

**Total Hours:** 15.0

#### 6th Semester

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>PHSCS 329 (W)</td>
<td>3.0</td>
</tr>
<tr>
<td>PHSCS 360 (W) or 471 (WSu) (requirement 2)</td>
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</tr>
<tr>
<td>Civilization 2</td>
<td>3.0</td>
</tr>
<tr>
<td>Religion Elective</td>
<td>2.0</td>
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</tbody>
</table>

**Total Hours:** 15.0

#### SENIOR YEAR

<table>
<thead>
<tr>
<th>7th Semester</th>
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</tr>
</thead>
<tbody>
<tr>
<td>PHSCS 416 (W)</td>
<td>3.0</td>
<td>PHSCS 428 (W)</td>
</tr>
<tr>
<td>PHSCS 428 (W)</td>
<td>3.0</td>
<td>PHSCS 360 (W) or 442 (W) or 452 (WSu) or 471 (FW) (requirement 2)</td>
</tr>
<tr>
<td>PHSCS 498 (FWSpSu)</td>
<td>3.0</td>
<td>Biological Science</td>
</tr>
<tr>
<td>Religion Cornerstone course</td>
<td>2.0</td>
<td>Global and Cultural Awareness</td>
</tr>
</tbody>
</table>

**Total Hours:** 15.0

**Total Hours:** 15.0

**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.
BS in Physics–Astronomy (694832)
2017-2018 Program Requirements (67 - 70 Credit Hours)

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

REQUIREMENT 1 Complete 1 option

OPTION 1.1 Complete 19 courses
- CS 142 - Introduction to Computer Programming 3.0
- PHSCS 121 - Introduction to Newtonian Mechanics 3.0
- PHSCS 123 - Introduction to Waves, Optics, and Thermodynamics 3.0
- PHSCS 127 - Descriptive Astronomy 3.0
- PHSCS 191 - Introduction to Physics Careers and Research 1 0.5
- PHSCS 220 - Introduction to Electricity and 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 - Introduction to Physics Careers and Research 2 0.5
- PHSCS 318 - Introduction to Mathematical Physics 3.0
- PHSCS 321 - Mechanics 3.0
- PHSCS 329 - Observational Astronomy 3.0
- PHCS 330 - Computational Physics Lab 2 1.0
- PHCS 427 - Introduction to Astrophysics 3.0
- PHCS 428 - Introduction to Astrophysics 3.0
- PHCS 441 - Electrostatics and Magnetism 3.0
- PHCS 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.

REQUIREMENT 2 Complete 2 courses
- PHSCS 360 - Statistical and Thermal Physics 3.0
- PHCS 442 - Applications of Quantum Mechanics 3.0
- PHCS 452 - Applications of Quantum Mechanics 3.0
- PHCS 471 - Principles of Optics 3.0

REQUIREMENT 3 Complete 1 option

OPTION 3.1 Complete 2 courses
- *MATH 113 - Calculus 2 4.0
- MATH 302 - Mathematics for Engineering 1 4.0

OPTION 3.2 Complete 3 courses
- *MATH 113 - Calculus 2 4.0
- MATH 313 - Elementary Linear Algebra 3.0
- MATH 314 - Calculus of Several Variables 3.0

REQUIREMENT 4 Complete 1 course
- MATH 303 - Mathematics for Engineering 2 4.0
- MATH 334 - Ordinary Differential Equations 3.0

REQUIREMENT 5 Complete 1 option

SENIOR THESIS:
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 192, 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.

OPTION 5.1 Complete 2.0 hours from the following course(s)
- 8. PHCS 498R - Senior Thesis 3.0

You may take up to 2 credit hours.

REQUIREMENT 6
Complete the Physics Major Field Test the last semester before graduation.

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).

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/careers.

MAP DISCLAIMER
While every reasonable effort is made to ensure accuracy, there are some student populations that could have exceptions to listed requirements. Please refer to the university catalog and your college advisement center/department for complete guidelines.

DEPARTMENT INFORMATION
FACULTY ADVISORS ASSIGNED BY LAST TWO DIGITS OF BYU ID NUMBER, CONTACT:
Department of Physics and Astronomy
Brigham Young University
N-283 ESC
BS in Physics--Astronomy (694832)
2017-2018