

Biology with Teaching, B.S.

Learn more about the Bachelor of Science in Biology with Teaching.

The B.S. with Teaching in Biology is part of Temple's innovative "TUteach" secondary education teacher-training program. The B.S. with Teaching provides broad training in Biology and prepares students for a career in secondary school teaching, further graduate study or an entry level position as a biologist. The education courses in the B.S. with Teaching include supervised teaching in school district classrooms and emphasize inquiry-based approaches to learning. Students in the B.S. with Teaching degree program become *eligible* for a Pennsylvania teacher certification when they complete all the requirements for the degree that include theoretical and practical courses in education specifically designed for science and mathematics majors. In order to be *recommended* for Pennsylvania teacher certification, students must graduate with:

1. a B.S. with Teaching degree
2. meet GPA and testing requirements of the state of Pennsylvania.

Students will be scheduled once each semester to meet with the TUteach advisor to ensure that students have knowledge of academic programming, internships opportunities, and testing options that include test preparation. The state of Pennsylvania has specific candidacy requirements. The TUteach advisor will also help the students complete and submit the candidacy documents. All students joining the program in their freshman year must complete the PAPA examination or acquire the PAPA waiver within their first 72 credits. Transfer students, from within Temple and those from other institutions, will build a tailored program with the academic and testing benchmarks structured for efficient degree completion with the TUteach advisor. Students are encouraged to complete the appropriate PRAXIS II examination prior to student teaching. Students are encouraged to take internship courses to expand their teaching portfolio or select elective courses that will extend their knowledge of science and teaching practice.

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Summary of Requirements for the Degree

1. University Requirements (124 total s.h.)

- MATH 0701 (4 s.h.) and/or ENG 0701 (4 s.h.), if required by placement testing.
- All Temple students must take a minimum of two writing-intensive courses at Temple as part of their major. Following is a list of courses that can be used to satisfy the writing-intensive requirement:

Code	Title	Credit Hours
BIOL 2296	Genetics (S)	
BIOL 3096	Cell Structure and Function (F)	
BIOL 3396	Scientific Writing for Biology: The Art of Communicating	
MGSE 3796	Differentiated Literacy Instruction in the Disciplines (grades 7-12)	

- Students must complete the General Education (GenEd) requirements.
 - See the General Education section of the *Undergraduate Bulletin* for the GenEd curriculum.
 - Students who complete TUTEACH majors typically receive a waiver for 1 Human Behavior (GB), 2 Science & Technology (GS) and 1 Quantitative Literacy (GQ) GenEd courses.
- Students must satisfy general Temple University residency requirements.

2. College Requirements

- 90 credits within the College of Science & Technology (CST) or the College of Liberal Arts (CLA).
- 45 Upper Level (2000+) credits within the College of Science & Technology (CST) or the College of Liberal Arts (CLA).
- First Year Seminar Requirement: All students in the College of Science & Technology (CST) are required to take a 1 credit first year seminar course, SCTC 1001 CST First Year Seminar. Other courses that fulfill this requirement may be found on the CST College Requirements page. Only one course in this category may count towards graduation.

3. Major Requirements for Bachelor of Science (94-97 s.h.)¹

At least 9 courses required for the major must be completed at Temple. At least 5 Biology courses and 3 Education courses must be completed at Temple. Though not required, students are strongly encouraged to increase training and field work experience by enrolling in SCTC 1385, SCTC 2385, or SCTC 2389. Students will also benefit from directed laboratory projects offered through SCTC 3185. These courses are offered every semester.

Code	Title	Credit Hours
Biology		
BIOL 1111 or BIOL 1911	Introduction to Organismal Biology Honors Introduction to Organismal Biology	4
BIOL 2112 or BIOL 2912	Introduction to Cellular and Molecular Biology Honors Introduction to Cellular and Molecular Biology	4
BIOL 2296	Genetics (S)	4
BIOL 2227	Principles of Ecology	3
BIOL 3091	Research Methods (S)	3
BIOL 3096	Cell Structure and Function (F)	4
Three upper level Biology electives at the 2200 level or above ²		9-12
Chemistry		
Select one of the following:		4
CHEM 1031 & CHEM 1033	General Chemistry I and General Chemistry Laboratory I	
CHEM 1951 & CHEM 1953	Honors General Chemical Science I and Honors Chemical Science Laboratory I (F)	
Select one of the following:		4
CHEM 1032 & CHEM 1034	General Chemistry II and General Chemistry Laboratory II	
CHEM 1952 & CHEM 1954	Honors General Chemical Science II and Honors Chemical Science Laboratory II (S)	
Select one of the following:		4
CHEM 2201 & CHEM 2203	Organic Chemistry I and Organic Chemistry Laboratory I	

CHEM 2211 & CHEM 2213	Organic Chemistry for Majors I and Organic Majors Laboratory I	
CHEM 2921 & CHEM 2923	Organic Chemistry for Honors I and Organic Honors Laboratory I (F)	
Select one of the following:		4
CHEM 2202 & CHEM 2204	Organic Chemistry II and Organic Chemistry Laboratory II	
CHEM 2212 & CHEM 2214	Organic Chemistry for Majors II and Organic Majors Laboratory II	
CHEM 2922 & CHEM 2924	Organic Chemistry for Honors II and Organic Honors Laboratory II (S)	
Mathematics		
MATH 1041 or MATH 1941	Calculus I Honors Calculus I	4
Select one of the following:		4
MATH 1044	Introduction to Probability and Statistics for the Life Sciences	
MATH 1042	Calculus II	
MATH 1942	Honors Calculus II	
Physics		
PHYS 2021 or PHYS 2921	General Physics I Honors General Physics I	4
PHYS 2022 or PHYS 2922	General Physics II Honors General Physics II	4
College of Science and Technology		
SCTC 1013	Elements of Data Science for the Physical and Life Sciences	3
SCTC 1389	Step 1 and 2: Inquiry-Based Lesson Design in Science and Mathematics Modified for English Learners	2
SCTC 3001	History of Science	3
SCTC 3312	Coding STEM Lessons ³	1
Education		
EDUC 2179	Knowing and Learning in Mathematics and Science	3
EDUC 4388	TUteach Apprentice Teaching	6
EDUC 4802	TUteach Apprentice Teaching Seminar	1
MGSE 3796	Differentiated Literacy Instruction in the Disciplines (grades 7-12)	3
MGSE 2189 or SCTC 3485	Classroom Interactions (S) Science and Mathematics in the Classroom	3
MGSE 4189 or SCTC 4485	Project-Based Instruction (F) Integrating STEM Practice in Diverse Teaching Environments	3
SPED 2231	Introduction to Special Education	3
Total Credit Hours		94-97

Code	Title	Credit Hours
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(F) - Fall only course

(S) - Spring only course

¹ The certification requirements need to meet Pennsylvania Department of Education standards and are subject to change. All students are strongly recommended to check with the TUteach Advisor in the College of Science and Technology, to affirm the requirements that pertain to their specific major. In addition, students should check the *Undergraduate Bulletin* web site for the most current information about these programs or the TUteach web site. It is also recommended that all students meet with an advisor before enrolling in classes specific to these majors and leading to certification as a teacher. This is to assure that a candidate's intended program of study will be compatible with the new requirements.

² See course descriptions for exceptions.

³ All students are required to take a minimum of one credit.

Note: A grade of C or higher in CHEM 1032 is required to take BIOL 1111 and BIOL 2112. A grade of C or higher in BIOL 1111 and BIOL 2112 is required to take upper-level Biology courses, and a C- or higher is required unless otherwise specified in all other courses for the major, including course prerequisites. BIOL 3091 is not available for major credit.

Calculation of Major GPA

Courses listed under the major requirements for the degree will be included in the calculation of the major GPA. Courses that could not apply toward the major as an elective or required course would not be counted in the calculation of the major GPA. This would include BIOL 1011, for example.

Distinction in Major

To graduate with a Distinction in Biology with Teaching, students must meet the following requirements:

1. Achieve a 3.50 GPA or better for the aggregate of courses required for the B.S. in Biology with Teaching.
2. Achieve a 3.20 GPA or better in the Biology coursework.
3. Achieve a 3.90 GPA in the following courses:

Code	Title	Credit Hours
SCES 2189 or SCTC 3485	Classroom Interactions Science and Mathematics in the Classroom	3
SCES 4189 or SCTC 4485	Project-Based Instruction Integrating STEM Practice in Diverse Teaching Environments	3
EDUC 4802	TUteach Apprentice Teaching Seminar	1
EDUC 4388	TUteach Apprentice Teaching	6

4. Write a final research paper either in a topic combining both major content and pedagogy or a topic focused on research in Biology. They must present their research for evaluation and present at a departmental research poster session before graduation. Consult the undergraduate TUteach advisor for more details.

Suggested Academic Plan

Bachelor of Science in Biology with Teaching

Requirements for New Students starting in the 2020-2021 Academic Year

Year 1		Credit Hours
Fall		
Select one of the following:		4
CHEM 1031 & CHEM 1033	General Chemistry I	
CHEM 1951 & CHEM 1953	Honors General Chemical Science I (F)	
MATH 1041 or 1941	Calculus I	4
SCTC 1001	CST First Year Seminar	1
SCTC 1013	Elements of Data Science for the Physical and Life Sciences	3
SCTC 1389	Step 1 and 2: Inquiry-Based Lesson Design in Science and Mathematics Modified for English Learners	2
GenEd Breadth Course		3
	Term Credit Hours	17
Spring		
BIOL 1111 or 1911	Introduction to Organismal Biology	4
Select one of the following:		4
CHEM 1032 & CHEM 1034	General Chemistry II	
CHEM 1952 & CHEM 1954	Honors General Chemical Science II (S)	
Select one of the following:		4
MATH 1044	Introduction to Probability and Statistics for the Life Sciences	

MATH 1042	Calculus II	
MATH 1942	Honors Calculus II	
ENG 0802, 0812, or 0902	Analytical Reading and Writing [GW]	4
	Term Credit Hours	16

Year 2**Fall**

BIOL 2112 or 2912	Introduction to Cellular and Molecular Biology	4
Select one of the following:		4
CHEM 2201 & CHEM 2203	Organic Chemistry I	
CHEM 2211 & CHEM 2213	Organic Chemistry for Majors I	
CHEM 2921 & CHEM 2923	Organic Chemistry for Honors I (F)	
EDUC 2179	Knowing and Learning in Mathematics and Science	3
SPED 2231	Introduction to Special Education	3
IH 0851 or 0951	Intellectual Heritage I: The Good Life [GY]	3
	Term Credit Hours	17

Spring

Select one of the following:		3-4
BIOL 2227	Principles of Ecology	
BIOL 2296	Genetics [WI] (S)	
Select one of the following:		4
CHEM 2202 & CHEM 2204	Organic Chemistry II	
CHEM 2212 & CHEM 2214	Organic Chemistry for Majors II	
CHEM 2922 & CHEM 2924	Organic Chemistry for Honors II (S)	
MGSE 3796	Differentiated Literacy Instruction in the Disciplines (grades 7-12) [WI]	3
IH 0852 or 0952	Intellectual Heritage II: The Common Good [GZ]	3
Elective		1-0
	Term Credit Hours	14

Year 3**Fall**

BIOL 3096	Cell Structure and Function [WI] (F)	4
PHYS 2021 or 2921	General Physics I	4
SCTC 3001	History of Science	3
GenEd Breadth Course		3
Elective		3
	Term Credit Hours	17

Spring

BIOL 3091	Research Methods (S)	3
PHYS 2022 or 2922	General Physics II	4
Select one of the following:		3-4
BIOL 2227	Principles of Ecology	
BIOL 2296	Genetics [WI] (S)	
Select one of the following:		3
MGSE 2189	Classroom Interactions (S)	
SCTC 3485	Science and Mathematics in the Classroom	
GenEd Breadth Course		3
Elective		1-0
	Term Credit Hours	17

Year 4**Fall**

Upper-Level 2200+ Biology Elective ¹		3-4
Upper-Level 2200+ Biology Elective ¹		3-4
SCTC 3312	Coding STEM Lessons ²	1
Select one of the following:		3
MGSE 4189	Project-Based Instruction (F)	
SCTC 4485	Integrating STEM Practice in Diverse Teaching Environments	
GenEd Breadth Course		3
Elective		2-0
	Term Credit Hours	15

Spring

Upper-Level 2200+ Biology Elective ¹		3-4
EDUC 4388	TUteach Apprentice Teaching	6
EDUC 4802	TUteach Apprentice Teaching Seminar	1
Elective Credits		1-0
	Term Credit Hours	11
	Total Credit Hours:	124

Code	Title	Credit Hours
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(F) - Fall only course

(S) - Spring only course

¹ If the student has taken the necessary prerequisite courses, some of the Biology elective courses may be taken before the Fall semester of Year 4. While not required, BIOL 3101 Evolution is highly recommended as one of three Biology electives.

² All students are required to take a minimum of one credit.