### 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>
</tr>
<tr>
<td>Foundations of the Restoration</td>
<td>1</td>
<td>2.0</td>
<td>REL C 225</td>
</tr>
<tr>
<td>The Eternal Family</td>
<td>1</td>
<td>2.0</td>
<td>REL C 200</td>
</tr>
<tr>
<td><strong>The Individual and Society</strong></td>
<td></td>
<td></td>
<td></td>
</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>
<td></td>
<td></td>
<td></td>
</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>
<td>1</td>
<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</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>
<td>1</td>
<td>3.0</td>
<td>from approved list</td>
</tr>
<tr>
<td><strong>Core Enrichment: Electives</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<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>

*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>Semester</th>
<th>Classes</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Semester</td>
<td>PHSCS 121 (FWSp)</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>PHSCS 191 (F)</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>MATH 112 (FWSpSu)</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td>First-year Writing</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>General Electives</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td>Religion Cornerstone course</td>
<td>2.0</td>
</tr>
<tr>
<td><strong>Total Hours</strong></td>
<td><strong>14.5</strong></td>
<td></td>
</tr>
</tbody>
</table>

#### SOPHOMORE YEAR

<table>
<thead>
<tr>
<th>Semester</th>
<th>Classes</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>2nd Semester</td>
<td>PHSCS 123 (FWSp)</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>MATH 113 (FWSpSu)</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td>C S 142 (FWSp)</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>American Heritage</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>Religion Cornerstone course</td>
<td>2.0</td>
</tr>
<tr>
<td><strong>Total Hours</strong></td>
<td><strong>15.0</strong></td>
<td></td>
</tr>
</tbody>
</table>

#### JUNIOR YEAR

<table>
<thead>
<tr>
<th>Semester</th>
<th>Classes</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>3rd Semester</td>
<td>PHSCS 220 (FWSp)</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>PHSCS 225 (FW)*</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>PHSCS 230 (FW)</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>PHSCS 291 (F)</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>MATH 302 (FW)**</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td>Biological Science</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>Religion Cornerstone course</td>
<td>2.0</td>
</tr>
<tr>
<td><strong>Total Hours</strong></td>
<td><strong>15.5</strong></td>
<td></td>
</tr>
</tbody>
</table>

*It’s highly recommended to take PHCS 220 and PHCS 225 at the same time.

**The MATH 213/215/314/334 (9 cr) sequence can be taken in place of the MATH 302/303 (8 cr) sequence.

#### 4th Semester

<table>
<thead>
<tr>
<th>Classes</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHSCS 222 (FWSp)</td>
<td>3.0</td>
</tr>
<tr>
<td>PHSCS 240 (FW)</td>
<td>2.0</td>
</tr>
<tr>
<td>MATH 303 (FW)</td>
<td>4.0</td>
</tr>
<tr>
<td>General Elective</td>
<td>3.0</td>
</tr>
<tr>
<td>Religion Cornerstone course</td>
<td>2.0</td>
</tr>
<tr>
<td><strong>Total Hours</strong></td>
<td><strong>14.0</strong></td>
</tr>
</tbody>
</table>

**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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### SUGGESTED SEQUENCE OF COURSES

#### BS in Physics (694821) MAP Sheet

**Physical and Mathematical Sciences, Physics and Astronomy**

For students entering the degree program during the 2019-2020 curricular year.
BS in Physics (694821)
2019-2020 Program Requirements (63 - 64 Credit Hours)

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

REQUIREMENT 1 Complete 22 courses

NOTE: PHSCS 191 SHOULD BE TAKEN THE FIRST SEMESTER AS A FRESHMAN.
PHSCS 291 SHOULD BE TAKEN THE FIRST SEMESTER AS A SOPHOMORE.

- C S 142 - Introduction to Computer Programming 3.0
- *MATH 113 - Calculus 2 4.0
- PHSCS 121 - Introduction to Newtonian Mechanics 3.0
- PHSCS 123 - Introduction to Waves, Optics, and Thermodynamics 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 225 - Introduction to Experimental Physics 2.0
- PHSCS 230 - Computational Physics Lab 1 1.0
- PHSCS 240 - Design, Fabrication, and Use of Scientific Apparatus 2.0
- PHSCS 245 - Experiments in Contemporary Physics 2.0
- 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 330 - Computational Physics Lab 2 1.0
- PHSCS 360 - Statistical and Thermal Physics 3.0
- PHSCS 430 - Computational Physics Lab 3 1.0
- PHSCS 441 - Electrostatics and Magnetism 3.0
- PHSCS 442 - Electrodynamics 3.0
- PHSCS 451 - Quantum Mechanics 3.0
- PHSCS 452 - Applications of Quantum Mechanics 3.0
- PHSCS 471 - Principles of Optics 3.0

REQUIREMENT 2 Complete 1 option

OPTION 2.1 Complete 2 courses
- MATH 302 - Mathematics for Engineering 1 4.0
- MATH 303 - Mathematics for Engineering 2 4.0

OPTION 2.2 Complete 3 courses
- MATH 313 - (Not currently offered) 3.0
- MATH 314 - Calculus of Several Variables 3.0
- MATH 334 - Ordinary Differential Equations 3.0

OPTION 2.3 Complete 4 courses
- MATH 213 - Elementary Linear Algebra 2.0
- MATH 215 - Computational Linear Algebra 1.0
- MATH 314 - Calculus of Several Variables 3.0
- MATH 334 - Ordinary Differential Equations 3.0

REQUIREMENT 3 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 291, and discussion with faculty, your
   advisor and senior thesis coordinator. It is best to start as a freshman or
   sophomore. Interdisciplinary work in other departments or in
   internships is possible.

OPTION 3.1 Complete 2.0 hours from the following course(s)

- PHSCS 498R - Senior Thesis 3.0v
  You may take up to 2 credit hours.

REQUIREMENT 4

Students are required to take the Physics "Major Field Test" the last semester
before they graduate. The test is a standardized assessment of
undergraduate physics written by ETS (Educational Testing Service). The ETS
website contains a description of the exam and sample problems:
http://www.ets.org/mft/about/content/physics. Results of the exam do not
appear on the transcript or affect the GPA. Students should contact the
Physics undergraduate secretary to make arrangements for taking the exam;
typically it's done in the Testing Center before mid-semester.

Note 1: Students planning careers in experimental, applied, or industrial
physics should complete Stat 201.

Note 2: All students will benefit, through courses or individual study, by
learning programming skills and numerical methods beyond what you are
taught in C S 142 and our computational physics courses. Consider the
following: C S courses, Math 410, Me En 373.

Note 3: Students planning graduate school in physics should learn complex
analysis. Consider the following: Math 332, Phscs 601, 602.

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
or 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.

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

CAREER OPPORTUNITIES:

A degree in physics or physics-astronomy can provide:

1. Preparation for those who intend to enter industrial or
governmental service as engineers, technicians, 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 (especially
patent 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 on careers in your major, see www.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
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physics_office@byu.edu

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