

# BS in Physics--Astronomy (694832) MAP Sheet

Physical and Mathematical Sciences, Physics and Astronomy

For students entering the degree program during the 2017-2018 curricular year.



University Core and Graduation Requirements				Suggested Sequence of Courses			
<b>University Core Requirements:</b>				<b>FRESHMAN YEAR</b>			
<b>Requirements</b>	<b>#Classes</b>	<b>Hours</b>	<b>Classes</b>	<u>1st Semester</u>		<b>JUNIOR YEAR</b>	
<b>Religion Cornerstones</b>				First-year Writing	3.0	<u>5th Semester</u>	
Teachings and Doctrine of The Book of Mormon	1	2.0	REL A 275	MATH 112 (FWSpSu)	4.0	PHSCS 318 (FWSp)	3.0
Jesus Christ and the Everlasting Gospel	1	2.0	REL A 250	PHSCS 121 (FWSp)	3.0	PHSCS 321 (FSp)	3.0
Foundations of the Restoration	1	2.0	REL C 225	PHSCS 127	3.0	PHSCS 330 (FSp)	1.0
The Eternal Family	1	2.0	REL C 200	PHSCS 191 (F)	0.5	Civilization 1	3.0
<b>The Individual and Society</b>				Religion Cornerstone course	2.0	Social Science	3.0
American Heritage	1-2	3-6.0	from approved list	<b>Total Hours</b>	<b>15.5</b>	Religion Elective	2.0
Global and Cultural Awareness	1	3.0	from approved list	<u>2nd Semester</u>		<b>Total Hours</b>	<b>15.0</b>
<b>Skills</b>				American Heritage	3.0	<u>6th Semester</u>	
First Year Writing	1	3.0	from approved list	C S 142	3.0	PHSCS 329 (W)	3.0
Advanced Written and Oral Communications	1	3.0	PHSCS 416 or ENGL 316	MATH 113 (FW)	4.0	PHSCS 360 (W) or 471 (WSu) (requirement 2)	3.0
Quantitative Reasoning	1	4.0	MATH 113*	PHSCS 123 (FWSp)	3.0	Arts	3.0
Languages of Learning (Math or Language)	1	4.0	MATH 113*	Religion Cornerstone course	2.0	Civilization 2	3.0
<b>Arts, Letters, and Sciences</b>				<b>Total Hours</b>	<b>15.0</b>	Religion Elective	2.0
Civilization 1	1	3.0	from approved list	<b>SOPHOMORE YEAR</b>		General Elective	2.0
Civilization 2	1	3.0	from approved list	<u>3rd Semester</u>		<b>Total Hours</b>	<b>16.0</b>
Arts	1	3.0	from approved list	PHSCS 220 (FWSu)	3.0	<b>SENIOR YEAR</b>	
Letters	1	3.0	from approved list	PHSCS 227 (F)	3.0	<u>7th Semester</u>	
Biological Science	1	3-4.0	from approved list	PHSCS 230 (FW)	1.0	PHSCS 427 (F)	3.0
Physical Science	1	3.0	PHSCS 222*	PHSCS 291 (F)	0.5	PHSCS 441 (F)	3.0
Social Science	1	3.0	from approved list	MATH 302	4.0	PHSCS 451 (F)	3.0
<b>Core Enrichment: Electives</b>				Religion Cornerstone course	2.0	Letters	3.0
Religion Electives	3-4	6.0	from approved list	General Electives	2.0	Religion Elective	2.0
Open Electives	Variable	Variable	personal choice	<b>Total Hours</b>	<b>15.5</b>	<b>Total Hours</b>	<b>14.0</b>
*THESE CLASSES FILL BOTH UNIVERSITY CORE AND PROGRAM REQUIREMENTS (7 hours overlap)				<u>4th Semester</u>		<u>8th Semester</u>	
<b>Graduation Requirements:</b>				PHSCS 220 (FWSu)	3.0	PHSCS 416 (W)	3.0
Minimum residence hours required		30.0		MATH 303 (FW)	4.0	PHSCS 428 (W)	3.0
Minimum hours needed to graduate		120.0		PHSCS 222 (FW)	3.0	PHSCS 360 (W) or 442 (W) or 452 (WSu) or 471 (FW)	3.0
				PHSCS 228 (W)	3.0	(requirement 2)	3.0
				Biological Science	3.0	PHSCS 498R (FWSpSu)	2.0
				Religion Cornerstone course	2.0	Global and Cultural Awareness	3.0
				<b>Total Hours</b>	<b>15.0</b>	<b>Total Hours</b>	<b>14.0</b>

**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)

<p><b>No more than 3 hours of D credit is allowed in major courses.</b></p> <p><b>REQUIREMENT 1</b> Complete 1 option</p> <p><b>OPTION 1.1</b> Complete 19 courses</p> <table style="width: 100%; border-collapse: collapse;"> <tr><td>C S 142 - Introduction to Computer Programming</td><td style="text-align: right;">3.0</td></tr> <tr><td>PHSCS 121 - Introduction to Newtonian Mechanics</td><td style="text-align: right;">3.0</td></tr> <tr><td>PHSCS 123 - Introduction to Waves, Optics, and Thermodynamics</td><td style="text-align: right;">3.0</td></tr> <tr><td>PHSCS 127 - Descriptive Astronomy</td><td style="text-align: right;">3.0</td></tr> <tr><td>PHSCS 191 - Introduction to Physics Careers and Research 1</td><td style="text-align: right;">0.5</td></tr> <tr><td>PHSCS 220 - Introduction to Electricity and Magnetism</td><td style="text-align: right;">3.0</td></tr> <tr><td>*PHSCS 222 - Modern Physics</td><td style="text-align: right;">3.0</td></tr> <tr><td>PHSCS 227 - Solar System Astronomy</td><td style="text-align: right;">3.0</td></tr> <tr><td>PHSCS 228 - Stellar and Extragalactic Astronomy</td><td style="text-align: right;">3.0</td></tr> <tr><td>PHSCS 230 - Computational Physics Lab 1</td><td style="text-align: right;">1.0</td></tr> <tr><td>PHSCS 291 - Introduction to Physics Careers and Research 2</td><td style="text-align: right;">0.5</td></tr> <tr><td>PHSCS 318 - Introduction to Mathematical Physics</td><td style="text-align: right;">3.0</td></tr> <tr><td>PHSCS 321 - Mechanics</td><td style="text-align: right;">3.0</td></tr> <tr><td>PHSCS 329 - Observational Astronomy</td><td style="text-align: right;">3.0</td></tr> <tr><td>PHSCS 330 - Computational Physics Lab 2</td><td style="text-align: right;">1.0</td></tr> <tr><td>PHSCS 427 - Introduction to Astrophysics</td><td style="text-align: right;">3.0</td></tr> <tr><td>PHSCS 428 - Introduction to Astrophysics</td><td style="text-align: right;">3.0</td></tr> <tr><td>PHSCS 441 - Electrostatics and Magnetism</td><td style="text-align: right;">3.0</td></tr> <tr><td>PHSCS 451 - Quantum Mechanics</td><td style="text-align: right;">3.0</td></tr> </table> <p><b>Note: Phscs 191 should be taken the first semester as a freshman. Phscs 291 should be taken the first semester as a sophomore.</b></p> <p><b>REQUIREMENT 2</b> Complete 2 courses</p> <table style="width: 100%; border-collapse: collapse;"> <tr><td>PHSCS 360 - Statistical and Thermal Physics</td><td style="text-align: right;">3.0</td></tr> <tr><td>PHSCS 442 - Electrodynamics</td><td style="text-align: right;">3.0</td></tr> <tr><td>PHSCS 452 - Applications of Quantum Mechanics</td><td style="text-align: right;">3.0</td></tr> <tr><td>PHSCS 471 - Principles of Optics</td><td style="text-align: right;">3.0</td></tr> </table> <p><b>REQUIREMENT 3</b> Complete 1 option</p> <p><b>OPTION 3.1</b> Complete 2 courses</p> <table style="width: 100%; border-collapse: collapse;"> <tr><td>*MATH 113 - Calculus 2</td><td style="text-align: right;">4.0</td></tr> <tr><td>MATH 302 - Mathematics for Engineering 1</td><td style="text-align: right;">4.0</td></tr> </table> <p><b>OPTION 3.2</b> Complete 3 courses</p> <table style="width: 100%; border-collapse: collapse;"> <tr><td>*MATH 113 - Calculus 2</td><td style="text-align: right;">4.0</td></tr> <tr><td>MATH 313 - Elementary Linear Algebra</td><td style="text-align: right;">3.0</td></tr> <tr><td>MATH 314 - Calculus of Several Variables</td><td style="text-align: right;">3.0</td></tr> </table> <p><b>REQUIREMENT 4</b> Complete 1 course</p> <table style="width: 100%; border-collapse: collapse;"> <tr><td>MATH 303 - Mathematics for Engineering 2</td><td style="text-align: right;">4.0</td></tr> <tr><td>MATH 334 - Ordinary Differential Equations</td><td style="text-align: right;">3.0</td></tr> </table>	C S 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	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 and Magnetism	3.0	PHSCS 451 - Quantum Mechanics	3.0	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	*MATH 113 - Calculus 2	4.0	MATH 302 - Mathematics for Engineering 1	4.0	*MATH 113 - Calculus 2	4.0	MATH 313 - Elementary Linear Algebra	3.0	MATH 314 - Calculus of Several Variables	3.0	MATH 303 - Mathematics for Engineering 2	4.0	MATH 334 - Ordinary Differential Equations	3.0	<p><b>REQUIREMENT 5</b> Complete 1 option</p> <p><b>SENIOR THESIS:</b></p> <p><b>Complete a senior thesis, including the following:</b></p> <p><b>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.</b></p> <p><b>OPTION 5.1</b> Complete 2.0 hours from the following course(s)</p> <p><b>B.</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr><td>PHSCS 498R - Senior Thesis</td><td style="text-align: right;">3.0v</td></tr> </table> <p style="text-align: center;"><i>You may take up to 2 credit hours.</i></p> <p><b>REQUIREMENT 6</b></p> <p>Complete the Physics Major Field Test the last semester before graduation.</p> <p><b>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).</b></p> <p><b>THE DISCIPLINE:</b></p> <p>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.</p> <p>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</p>	PHSCS 498R - Senior Thesis	3.0v	<p>preparation for employment of for graduate studies in physics, other sciences, engineering, medicine, law, or business.</p> <p>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.</p> <p><b>CAREER OPPORTUNITIES:</b></p> <p>A degree in physics or physics-astronomy can provide:</p> <ol style="list-style-type: none"> <li>1. Preparation for those who intend to enter industrial or governmental service as physicists or astronomers.</li> <li>2. Education for those who intend to pursue graduate work in physics or astronomy.</li> <li>3. Education in the subject matter of physics for prospective teachers of the physical sciences.</li> <li>4. Undergraduate education for those who will pursue graduate work in the professions: business (e.g., an MBA), law, medicine, etc.</li> <li>5. Fundamental background for other physical sciences and engineering, in preparation for graduate study in these fields.</li> <li>6. Physics fundamentals required by the biological science, medical, dental, nursing, and related programs.</li> </ol> <p>For more information, see <a href="http://physics.byu.edu/undergraduate/careers">physics.byu.edu/undergraduate/careers</a>.</p> <p><b>MAP DISCLAIMER</b></p> <p>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.</p> <p><b>DEPARTMENT INFORMATION</b></p> <p>FACULTY ADVISORS ASSIGNED BY LAST TWO DIGITS OF BYU ID NUMBER, CONTACT:  <b>Department of Physics and Astronomy</b>      Brigham Young University      N-283 ESC</p>
C S 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																																																															
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 and Magnetism	3.0																																																															
PHSCS 451 - Quantum Mechanics	3.0																																																															
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																																																															
*MATH 113 - Calculus 2	4.0																																																															
MATH 302 - Mathematics for Engineering 1	4.0																																																															
*MATH 113 - Calculus 2	4.0																																																															
MATH 313 - Elementary Linear Algebra	3.0																																																															
MATH 314 - Calculus of Several Variables	3.0																																																															
MATH 303 - Mathematics for Engineering 2	4.0																																																															
MATH 334 - Ordinary Differential Equations	3.0																																																															
PHSCS 498R - Senior Thesis	3.0v																																																															

## **BS in Physics--Astronomy (694832)**

**2017-2018**

Provo, UT 84602  
Telephone: (801) 422-4361

### **ADVISEMENT CENTER INFORMATION**

#### **Physical and Mathematical Sciences College Advisement Center**

Brigham Young University  
N-181 ESC  
Provo, UT 84602  
Telephone: (801) 422-2674