BS in Physics (694821) MAP Sheet
Physical and Mathematical Sciences, Physics and Astronomy
For students entering the degree program during the 2018-2019 curricular year.

<table>
<thead>
<tr>
<th>University Core and Graduation Requirements</th>
<th>Suggested Sequence of Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>University Core Requirements:</strong></td>
<td><strong>FRESHMAN YEAR</strong></td>
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<tr>
<td>Requirements</td>
<td>1st Semester</td>
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<td></td>
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<tr>
<td>#Classes</td>
<td>Hours</td>
</tr>
<tr>
<td>Religion Cornerstones</td>
<td></td>
</tr>
<tr>
<td>Teachings and Doctrine of The Book of Mormon</td>
<td>1 2.0 REL A 275</td>
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<tr>
<td>Jesus Christ and the Everlasting Gospel</td>
<td>1 2.0 REL A 250</td>
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<tr>
<td>Foundations of the Restoration</td>
<td>1 2.0 REL C 215</td>
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<tr>
<td>The Eternal Family</td>
<td>1 2.0 REL C 200</td>
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<tr>
<td>The Individual and Society</td>
<td></td>
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<tr>
<td>American Heritage</td>
<td>1-2 3-6.0 from approved list</td>
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<tr>
<td>Global and Cultural Awareness</td>
<td>1 3.0 from approved list</td>
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<tr>
<td>Skills</td>
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<tr>
<td>First Year Writing</td>
<td>1 3.0 from approved list</td>
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<tr>
<td>Advanced Written and Oral Communications</td>
<td>1 3.0 PHSCS 416 or ENGL 316</td>
</tr>
<tr>
<td>Quantitative Reasoning</td>
<td>1 4.0 MATH 113*</td>
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<tr>
<td>Languages of Learning (Math or Language)</td>
<td>1 4.0 MATH 113*</td>
</tr>
<tr>
<td>Arts, Letters, and Sciences</td>
<td></td>
</tr>
<tr>
<td>Civilization 1</td>
<td>1 3.0 from approved list</td>
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<tr>
<td>Civilization 2</td>
<td>1 3.0 from approved list</td>
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<tr>
<td>Arts</td>
<td>1 3.0 from approved list</td>
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<tr>
<td>Letters</td>
<td>1 3.0 from approved list</td>
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<tr>
<td>Biological Science</td>
<td>1 3-4.0 from approved list</td>
</tr>
<tr>
<td>Physical Science</td>
<td>1 3.0 PHSCS 222*</td>
</tr>
<tr>
<td>Social Science</td>
<td>1 3.0 from approved list</td>
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<tr>
<td>Core Enrichment: Electives</td>
<td></td>
</tr>
<tr>
<td>Religion Electives</td>
<td>3-4 6.0 from approved list</td>
</tr>
<tr>
<td>Open Electives</td>
<td>Variable Variable personal choice</td>
</tr>
<tr>
<td>*THESE CLASSES FILL BOTH UNIVERSITY CORE AND PROGRAM REQUIREMENTS (7 hours overlap)</td>
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<tr>
<td><strong>Graduation Requirements:</strong></td>
<td></td>
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<tr>
<td>Minimum residence hours required</td>
<td>30.0</td>
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<tr>
<td>Minimum hours needed to graduate</td>
<td>120.0</td>
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</tbody>
</table>

**SOPHOMORE YEAR**
3rd Semester
PHCS 145 (FSu) 1.0 PHCS 441 (FSu) 3.0
PHCS 220 (FWSu) 3.0 PHCS 451 (F) 3.0
PHCS 230 (FW) 1.0 PHCS 498R (FWSpSu) 2.0
PHCS 292 (F) 0.5 Letters 3.0
Biological Science 3.0 Civilization 1 3.0
Social Science 3.0 Religion Elective 2.0
Religion Cornerstone course 2.0 Total Hours 15.5
General Elective 2.0 SENIOR YEAR
8th Semester
PHCS 416 (W) 3.0
PHCS 442 (WSpSu) 3.0
PHCS 452 (W) 3.0

**JUNIOR YEAR**
5th Semester
PHCS 245 (FW) 2.0
PHCS 318 (FWSp) 3.0
PHCS 321 (FSu) 3.0
PHCS 330 (FSu) 1.0
Math 303 (FW) 4.0
Religion Elective 2.0
Total Hours 15.0
Total Hours 6th Semester
PHCS 360 (W) 3.0
PHCS 430 (WSu) 1.0
Arts 3.0
Civilization 2 3.0
Total Hours 16.0
Total Hours 7th Semester
8th Semester
Total Hours 16.0

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

**REQUIREMENT 1** Complete 23 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 140 - Electronics Lab 1.0

PHSCS 145 - Experimental Methods in Physics 1.0

PHSCS 191 - Introduction to Physics Careers and Research 1 0.5

PHSCS 220 - Introduction to Electricity and Magnetism 3.0

*MATH 222 -** Modern Physics 3.0

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 - Elementary Linear Algebra 3.0

MATH 314 - Calculus of Several Variables 3.0

MATH 334 - Ordinary Differential Equations 3.0

**REQUIREMENT 3** Complete 1 option

**SENIOR THERS:**

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)

8. 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

**ADVICEMENT CENTER INFORMATION**

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