

Mathematics & Technology with Teaching, B.S.

Learn more about the Bachelor of Science in Mathematics and Technology with Teaching (<https://www.temple.edu/academics/degree-programs/mathematics-and-technology-with-teaching-major-st-mttc-bs>).

The B.S. with Teaching in Mathematics and Technology is part of Temple's innovative "TUteach" secondary education teacher-training program. The B.S. with Teaching provides broad training in mathematics and prepares students for a career in secondary school teaching or an entry level position as a mathematics specialist. 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 insure 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
MATH 3096	Introduction to Modern Algebra	
MATH 4096	Senior Problem Solving	
PHIL 2196	Perspectives on Science and Mathematics	
SECE 3796	Differentiated Literacy Instruction in the Disciplines, 7-12	

- Students must complete the General Education (GenEd) requirements.
 - See the General Education (<http://bulletin.temple.edu/undergraduate/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 (<http://bulletin.temple.edu/undergraduate/academic-policies/academic-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 (<http://bulletin.temple.edu/undergraduate/science-technology/#collegerequirementstext>) page. Only one course in this category may count towards graduation.

3. Major Requirements for Bachelor of Science (95-98 s.h.)¹

At least 10 courses required for the major must be completed at Temple. At least 7 Math, 2 Engineering, 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
Mathematics		
MATH 1041 or MATH 1941	Calculus I Honors Calculus I	4
MATH 1042 or MATH 1942	Calculus II Honors Calculus II	4
MATH 2021	Functions and Modeling (S)	3
MATH 2043 or MATH 2943	Calculus III Honors Calculus III	4
MATH 2061	Euclidean Geometry (S)	3
MATH 2101 or MATH 2103	Linear Algebra Linear Algebra with Computer Lab	3-4
MATH 2111	Basic Concepts of Math	3
MATH 3003	Theory of Numbers	3
MATH 3031	Probability Theory I	3
MATH 3096	Introduction to Modern Algebra	3

MATH 3137	Real & Complex Analysis I (F)	3
MATH 3138	Real & Complex Analysis II (S)	3
MATH 4096	Senior Problem Solving	3
One Mathematics 3000+ elective		3

Physics or Chemistry

Select one of the following sets: ² 8

PHYS 1061	Elementary Classical Physics I	
or PHYS 1961	Honors Elementary Classical Physics I	
or PHYS 2021	General Physics I	
or PHYS 2921	Honors General Physics I	
& PHYS 1062	and Elementary Classical Physics II	
or PHYS 1962	Honors Elementary Classical Physics II	
or PHYS 2022	General Physics II	
or PHYS 2922	Honors General Physics II	
CHEM 1031	General Chemistry I	
& CHEM 1033	and General Chemistry Laboratory I	
& CHEM 1032	and General Chemistry II	
& CHEM 1034	and General Chemistry Laboratory II	
CHEM 1951	Honors General Chemical Science I	
& CHEM 1953	and Honors Chemical Science Laboratory I	
& CHEM 1952	and Honors General Chemical Science II	
& CHEM 1954	and Honors Chemical Science Laboratory II	

Engineering Foundation courses

Select one of the following: 3

ENGR 1101	Introduction to Engineering & Engineering Technology	
ENGR 1102	Introduction to Engineering Problem Solving	
ENGR 1901	Honors Introduction to Engineering	
ENGR 1117	Engineering Graphics	

Engineering Concentration Courses

Select two courses within the same track: ² 6-8

Track 1 - Environment

EES 2001	Physical Geology	
CEE 2711	Environmental Chemistry & Microbiology	
or CEE 3711	Environmental Engineering	

Track 2 - Robotics

ECE 2312	Electrical Engineering Science I	
& ECE 2313	and Electrical Engineering Science I Lab	
ECE 2612	Digital Circuit Design	
& ECE 2613	and Digital Circuit Design Laboratory	

Track 3 - Energy

ENGR 3571	Classical and Statistical Thermodynamics	
MEE 4575	Renewable and Alternative Energy	
or MEE 4576	Photovoltaic System Design for Engineers	

Track 4 - Bioengineering

BIOE 2001	Frontiers in Bioengineering	
BIOE 3725	Cell Biology for Engineers	
or BIOL 3334	Mammalian Physiology	

College of Science & Technology

SCTC 1389	Step 1 and 2: Inquiry-Based Lesson Design in Science and Mathematics Modified for English Learners	2
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

MAES 2189 or SCTC 3485	Classroom Interactions (S) Science and Mathematics in the Classroom	3
MAES 4189 or SCTC 4485	Project-Based Instruction (F) Integrating STEM Practice in Diverse Teaching Environments	3
SECE 3796	Differentiated Literacy Instruction in the Disciplines, 7-12	3
SPED 2231	Introduction to Inclusive Education	3
Philosophy/History		
Select one of the following:		3
PHIL 2196 SCTC 3001	Perspectives on Science and Mathematics History of Science	
Research Methods		
BIOL/CHEM/EES/PHYS 3091	Research Methods (S)	3
Total Credit Hours		95-98

Code	Title	Credit Hours
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(F) - Fall only course

(S) - Spring only course

- 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 (<https://cst.temple.edu/academics/accelerated-programs/tuteach>). 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.
- Most engineering concentration courses require either Chemistry or Physics as a prerequisite, so students should choose the course that best prepares them for their intended track. The Environment and Bioengineering tracks cannot be completed without the chemistry sequence, and the Robotics and Energy tracks cannot be completed without the physics sequence.
- All students are required to take a minimum of one 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 MATH 1022, for example.

Distinction in Major

To graduate with a Distinction in Mathematics and Technology with Teaching, a student should meet the following requirements:

- Achieve a 3.50 GPA or better for the aggregate of courses required for the B.S. in Mathematics and Technology with Teaching.
- Achieve a 3.50 GPA for the aggregate of CST content courses required for the B.S. in Mathematics and Technology with Teaching.
- Achieve a 3.50 GPA for the aggregate of Engineering content courses required for B.S. in Mathematics and Technology with Teaching.
- Achieve an overall GPA, including all college-level courses, of at least 3.25.
- Complete MATH 3141, MATH 3142 and MATH 4051 instead of MATH 3137 and MATH 3138, as well as MATH 3098 instead of MATH 3096.
- A student must achieve a GPA of 3.50 or higher in:

Code	Title	Credit Hours
MATH 3141	Advanced Calculus I	3
MATH 3142	Advanced Calculus II	3
MATH 3098	Modern Algebra	3
MATH 4051	Complex Analysis	3
Any additional courses from the following:		
MATH 3043	Numerical Analysis I	4

MATH 3044	Numerical Analysis II	3
MATH 3101	Topics in Modern Algebra	3
Any 4000-level course other than individual study		

- Achieve a 3.90 GPA in the following courses:

Code	Title	Credit Hours
MAES 2189 or SCTC 3485	Classroom Interactions Science and Mathematics in the Classroom	3
MAES 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

Suggested Academic Plan

Bachelor of Science in Mathematics & Technology with Teaching Requirements for New Students starting in the 2019-2020 Academic Year

Year 1		Credit Hours
Fall		
MATH 1041 or 1941	Calculus I	4
Select one of the following: ¹		4
CHEM 1031 & CHEM 1033	General Chemistry I	
CHEM 1951 & CHEM 1953	Honors General Chemical Science I	
PHYS 1061	Elementary Classical Physics I	
PHYS 1961	Honors Elementary Classical Physics I (F)	
PHYS 2021	General Physics I	
PHYS 2921	Honors General Physics I (F)	
SCTC 1001	CST First Year Seminar	1
SCTC 1389	Step 1 and 2: Inquiry-Based Lesson Design in Science and Mathematics Modified for English Learners	2
General Education/Elective Credits		5
Term Credit Hours		16
Spring		
MATH 1042 or 1942	Calculus II	4
Select one of the following: ¹		4
CHEM 1032 & CHEM 1034	General Chemistry II	
CHEM 1952 & CHEM 1954	Honors General Chemical Science II	
PHYS 1062	Elementary Classical Physics II	
PHYS 1962	Honors Elementary Classical Physics II (S)	
PHYS 2022	General Physics II	
PHYS 2922	Honors General Physics II (S)	
Select one of the following:		3
ENGR 1101	Introduction to Engineering Engineering Technology	
ENGR 1102	Introduction to Engineering Problem Solving	
ENGR 1901	Honors Introduction to Engineering	
General Education/Elective Credits		5
Term Credit Hours		16

Year 2		
Fall		
MATH 2043 or 2943	Calculus III	4
MATH 2101 or 2103	Linear Algebra	3-4
ENGR 1117	Engineering Graphics	2
EDUC 2179	Knowing and Learning in Mathematics and Science	3
General Education/Elective Credits		5-4
	Term Credit Hours	17
Spring		
MATH 2021	Functions and Modeling (S)	3
MATH 2061	Euclidean Geometry (S)	3
MATH 2111	Basic Concepts of Math	3
SPED 2231	Introduction to Inclusive Education	3
General Education/Elective Credits		5
	Term Credit Hours	17
Year 3		
Fall		
MATH 3003	Theory of Numbers	3
MATH 3137	Real Complex Analysis I (F)	3
Engineering Concentration Elective ¹		3-4
SECE 3796	Differentiated Literacy Instruction in the Disciplines, 7-12 [WI]	3
Select one of the following:		3
PHIL 2196	Perspectives on Science and Mathematics [WI]	
SCTC 3001	History of Science	
Elective Credits		1-0
	Term Credit Hours	16
Spring		
MATH 3096	Introduction to Modern Algebra [WI]	3
MATH 3138	Real Complex Analysis II (S)	3
Select one of the following:		3
MAES 2189	Classroom Interactions (S)	
SCTC 3485	Science and Mathematics in the Classroom	
Select one of the following:		3
BIOL 3091	Research Methods (S)	
CHEM 3091	Research Methods (S)	
EES 3091	Research Methods (S)	
PHYS 3091	Research Methods (S)	
Engineering Concentration Elective ¹		3-4
Elective Credits		1-0
	Term Credit Hours	16
Year 4		
Fall		
Mathematics Elective (3000+)		3
MATH 3031	Probability Theory I	3
MATH 4096	Senior Problem Solving [WI]	3
SCTC 3312	Coding STEM Lessons ²	1
Select one of the following:		3
MAES 4189	Project-Based Instruction (F)	
SCTC 4485	Integrating STEM Practice in Diverse Teaching Environments	
General Education/Elective Credits		3
	Term Credit Hours	16
Spring		

EDUC 4388	TUteach Apprentice Teaching	6
EDUC 4802	TUteach Apprentice Teaching Seminar	1
General Education/Elective Credits		3
Term Credit Hours		10
Total Credit Hours:		124

¹ The two (2) Engineering concentration electives must be chosen from the same track. See major requirements for details. Most engineering concentration courses require either Chemistry or Physics as a prerequisite, so students should choose the course that best prepares them for their intended track. The Environment and Bioengineering tracks cannot be completed without the chemistry sequence, and the Robotics and Energy tracks cannot be completed without the physics sequence.

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

Code	Title	Credit Hours
(F) - Fall only course		
(S) - Spring only course		