

# PHYSICAL SCIENCE, B.S.

## Mission

The mission of the Bachelor of Science in Physical Sciences (<https://www.biola.edu/degrees/u/physical-science-bs/>) is to train and mentor students to become skilled scientists who will glorify God and be good stewards of His creation as they serve others in research, education, and industry.

## Degree Program

A Bachelor of Science degree in Physical Science is offered upon completion of the University baccalaureate requirements and the departmental requirements.

## Learning Outcomes

### Program Learning Outcomes

Upon completion of the Bachelor of Science in Physical Science, students will be able to:

1. Demonstrate an understanding of the foundational principles related to the physical sciences (ULO 1).
2. Demonstrate an ability to solve quantitative, qualitative, and technical problems related to physical science (ULO 1).
3. Demonstrate safe laboratory technique, proper use of appropriate equipment, and suitable results and data analysis (ULO 1).
4. Obtain and use appropriate literature and resource materials related to the physical sciences (ULO 1).
5. Summarize the key issues in science and faith and recognize the harmony possible while studying God's creation (ULO 1, 2, and 3).

Each Program Learning Outcome (PLO) listed above references at least one of the University Learning Outcomes (ULO 1, 2, 3), which may be found in the General Information (<http://catalog.biola.edu/general-information/>) section of this catalog.

## Requirements

### GPA Requirement

To continue in the program a student is required to have a cumulative GPA of 2.5 or higher in their first year of chemistry, physics and/or math courses taken at Biola. Depending on the major, these courses may include: CHEM 105, MATH 150, MATH 151, PHSC 132, PHSC 134, PHSC 233, PHSC 237.

### Integration Seminar Requirement

Students enrolled in the Bachelor of Science in Physical Science degree program are required to take BBST 465 as "Christianity and the Natural Sciences," or another approved Integration Seminar topic (see advisor).

## Curriculum Requirements

Code	Title	Credits
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### Program-Specific Core Curriculum Courses

Physical Science majors automatically meet the Core Curriculum requirement of 6 credits of science and mathematics. The foreign language requirement is met by two years in high school or 4 credits of college foreign language.

### Program Courses

CHEM 105	General Chemistry I <sup>1</sup>	4
CHEM 106	General Chemistry II	4
MATH 150	Calculus I	4
MATH 151	Calculus II	4
PHSC 124	Data Analysis and Presentation	1
PHSC 132	General Physics I: Mechanics and Heat	3
PHSC 134	General Physics I Laboratory	1
PHSC 233	General Physics II: Electricity and Magnetism	3
PHSC 237	General Physics II Laboratory	1
PHSC 234	General Physics III: Waves, Optics and Modern Physics	4
PHSC 460	Capstone Seminar	1

Select 30 credits (23 credits if choosing a Secondary Instruction concentration found below) of Chemistry, Physics, Computer Science, or Math courses; of which 23 credits must be upper-division. Depending on the student's interests in science and career goals, the following are recommended electives:

BIOS 103	Introduction to Environmental Science	23 or 30
CHEM 301	Organic Chemistry I	
CHEM 302	Organic Chemistry II	
CHEM 311	Laboratory in Organic Chemistry I	
CHEM 312	Laboratory in Organic Chemistry II	
CHEM 321 & CHEM 322	Basic Organic and Biochemistry and Basic Organic and Biochemistry Lab	
MATH 250	Calculus III	
MATH 291	Linear Algebra	
MATH 335	Ordinary Differential Equations	
PHSC 103	Geology	
PHSC 110	Astronomy	
PHSC 311	Computer Techniques in Science and Engineering	
PHSC 313	Statics	
PHSC 321	Circuits and Instrumentation I	
PHSC 322	Circuits and Instrumentation II	

**Program Course Requirements: 60 credits**

**Core Curriculum Requirements <sup>2</sup> 61**

**Total Credits 121**

<sup>1</sup> The prerequisite for CHEM 105 is a passing score on the Chemistry Placement Exam or CHEM 107 with at least a "B-".

<sup>2</sup> See Core Curriculum Program section (<http://catalog.biola.edu/general-information/undergraduate-core-curriculum-program/>) for details.

## Concentration Secondary Instruction

In addition to the Program Core Requirements listed above, students must complete the following requirements for a total of 70 program credits.

Code	Title	Credits
<b>Program Courses</b>		<b>30</b>
<b>Concentration-Specific Core Curriculum Courses</b>		
The following courses are required to fulfill the Core Curriculum requirements for History and Behavioral Science:		
HIST 200 or POSC 225	United States History To 1865 <sup>1</sup> Survey of American Government	
PSYC 200	Introduction to Psychology	
<b>Concentration Courses</b>		
LEDU 301	Introduction to Teaching	3
LEDU 330	Psychological Foundations of Education	3
LEDU 341	Methods of Teaching Linguistically Diverse Students	3
LEDU 425	Secondary Content Area Reading	3
LEDU 433	Single Subject Pedagogy	2
LEDU 438	Secondary Curriculum, Differentiation, and Assessment	3
Student teaching (12 credits) may be completed at the graduate level and is not required for undergraduate graduation.		
LEDU 450	Secondary Student Teaching I <sup>1</sup>	
LEDU 452	Secondary Student Teaching II	
<b>Concentration Elective Courses</b>		
Select 23 credits of upper-division courses in Physics, Chemistry, Computer Science, or Math. Depending on the student's interests in science, the courses listed under Elective Requirements above are recommended electives. <sup>2</sup>		<b>23</b>
<b>Concentration Course Requirements: 40 credits</b>		
<b>Core Curriculum Requirements</b> <sup>3</sup>		<b>61</b>
<b>Total Credits</b>		<b>131</b>

<sup>1</sup> The California Commission on Teacher Credentialing requires that a teaching credential candidate must have completed a minimum 2-credit course that covers the U.S. Constitution or fulfill this requirement by examination. Biola University students may complete this requirement by taking either HIST 200 or POSC 225 with a grade of "C" or better. Students receiving AP college credit for either HIST 200 or POSC 225 will also meet this requirement. Transfer coursework must be reviewed by a credential analyst in the School of Education.

<sup>2</sup> Although it does not count toward the major, students may elect to take PHSC 326 as a formal review and preparation for the CSET exams.

<sup>3</sup> See Core Curriculum Program section (<http://catalog.biola.edu/general-information/undergraduate-core-curriculum-program/>) for details.

## Secondary Education Minor

The School of Education offers a state-approved professional teacher preparation program which leads to a preliminary single subject teaching credential in the state of California. The Single Subject credential

authorizes the holder to teach the specific subject named on the credential. In most cases individuals with this credential will be offered employment in middle schools and high schools. The teacher preparation program can be added as a minor to any major; however, candidates are advised to major in the subject area they wish to teach. Candidates who take the following 17 credits qualify for a Secondary Education Minor:

Code	Title	Credits
LEDU 301	Introduction to Teaching	3
LEDU 330	Psychological Foundations of Education	3
LEDU 341	Methods of Teaching Linguistically Diverse Students	3
LEDU 425	Secondary Content Area Reading	3
LEDU 433	Single Subject Pedagogy	2
LEDU 438	Secondary Curriculum, Differentiation, and Assessment	3
<b>Total Credits</b>		<b>17</b>

The Professional Teacher Preparation Program leading to a California Teaching Credential at Biola University is subject to change in response to new legislation. See a credential analyst in the School of Education for current information on completing the requirements for a teaching credential. Students must consult with both their major advisor and a School of Education advisor.

## Course Sequence

**NOTE:** The course sequence table is designed by the major department and is one way that the classes will work out properly in sequence for your major. However, there are alternative or flexible ways to rotate some of the classes within the same year/level and sometimes between year levels. Please contact your major department advisor to discuss flexible alternatives in scheduling the sequence of your classes.

Taking coursework during the summer session may also be an option to accelerate your degree path.

See Core Curriculum Program section (<http://catalog.biola.edu/general-information/undergraduate-core-curriculum-program/>) for a list of approved Core Curriculum courses.

- Physical Science, B.S. (p. 2)
- Secondary Instruction (p. 3)

### Physical Science, B.S. (PHSC)

First Year		
Fall	Credits Spring	Credits
BBST 103 or 165	3 BBST 103 or 165	3
MATH 150	4 MATH 151	4
PHSC 132	3 PHSC 233	3
PHSC 134	1 PHSC 237	1
PHSC 124	1 Communication (see Core Curriculum)	3
ENGL 100 or 112	3 KNES 107	1
GNST 102	1	
		<b>16</b>

**Total Credits 31**

Second Year		
Fall	Credits Spring	Credits
BBST 209 or 210	3 BBST 209 or 210	3
PHSC 234	4 BBST 251	3
CHEM, CSCI, MATH, PHSC Elective <sup>1</sup>	3 CHEM, CSCI, MATH, PHSC Elective <sup>1</sup>	3
CHEM, CSCI, MATH, PHSC Elective (upper-division) <sup>1</sup>	3 CHEM, CSCI, MATH, PHSC Elective (upper-division) <sup>1</sup>	4
Philosophy (see Core Curriculum)	3 Fine Arts (see Core Curriculum)	3
	<b>16</b>	<b>16</b>

**Total Credits 32**

Third Year		
Fall	Credits Spring	Credits
BBST 365	3 BBST 354	3
CHEM 105	4 CHEM 106	4
CHEM, CSCI, MATH, PHSC Elective (upper-division) <sup>1</sup>	3 CHEM, CSCI, MATH, PHSC Elective (upper-division) <sup>1</sup>	4
Behavioral Science (see Core Curriculum)	3 Foreign Language (see Core Curriculum)	4
ENGL 313	3 KNES Activity (see Core Curriculum)	1
Writing Competency Requirement	Graduation Petition due in Registrar's Office	
	<b>16</b>	<b>16</b>

**Total Credits 32**

Fourth Year		
Fall	Credits Spring	Credits
BBST 300/400 Bible Elective	3 BBST 300/400 Bible Elective	3
CHEM, CSCI, MATH, PHSC Elective (upper-division) <sup>1</sup>	4 BBST 465 (Christianity & Nat Sci - required)	3
CHEM, CSCI, MATH, PHSC Elective (upper-division) <sup>1</sup>	3 PHSC 460	1
Literature (see Core Curriculum)	3 CHEM, CSCI, MATH, PHSC Elective (upper-division) <sup>1</sup>	3
	HIST 200, 201, or POSC 225	3
	<b>13</b>	<b>13</b>

**Total Credits 26**<sup>1</sup> See list of electives in catalog.**Physical Science, B.S. Secondary Instruction (PHSI)**

First Year		
Fall	Credits Spring	Credits
BBST 103 or 165	3 BBST 103 or 165	3
CHEM 105	4 CHEM 106	4
MATH 150	4 MATH 151	4
PHSC 124	1 PSYC 200 (required)	3
ENGL 100 or 112	3 KNES 107	1
GNST 102	1	
	<b>16</b>	<b>15</b>

**Total Credits 31**

Second Year		
Fall	Credits Spring	Credits
BBST 209 or 210	3 BBST 209 or 210	3
PHSC 132	3 BBST 251	3
PHSC 134	1 PHSC 233	3
CHEM, CSCI, MATH, PHSC Elective (upper-division) <sup>1</sup>	4 PHSC 237	1
LEDU 301	3 CHEM, CSCI, MATH, PHSC Elective (upper-division) <sup>1</sup>	3

Fine Arts (see Core Curriculum)	3 LEDU 330	3
	<b>17</b>	<b>16</b>

**Total Credits 33**

Third Year		
Fall	Credits Spring	Credits
BBST 365	3 BBST 354	3
PHSC 234	4 CHEM, CSCI, MATH, PHSC Elective (upper-division) <sup>1</sup>	3
CHEM, CSCI, MATH, PHSC Elective (upper-division) <sup>1</sup>	3 CHEM, CSCI, MATH, PHSC Elective (upper-division) <sup>1</sup>	3
LEDU 341	3 LEDU 425	3
ENGL 313	3 HIST 200 or POSC 225 (required)	3
Writing Competency Requirement	Literature (see Core Curriculum)	3
	Graduation Petition due in Registrar's Office	
	<b>16</b>	<b>18</b>

**Total Credits 34**

Fourth Year		
Fall	Credits Spring	Credits
BBST 300/400 Bible Elective	3 BBST 300/400 Bible Elective	3
CHEM, CSCI, MATH, PHSC Elective (upper-division) <sup>1</sup>	4 BBST 465 (Christianity & Nat Sci - required)	3
Communication (see Core Curriculum)	3 PHSC 460	1
Foreign Language (see Core Curriculum)	4 CHEM, CSCI, MATH, PHSC Elective (upper-division) <sup>1</sup>	3
Philosophy (see Core Curriculum)	3 LEDU 433	2
KNES Activity (see Core Curriculum)	1 LEDU 438	3
	LEDU 450 <sup>2</sup>	0
	LEDU 452 <sup>2</sup>	0
	<b>18</b>	<b>15</b>

**Total Credits 33**<sup>1</sup> See list of electives in catalog.<sup>2</sup> LEDU 450 (6) and LEDU 452 (6) are not required for graduation; may be completed at graduate level.

## Torrey Hnrs Seq

**NOTE:** The course sequence table is designed by the major department and is one way that the classes will work out properly in sequence for your major. However, there are alternative or flexible ways to rotate some of the classes within the same year/level and sometimes between year levels. Please contact your major department advisor to discuss flexible alternatives in scheduling the sequence of your classes.

Taking coursework during the summer session may also be an option to accelerate your degree path.

See Core Curriculum Program section (<http://catalog.biola.edu/general-information/undergraduate-core-curriculum-program/>) for a list of approved Core Curriculum courses.

- Physical Science, B.S. (p. 3)
- Secondary Instruction (p. 4)

**Physical Science, B.S. (PHSC)**

First Year		
Fall	Credits Spring	Credits
HNRS 101	4 HNRS 105	4
HNRS 102	4 HNRS 106	4
MATH 150	4 MATH 151	4
PHSC 124	1 PHSC 233	3
PHSC 132	3 PHSC 237	1
PHSC 134	1 KNES 107	1
GNST 102	1	
<b>18</b>		<b>17</b>

Second Year		
Fall	Credits Spring	Credits
HNRS 210	4 HNRS 230	4
HNRS 215	4 HNRS 231	4
CHEM/CSCI/MATH/PHSC Elective	3 CHEM/CSCI/MATH/PHSC Elective	3
PHSC 234	4 CHEM/CSCI/MATH/PHSC Elective (upper-division)	4
<b>15</b>		<b>15</b>

Third Year		
Fall	Credits Spring	Credits
HNRS 324	4 HNRS 337	4
HNRS 326	2 HNRS 339	2
CHEM 105	4 CHEM 106	4
CHEM/CSCI/MATH/PHSC Elective (upper-division)	3 ENGL 313	3
	Foreign Language (see Core Curriculum)	4
	KNES Activity (see Core Curriculum)	1
<b>13</b>		<b>18</b>

Fourth Year		
Fall	Credits Spring	Credits
HNRS 443	4 HNRS 458	4
CHEM/CSCI/MATH/PHSC Elective (upper-division)	3 BBST 465	3
CHEM/CSCI/MATH/PHSC Elective (upper-division)	3 PHSC 460	1
CHEM/CSCI/MATH/PHSC Elective (upper-division)	4 CHEM/CSCI/MATH/PHSC Elective (upper-division)	3
	CHEM/CSCI/MATH/PHSC Elective (upper-division)	4
<b>14</b>		<b>15</b>

**Total Credits 125**

### Physical Science, B.S. Secondary Instruction (PHSI)

For students who enroll in more than 18 semester credits, please note the additional cost per credit in the catalog's Financial Information section (<http://catalog.biola.edu/general-information/financial-information/>).

First Year		
Fall	Credits Spring	Credits
HNRS 101	4 HNRS 105	4
HNRS 102	4 HNRS 106	4
CHEM 105	4 CHEM 106	4
MATH 150	4 MATH 151	4
PHSC 124	1 KNES 107	1
GNST 102	1	
<b>18</b>		<b>17</b>

Second Year		
Fall	Credits Spring	Credits
HNRS 210	4 HNRS 230	4
HNRS 215	4 HNRS 231	4

PSYC 200 (required)	3 PHSC 233	3
PHSC 132	3 PHSC 237	1
PHSC 134	1 CHEM/CSCI/MATH/PHSC Elective	3
LEDU 301	3 LEDU 330	3
<b>18</b>		<b>18</b>

Third Year		
Fall	Credits Spring	Credits
HNRS 324	4 HNRS 337	4
HNRS 326	2 HNRS 339	2
PHSC 234	4 LEDU 425	3
CHEM/CSCI/MATH/PHSC Elective	3 ENGL 313	3
LEDU 341	3 CHEM/CSCI/MATH/PHSC Elective (upper-division)	3
	Foreign Language (see Core Curriculum)	4
<b>16</b>		<b>19</b>

Fourth Year		
Fall	Credits Spring	Credits
HNRS 443	4 HNRS 458	4
CHEM/CSCI/MATH/PHSC Elective (upper-division)	4 BBST 465	3
CHEM/CSCI/MATH/PHSC Elective (upper-division)	4 PHSC 460	1
CHEM/CSCI/MATH/PHSC Elective (upper-division)	3 LEDU 433	2
KNES Activity (see Core Curriculum)	1 LEDU 438	3
	CHEM/CSCI/MATH/PHSC Elective (upper-division)	3
<b>16</b>		<b>16</b>

**Total Credits 138**