

College of Science and Technology (SCTC)

Course information contained within the Bulletin is accurate at the time of publication in August 2023 but is subject to change. For the most up-to-date course information, please refer to the Course Catalog.

SCTC 0712. Mathematical Concepts I. 0 Credit Hours.

The goal of this course is to give students a firm foundation in the topics of intermediate algebra as a basis for subsequent courses in mathematics and other disciplines. Included in this goal is the development and strengthening of one's skill in interpreting and solving application problems. Intermediate Algebra begins with a presentation of topics of Algebra including use of variables, exponents, order of operations. Further topics include solving linear equations and inequalities, understanding and graphing linear equations in two variables, finding the equation of a line, applying the laws of exponents, performing operations with polynomials, factoring polynomials, and solving polynomial equations. The skill of solving equations will be extended to formulating and solving equations of applied problems. Students will be offered the opportunity to use MyMath Test with instructor support as they work through the course material and will be offered the opportunity to re-take the Math Placement Test upon completion of the course. Note: The fee for this course may be found in the Detailed Class Information, which can be reached from the class schedule listing.

SCTC 0721. Mathematical Concepts II. 0 Credit Hours.

This course emphasizes techniques of problem solving using algebraic concepts. This course will prepare students for Pre-calculus by review of multiple algebraic concepts. This course covers polynomial, rational and algebraic expressions, solving linear equations and inequalities, algebra and graphs of quadratic expressions, and an introduction to the concept of a function. Approaches to problem solving will be emphasized. Students will be offered the opportunity to use MyMath Test with instructor support as they work through the course material and will be offered the opportunity to re-take the Math Placement Test upon completion of the course. Note: The fee for this course may be found in the Detailed Class Information, which can be reached from the class schedule listing.

SCTC 0727. Chemical Concepts. 0 Credit Hours.

In this course quantitative practices in chemistry will be emphasized. Topics include empirical and molecular formula, reaction quantities, stoichiometry, thermochemistry and gas properties. Core concepts and principles will be reviewed. A significant component of the course will focus on problem solving skills. A discussion of expectation and test taking practices in preparation for General Chemistry will be provided. Note: The fee for this course may be found in the Detailed Class Information, which can be reached from the class schedule listing.

SCTC 0860. GenEd Limited Edition GS. 3 Credit Hours.

This is a General Education Limited Edition course that will satisfy the GenEd Science and Technology requirement. Topics vary by semester. Check the Class Schedule for the full description of specific topics offered. Students cannot repeat this course for additional credits, regardless of the topic.

Course Attributes: GS

Repeatability: This course may not be repeated for additional credits.

SCTC 0960. Honors GenEd Limited Edition GS. 3 Credit Hours.

This is an Honors General Education Limited Edition course that will satisfy the GenEd Science and Technology requirement. Topics vary by semester. Check the Class Schedule for the full description of specific topics offered. Students cannot repeat this course for additional credits, regardless of the topic.

Course Attributes: GS, HO

Repeatability: This course may not be repeated for additional credits.

SCTC 1001. CST First Year Seminar. 1 Credit Hour.

This course is typically offered in Fall.

This course provides students with the foundation necessary for success in college. Students engage in interactive workshops to develop the academic, professional, and life skills required for Science and Technology students. Topics include: study habits, test-taking strategies, time management tools, goal setting techniques, financial literacy, communication in college, and university resources/navigation/utilization. Students work closely with the instructor to develop an academic plan. NOTE: Registration for this course is restricted to first year students enrolled in the College of Science & Technology.

Class Restrictions: Must be enrolled in one of the following Classes: Freshman 0 to 29 Credits.

College Restrictions: Must be enrolled in one of the following Colleges: Science & Technology.

Repeatability: This course may not be repeated for additional credits.

SCTC 1002. STEM Scholars Seminar. 1 Credit Hour.

This course provides students majoring in Biology, Biochemistry, and Chemistry with the foundation necessary to succeed in college. Student participants in the Emerging STEM Scholars program are required to attend these weekly seminars in both the fall and spring semesters over all four years, enabling them to develop the academic, professional, and life skills required for success in a science or science-related career. Topics will include: study habits, test-taking strategies, time management tools, and contact with academic and industrial scientists. The seminars will be led by advanced graduate student mentors in computational biology or chemistry. As needed, students will be directed to appropriate university provided resources. NOTE: Registration for this course is restricted to participants in the Emerging STEM Scholars program.

Cohort Restrictions: Must be enrolled in one of the following Cohorts: STEM.

Repeatability: This course may be repeated for additional credit.

SCTC 1003. STEM Connections Seminar. 1 Credit Hour.

This one credit course will engage first-year students in explorations of inter- and trans-disciplinary themes in science and mathematics. Themes include (but are not limited to): Fragile Futures, Molecules to Medicine, Modern Materials, Dark Matter/Dark Energy, Modeled by Math, and Designed by Data. Faculty from CST departments will contribute a 30-45 minute presentation to a series of six seminars related to one of the selected themes. Students are to contribute broadly to a discussion of the theme. Students will complete activities and/or assignments related to the faculty presentations.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Undergraduate.

Repeatability: This course may be repeated for additional credit.

SCTC 1013. Elements of Data Science for the Physical and Life Sciences. 3 Credit Hours.

This course is typically offered in Fall and Spring.

This course provides a basic introduction to data science. Data is ubiquitous in our society, as it is processed in fields including science, medicine, economics, and business. We evaluate surveys, test performance, analyze large data sets and more. This course will help students to understand how data is generated, collected, and used. Both inferential and computational thinking will be applied to practical problems and common problems faced by all in the sciences. Students will learn basic computer programming and statistical inference by working, hands-on, with real world problems. This course is based on the Foundations of Data Science (Data 8) course designed by faculty at UC Berkeley and distributed widely to academic partners. Data projects will be selected from the basic sciences including biology, ecology, environmental science, genomics, chemistry and physics. This approach will allow students from the physical, life and mathematical sciences to engage in disciplinary knowledge in their majors as they learn and apply basic tools of data science. The applications will focus on experimental design, basic simulation and data analyses. Course topics will be explored using on-line resources in a collaborative learning classroom environment. To increase student engagement and success, the topics will be broken into smaller modules with focused exercises that allow scaffolding of the computer programming and basic statistics curricula. This course is a component of the recommended CST first-year student curriculum.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites: Minimum grade of C- in (MATH 0702 (may be taken concurrently), any MATH course numbered 0800 to 4999 (may be taken concurrently), 'Y' in MC4, 'Y' in MC5, 'Y' in MC6, 'Y' in MC6A, 'Y' in MATW, 'Y' in MA01, STAT 1001 (may be taken concurrently), 'Y' in STT2, STAT 1102 (may be taken concurrently), STAT 1902 (may be taken concurrently), or 'Y' in MC6T)

SCTC 1021. Journey of the Algorithm. 1 to 4 Credit Hour.

Students will explore mathematics via discussions, manipulative methods, and other techniques. By completing tasks provided by the instructor, students will make authentic connections across the mathematical platform. The tasks will allow students to investigate mathematics from an integrated approach, bringing appropriate mathematical phenomena and algorithms into their solutions as needed. Science applications will be part of each curricular unit, and this content will support integration of mathematics into science lessons for students in the TUTEACH program.

Repeatability: This course may not be repeated for additional credits.

SCTC 1189. Step 1: Inquiry Approaches to Teaching. 1 Credit Hour.

This course is typically offered in Fall and Spring.

This is the first course in the TUtach pedagogy sequence. This course will provide students with an opportunity to explore teaching in science or mathematics as a career; early field experiences in teaching; and an introduction to the theory and practice necessary to prepare and deliver excellent instruction. To obtain first-hand experience with planning and implementing inquiry-based curriculum, students will teach science/mathematics lessons (designed in NSF-funded project) in elementary classrooms in a local school district. Students will attend 1.5 hours of class on campus each week, where they will learn to prepare and deliver excellent science/mathematics lessons. Students, working in teams, will present three lessons in a third, fourth, fifth or sixth grade classroom during the semester. These classrooms are selected both for the diversity of the student body and for the quality of the classroom teacher. Each team of students will have a district classroom teacher and a TUtach master teacher who will work with them to improve their teaching skills as the semester progresses. The district classroom teacher will remain in the classroom at all times and provide immediate feedback on the quality of the instruction. A tuition remission stipend will be paid to those students who successfully complete this course.

Repeatability: This course may be repeated for additional credit.

Pre-requisites: Minimum grade of C (except where noted) in (MATH 1021, any MATH course numbered 1022 to 4999 (C- or higher; may be taken concurrently), 'Y' in MC5, 'Y' in MC6, 'Y' in MA03, 'Y' in MC6A, STAT 1001, STAT 1102, STAT 1902, 'Y' in MATW, 'Y' in CRMA04, 'Y' in CRST01, 'Y' in CRST02, or 'Y' in MC6T)

SCTC 1289. Step 2: Inquiry Based Lesson Design with Strategies for English Learners. 1 Credit Hour.

This course is typically offered in Fall & Spring.

This is the second course in the TUtach pedagogy sequence. This course offers students the opportunity to explore science or mathematics teaching as a career, first-hand experience planning inquiry-based curriculum, and an introduction to theory, research and practice in teaching English language learners in the middle grades. Students will explore the philosophies of bilingual and ESL education as well as different program models that address the education of linguistically diverse students. Students attend 1.5 hours of class on campus each week, where they learn to design and deliver inquiry-based lessons with an understanding of how to adapt standards-based lessons for English language learners. Students teach three lessons in middle grade classroom during the semester. Students will also develop cross-cultural competence through interactions with ELLs, teachers and school staff in the middle grades. After Step 2, students can decide whether they want to pursue teacher certification through the TUtach program.

Repeatability: This course may be repeated for additional credit.

Pre-requisites: Minimum grade of C- in SCTC 1189.

SCTC 1301. Problem Solving in Science. 2 Credit Hours.

This course is typically offered in Fall and Summer II.

As a gateway into science majors, this introductory course will show students how to apply critical thinking and build problem solving skills in all science disciplines. We will look at a vast array of actual problems that you will be confronted with in courses in Biology, Chemistry, Computer Science, Geology, Mathematics and Physics. Problem solving processes and techniques that will be beneficial in solving complex and intricate problems that naturally arise in the sciences will be examined. Rote problems designed to give you practice at learning subject matter are straightforward. Actual science takes place, however, in conceptual, non-formulaic problems, which form the essence of the course.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites: Minimum grade of C- in (any MATH course numbered 0701 to 0702, any MATH course numbered 0800 to 4999 (may be taken concurrently), 'Y' in MC3, 'Y' in MC4, 'Y' in MC5, 'Y' in MC6, 'Y' in MC3A, 'Y' in MC6A, STAT 1001, 'Y' in STT2, STAT 1102, STAT 1902, 'Y' in MATW, 'Y' in MC3S, 'Y' in MC3D, 'Y' in MC3O, 'Y' in MC3T, or 'Y' in MC6T)

SCTC 1385. Community Engagement: Science and Mathematics Tutoring Mentoring and Service. 1 to 3 Credit Hour.

Students, sophomores and above, will apply in a real world setting, teaching, tutoring, mentoring and/or curriculum development skills. Students will work with the instructor to identify a set of background readings on: a) science and math background content, b) populations to be served, particular needs of these populations, and proven approaches to tutoring, mentoring, or developing curriculum for inquiry-based science or mathematics lessons for in-school or out-of-school activities to be offered, and c) the relationship of science to society for the particular placement. After this background research, students will develop a proposal, carry out the teaching/tutoring/mentoring/curriculum development they proposed, and reflect on the efficacy of their project.

Repeatability: This course may not be repeated for additional credits.

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

This course is typically offered in Fall and Spring.

This is the first course in the TUtach pedagogy sequence. This course will provide students with an opportunity to explore teaching in science or mathematics as a career; early field experiences in teaching; and an introduction to the theory and practice necessary to prepare and deliver excellent instruction. Students will attend 3 hours of class on campus each week, where they will learn to prepare and deliver excellent inquiry-based science/mathematics lessons. Each team of students will have a district classroom teacher and a TUtach master teacher who will work with them to improve their teaching skills as the semester progresses. The district classroom teacher will remain in the classroom at all times and provide immediate feedback on the quality of the instruction. Students will become familiar with elementary and middle school environments as well as the instructional needs of English language learners (ELLs) by observing and discussing middle school culture and by teaching lessons to a middle school class that includes ELLs. They will become familiar with exemplary science curricula for the middle school setting. This course also offers students an introduction to theory, research, and practice in teaching English language learners in the middle grades. Lesson plans will be designed using a modified SIOP (Sheltered Instruction Observation Protocol) model, a model teachers use to differentiate instruction for ELLs. As a result, they will gain an understanding of how to adapt standards-based lessons for English language learners. Students will also develop cross-cultural competence through interactions with ELLs, teachers and school staff in the middle grades. This course helps students determine if they wish to choose a teaching career.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites: Minimum grade of C (except where noted) in (MATH 1021, (MATH 1021 (may be taken concurrently) and SCTC 1021 (may be taken concurrently))), (MATH 0702 (may be taken concurrently) and SCTC 1021 (may be taken concurrently))), any MATH course numbered 1022 to 4999 (C- or higher; may be taken concurrently), 'Y' in MC5, 'Y' in MC6, 'Y' in MA03, 'Y' in MC6A, STAT 1001, STAT 1102, STAT 1902, 'Y' in MATW, 'Y' in CRMA04, (SCTC 1021 (may be taken concurrently) and 'Y' in CRMA04), (SCTC 1021 (may be taken concurrently) and 'Y' in CRMA01), 'Y' in CRST01, 'Y' in CRST02, (MATH 1021 (may be taken concurrently) and 'Y' in CRST01), ('Y' in CRMA04 and 'Y' in CRST01), (MATH 0702 (may be taken concurrently) and 'Y' in CRST01), ('Y' in CRMA01 and 'Y' in CRST01), or 'Y' in MC6T)

SCTC 1501. STEM Challenge: The World Around Us. 4 Credit Hours.

This course is typically offered in Fall and Spring.

This course provides an exploration of the world around us using an integrated and conceptual approach that includes the major themes: life science, physical science and environmental sciences. Topics of matter and motion, electricity and magnetism, sound and light, astronomy and earth science will be integrated to understand natural phenomena. In addition, students in the course will investigate the role of science through reading "Science in the News" and other current science-focused publications. The course is part of a two semester sequence intended to prepare students with a strong background in science to support disciplinary majors or to prepare elementary education majors with the necessary background to teach science.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites: Minimum grade of C in (any MATH course numbered 0701 to 0702 (may be taken concurrently)), any MATH course numbered 0800 to 4999 (may be taken concurrently), 'Y' in MC3, 'Y' in MC4, 'Y' in MC5, 'Y' in MC6, 'Y' in MC3A, 'Y' in MC6A, STAT 1102, STAT 1902, 'Y' in STT2, 'Y' in MATW, 'Y' in MC3S, 'Y' in CRMA18, 'Y' in CRMA19, 'Y' in CRST02, 'Y' in MC3D, 'Y' in MC3O, 'Y' in MC3T, or 'Y' in MC6T)

SCTC 1502. STEM Challenge: The World Within. 4 Credit Hours.

This course is typically offered in Fall and Spring.

This course provides an exploration of the world within using an integrated and conceptual approach that includes the major themes: life science, physical science. Topics including biomolecules and the cell, biochemical cycles, proteins and DNA, cellular processes, genetics, evolution, anatomy and plant biology and ecology will be integrated to understand natural phenomena associated with organisms in their habitats. In addition, students in the course will investigate the role of science through reading "Science in the News" and other current science-focused publications. The course is part of a two semester sequence intended to prepare students with a strong background in science to support disciplinary majors or to prepare elementary education majors with the necessary background to teach science.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites: Minimum grade of C in (any MATH course numbered 0701 to 0702 (may be taken concurrently)), any MATH course numbered 0800 to 4999 (may be taken concurrently), 'Y' in MC3, 'Y' in MC4, 'Y' in MC5, 'Y' in MC6, 'Y' in MC3A, 'Y' in MC6A, STAT 1102, STAT 1902, 'Y' in STT2, 'Y' in MATW, 'Y' in MC3S, 'Y' in CRMA18, 'Y' in CRMA19, 'Y' in CRST02, 'Y' in MC3D, 'Y' in MC3O, 'Y' in MC3T, or 'Y' in MC6T)

SCTC 2001. CST Transfer Seminar. 1 Credit Hour.

This course provides transfer students with the foundation necessary for success in the College of Science and Technology and provides guided exploration of the opportunities and resources at Temple University. Students engage in interactive workshops to develop the academic, professional, and life skills required for Science and Technology students. Topics may include: study habits, test-taking strategies, time management tools, goal setting techniques, financial literacy, communication in college, university resources/navigation/utilization, potential career paths, obtaining internships, research opportunities, getting involved on campus, and graduate school preparation. Students work closely with the instructor to develop an academic plan.

Class Restrictions: May not be enrolled in one of the following Classes: Freshman 0 to 29 Credits.

Repeatability: This course may not be repeated for additional credits.

SCTC 2002. CST Professional Development Seminar. 1 Credit Hour.

CST's Professional Development Seminar will introduce students to central concepts, resources, and skills to prepare for the career exploration and job search/application process, as well as develop leadership skills. Topics include: learning one's strengths, career exploration, resume writing, networking, cover letter writing, interview preparation, and the science of building high-performing teams and organizations. Students will complete individual and collaborative in-class assignments and exercises to develop their professional skills.

College Restrictions: Must be enrolled in one of the following Colleges: Science & Technology.

Repeatability: This course may not be repeated for additional credits.

SCTC 2082. Sophomore Directed Study. 1 to 4 Credit Hour.

This course is typically offered in Fall, Spring, Summer I and Summer II.

Intensive study in a cross-disciplinary area. This course does not count for a major elective credit in a CST major. Prerequisites are completion of one year of an introductory science sequence in a CST department.

Repeatability: This course may not be repeated for additional credits.

SCTC 2100. Special Topics in Science and Technology. 1 to 6 Credit Hour.

This course is typically offered in Fall and Spring.

This course will challenge students to examine topics in the sciences (Earth Science, Environmental Science, Chemistry, Biology, Physics, Computer and Information Science, Mathematics) and appreciate that the sciences are inter- and cross-disciplinary. Students may also be required to use a variety of problem solving skills to address specific issues related to the topic selected. Selected topics include current discoveries or analysis of seminal works in various scientific fields.

Repeatability: This course may be repeated for additional credit.

Pre-requisites: Minimum grade of C- in (BIOL 1111, BIOL 1911, BIOL 2112, BIOL 2912, CHEM 1031, CHEM 1951, CIS 1068, CIS 1968, EES 2001, PHYS 1061, PHYS 2021, PHYS 2921, or 'Y' in BIOW) and (MATH 1022 (may be taken concurrently), any MATH course numbered 1038 to 4999 (may be taken concurrently), 'Y' in MC6, 'Y' in MC6A, 'Y' in MATW, or 'Y' in MC6T)

SCTC 2101. Medical Imaging Physics - Seeing Through Ourselves. 3 Credit Hours.

From practically the very day x-rays were discovered in 1895, the use of physics-based methods to see inside the body without surgery has helped greatly reduce suffering from disease and injury. Accuracy and certainty of diagnosis have continuously improved, and the effectiveness of treatment can easily be monitored. This course will provide descriptions of the basic physical science behind conventional and modern medical imaging methods. Topics include endoscopy, laser light scattering, ultrasound, conventional and tomographic x-ray imaging, PET and other nuclear medicine methods, and MRI.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites: Minimum grade of C- in (CHEM 1022, CHEM 1032, or CHEM 1952) and (PHYS 1021, PHYS 1061, PHYS 2021, PHYS 2921, or CIS 2168)

SCTC 2102. SERC: Science of Energy Resource Consumption. 3 Credit Hours.

This course is typically offered in Fall.

This course delves into our scientific understanding of the Earth, its resources, and the methods of resource extraction necessary to meet societal demand. We will consider the increasingly complex and large-scale methods of energy extraction. In addition, we will investigate clashes between societal demands for these resources, interest groups on the demand and supply side, and the public perceptions of the science. Students will obtain skills in earth sciences applied to energy and resources, but also skills in communicating uncertainty and scientific results to the general public.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites: Minimum grade of C- in (BIOL 1111, BIOL 1911, BIOL 2112, BIOL 2912, CHEM 1031, CHEM 1951, CIS 1068, CIS 1968, EES 2001, PHYS 1061, PHYS 2021, PHYS 2921, or 'Y' in BIOW) and (MATH 1022 (may be taken concurrently), any MATH course numbered 1038 to 4999 (may be taken concurrently), 'Y' in MC6, 'Y' in MC6A, 'Y' in MATW, or 'Y' in MC6T)

SCTC 2105. Best Selling Science and Mathematics. 3 Credit Hours.

Students in this course will read and analyze two best selling books written along science and mathematics themes. The books selected will vary by semester to cover topics from the various disciplines of science. Advanced reading topics will be selected from the literature as it relates to the assigned reading from the best selling books. Major writing assignments and integrated classroom activities will emphasize the development of conceptual knowledge in math and science. Statistics and data science applications to book topics will be infused throughout the course.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites: Minimum grade of C- in MATH 1022 and (any CHEM course numbered 1021 to 4999, any BIOL course numbered 1011 to 4999, CIS 1051, CIS 1057, any CIS course numbered 1068 to 4999, any EES course numbered 2001 to 4999, or any PHYS course numbered 1021 to 4999)

SCTC 2106. Learning Science with New Media. 3 Credit Hours.

Over the last 10 years there has been a renaissance in the way people communicate about and learn science. These new ways involve newer tools, techniques, and the power of social media to inform and collaborate. Examples of these groundbreaking learning tools include, but are not limited to, Khan Academy, SciShow, Veritasium, ASAPScience, Zooniverse and others. The online science learning tools are followed by hundreds of thousands to millions of people around the world interested in learning science. The purpose of this course is twofold: 1) for students to learn how to develop and use these new tools so that they can communicate science to a broader audience and 2) to join a team of researchers on a project aligned to their area of study and contribute to the data collection of that research through citizen science. The course is divided into 2 parts that align with these purposes. In Part One of the course (developing and using tools to create science communication media), students will engage a specific audience (student, teacher, parent or the general public) and learn to write a script that matches that level of audience engagement. In Part Two of the course, students will join a science research team and learn how this team is communicating their work and data. The students in this course will utilize one of a myriad of citizen science curated online tools such as SciStarter, Zooniverse, Smithsonian, National Geographic, and Foldit among others.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites: Minimum grade of C- in MATH 1022 and (any CHEM course numbered 1021 to 4999, any BIOL course numbered 1011 to 4999, CIS 1051, CIS 1057, any CIS course numbered 1068 to 4999, any EES course numbered 2001 to 4999, or any PHYS course numbered 1021 to 4999)

SCTC 2201. Peer Leader Development Seminar. 1 Credit Hour.

This 1-credit course is designed to prepare students for their future role as Peer Leaders in a section of the College of Science and Technology's required first year seminar or transfer seminar. Students will explore various topics such as leadership development, information processing theory, diversity awareness, active learning strategies, lesson plan design, presentation acumen and knowledge of university resources in order to prepare them to integrate this knowledge into a Peer Leader role. This course will prepare students for this position by providing them with proper skill development to be applied during their time as a Peer Leader. Registration for this course is restricted to students who wish to pursue a Peer Leader position in a CST first year or transfer seminar in the following semester.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Undergraduate.

College Restrictions: Must be enrolled in one of the following Colleges: Science & Technology.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites: Minimum grade of CR in (SCTC 1001 or SCTC 2001)

SCTC 2385. Internship in Informal Science Education. 1 to 6 Credit Hour.

This course is typically offered in Fall, Spring, Summer I, and Summer II.

Students registering for the course will be working as instructional assistants in a variety of informal education venues. The student will be responsible for delivering science content to middle and high school students in after school programs or summer programs. The students registered for this course will be responsible for lesson planning, implementation and assessment.

Repeatability: This course may be repeated for additional credit.

Pre-requisites: Minimum grade of C- (except where noted) in (MATH 1041 (C or higher), MATH 1038 (C or higher), MATH 1031 (C or higher), 'Y' in MATW, 'Y' in CRMA06, or 'Y' in CRMA08), (SCTC 1385 (C or higher) or SCTC 1389 (C or higher)), and (CHEM 1032, CHEM 1042, CHEM 1052, BIOL 1111, BIOL 1911, BIOL 2112, BIOL 2912, (BIOL 1011 and BIOL 1012), EES 2011, EES 2021, EES 2065, PHYS 1022, PHYS 1062, PHYS 2022, PHYS 2922, or 'Y' in BIOW)

SCTC 2389. Step 3: STEM Classroom Teaching. 2 Credit Hours.

This course provides additional classroom observation and practice for intending science and mathematics teachers by focusing on instruction that requires high level STEM content and understanding of different classroom behaviors, pedagogies, and multi-modal assessments. TUteach students are encouraged to take this course to enhance their classroom experience portfolio. CST majors may take this course as an elective with approval of the instructor.

Repeatability: This course may be repeated for additional credit.

Pre-requisites: Minimum grade of C- in (BIOL 1111, BIOL 2112, CHEM 1032, EES 2011, EES 2096, PHYS 1062, PHYS 2022, or 'Y' in BIOW) and (MATH 1041, MATH 1031, or 'Y' in MATW)

SCTC 2396. Writing for Science and Technology. 3 Credit Hours.

This course will teach students how to become more effective writers by developing their technical writing skills through practical examples and exercises. The disciplinary content for the writing assignments will be based on the content from the student's major area: biology, chemistry, earth and environmental science, or physics. Specifically, students will learn the process of developing professional scientific documents, including abstract preparation, literature research practice, use of scientific databases, and creation of white papers leading to final proposals. The ability to formulate a research proposal is a critical skill for students entering research careers or working in scientific industries. All documents and assignments will be reviewed by faculty in the science disciplines.

Course Attributes: WI

Repeatability: This course may not be repeated for additional credits.

Pre-requisites: Minimum grade of C- in (MATH 1041, MATH 1031, MATH 1941, or 'Y' in MATW) and (BIOL 1111, BIOL 1911, BIOL 1012, BIOL 1112, BIOL 1912, BIOL 2112, BIOL 2912, CHEM 1032, CHEM 1952, EES 2011, PHYS 1022, PHYS 1062, PHYS 1962, PHYS 2022, PHYS 2922, or 'Y' in BIOW)

SCTC 3001. History of Science. 3 Credit Hours.

This course is not offered every year.

The first two objectives of this course are to give the students a working knowledge of the broad developments in science since the ancient world and to give them familiarity with the concept of the Scientific Method necessary for understanding areas of science not covered in the course. The ultimate objective is to provide students with the skill to evaluate claims and classify them as scientific or un-scientific. Students will take an inquiry-based approach through readings and discussions and will address both the scientific history and its role in controversial social and moral issues such as pollution, child labor in the Industrial Revolution, weapons in wartime, attitudes toward women, and science and religion. The course will survey the genesis of the Scientific Revolution and go on to examine the work of scientists in the 16th century through today.

Class Restrictions: Must be enrolled in one of the following Classes: Junior 60 to 89 Credits, Senior 90 to 119 Credits, Senior/Fifth Year 120+ Credits.

Repeatability: This course may not be repeated for additional credits.

SCTC 3082. Junior Individual Research. 1 to 4 Credit Hour.

This course is typically offered in Fall and Spring.

This course is intended for students doing multidisciplinary research under the direction of a CST faculty member that is not in the student's home department. This course does not count for major elective credit in any CST major. Prerequisites are successful completion of at least two upper-level (2000+) courses in their CST major.

Repeatability: This course may be repeated for additional credit.

SCTC 3185. Laboratory Experiences in STEM for Pre-Service and In-Service Teachers. 1 to 3 Credit Hour.

This course is typically offered in Fall, Spring, Summer I and Summer II.

This course will offer students intending teaching careers and those in-field an opportunity to perform several small research projects that would be adaptable to implementation in classrooms as extended activities. The students in the course will be expected to complete laboratory projects that integrate Pennsylvania and Next Generation Science Standards. The students in the course are expected to develop a mini-proposal/work plan, create a project safety plan, complete project objectives and submit a final report for each short project that not only describes the STEM work in journal format, but provides a detailed description of how the project might be implemented in a school setting and how the goals and objectives of the project meet educational science standards.

Cohort Restriction: TUtch students and in-service teachers holding Level I certification in one or more STEM disciplines.

Repeatability: This course may be repeated for additional credit.

Pre-requisites: Minimum grade of C- in EDUC 2179 and (SCES 2189 (may be taken concurrently) or MAES 2189 (may be taken concurrently))

SCTC 3201. Research On and Assessment of STEM Teaching Practices. 3 Credit Hours.

This course is typically offered in Fall and Spring.

Students will learn about innovative and emerging trends and resources that support effective learning in science, technology, engineering, and mathematics education. One aspect of the course will focus on recent research findings and how they can be applied within instruction throughout a K-16 environment. Another aspect of the course will focus on existing learning tools and the development of original STEM content. Tools that allow this content to be distributed to a regional or global audience will also be explored. These distribution tools also allow for additional support, user feedback, and user/developer collaboration. Analysis of data from ongoing STEM research projects will also be explored. Cohort Restriction: TUTEACH students and in-service teachers holding Level I certification in one or more STEM disciplines.

Repeatability: This course may be repeated for additional credit.

Pre-requisites: Minimum grade of C- (except where noted) in (MATH 1041 (C or higher; may be taken concurrently), MATH 1038 (C or higher; may be taken concurrently), MATH 1031 (C or higher; may be taken concurrently), 'Y' in MATW, 'Y' in CRMA06, or 'Y' in CRMA08), (MAES 2189 (may be taken concurrently), SCES 2189 (may be taken concurrently), or SCTC 3485 (may be taken concurrently)), and (CHEM 1032, CHEM 1042, CHEM 1052, BIOL 1111, BIOL 1911, BIOL 2112, BIOL 2912, (BIOL 1011 and BIOL 1012), EES 2011, EES 2021, EES 2065, PHYS 1022, PHYS 1062, PHYS 2022, PHYS 2922, or 'Y' in BIOW)

SCTC 3312. Coding STEM Lessons. 1 to 3 Credit Hour.

This course requires that students create STEM lessons and projects that integrate science and/or mathematics and coding. The purpose of integrating science and/or mathematics and coding is to introduce coding to a broad audience that includes intending teachers and learners from all disciplines and reinforce STEM content through the coding algorithm. For each credit hour, students will create and present 4 STEM-coded lessons. 1 credit will be required for all TUTEACH majors. Students can repeat the course up to a total of 3 credit hours.

Repeatability: This course may be repeated for a total of 3 credit.

Pre-requisites: Minimum grade of C- in (BIOL 1111, BIOL 1911, CHEM 1032, CHEM 1952, EES 2001, PHYS 1062, PHYS 1962, or 'Y' in BIOW) and (MATH 1021, 'Y' in MC5, 'Y' in MC6, 'Y' in MC6A, 'Y' in MA03, 'Y' in MATW, or 'Y' in MC6T)

SCTC 3385. Diamond Peer Teachers - Internship I. 1 Credit Hour.

This course is typically offered in Fall and Spring.

The Diamond Peer Teachers Program provides students with a mentored university-level teaching experience in their major. Course requirements include participation in the three-day pre-semester Teaching Institute and regular participation in the Peer Teachers support group throughout the semester. Peer Teachers provide supplemental instruction in first- and second-year courses, promote student engagement, and model successful study habits and academic preparedness for students with whom they work. For Diamond Peer Teachers only.

Repeatability: This course may be repeated for additional credit.

SCTC 3386. Diamond Peer Teachers - Internship II. 1 Credit Hour.

This course is typically offered in Fall and Spring.

The Diamond Peer Teachers Program provides students with a mentored university-level teaching experience in their major. Course requirements include participation in the three-day pre-semester Teaching Institute and regular participation in the Peer Teachers support group throughout the semester. Peer Teachers provide supplemental instruction in first- and second-year courses, promote student engagement, and model successful study habits and academic preparedness for students with whom they work. For Diamond Peer Teachers only.

Repeatability: This course may be repeated for additional credit.

SCTC 3485. Science and Mathematics in the Classroom. 3 Credit Hours.

This course is typically offered in Fall, Spring, Summer I and Summer II.

This course moves from a focus on thinking and learning to a focus on teaching, learning and classroom management. Topics include principles of delivering effective instruction, integration of formative assessment in lesson planning, developing classroom management practices, unit lesson planning. Students will also examine issues of gender, class, race, and culture in mathematics and science education and policies related to mathematics and science education. Additionally, students will examine different classroom settings reviewing video from urban, suburban and rural classrooms. Students will intern for one week in a local school and present a full STEM unit. The course will be an early term Spring or a SSI offering. The course will use hybrid pedagogy. The reading and study unit will be taught through a series of online modules. The practice will be on-site at TU and local high schools, HSES, U-School, Elverson.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites: Minimum grade of C in (EDUC 2179 (may be taken concurrently) or 'Y' in CRED02) and SCTC 1389 (may be taken concurrently)

SCTC 4001. Responsible Conduct of Research. 2 Credit Hours.

This course is not offered every year.

The course is designed to expose undergraduate students to the research environment in terms of a research code of conduct and ethical standards. The course is open to senior undergraduate students of all majors with special authorization required. The course has no specific prerequisites and it does not count as a biology major elective. The course will fulfill the requirement for training in responsible conduct of research for students funded by the National Institutes of Health.

Repeatability: This course may not be repeated for additional credits.

SCTC 4321. Entrepreneurship in Science and Technology. 3 Credit Hours.

This course is not offered every year.

The theme of this course is identifying opportunity and application. It will demonstrate that in every area of interest, or course of study, there is an entrepreneurial potential. Students will be given the basic knowledge to pursue their ideas and to understand the steps required to finance, promote, staff, and manage a business. The goal, however, is not establishing an enterprise but rather developing the skills to relate interests and opportunities; and to apply knowledge of a particular field to its commercial possibilities. The course will use case studies from diverse fields and discuss specific entrepreneurial ventures. There will also be guest speakers from industry to discuss their entrepreneurial endeavors.

Class Restrictions: Must be enrolled in one of the following Classes: Junior 60 to 89 Credits, Senior 90 to 119 Credits, Senior/Fifth Year 120+ Credits.

Repeatability: This course may not be repeated for additional credits.

SCTC 4385. STEM Teaching and Assessment in Practice. 7 Credit Hours.

This course is typically offered in Fall, Spring, Summer I and Summer II.

This course is designed to provide a secondary student teaching experience for TUTEACH majors that meets PDE requirements for student teaching and will encompass the full context of pedagogy and assessment specific to STEM disciplines. Use of electronic resources and application of teaching methods to students of different backgrounds and abilities will be emphasized. Approaches to and methods of teaching STEM to ELL students will be part of all lessons. Each of these lessons will be documented with video. Prerequisites: Research Methods (BIO/CHEM/EES/PHYS 3091), Competitive Praxis score, Praxis II score within 1 semester of passing, Permission of instructor. Completion of major requirements and education course sequence. Students taking this class cannot register for any other academic course without approval of their advisor with the single exception of MATH 4096.

Student Attribute Restrictions: Must be enrolled in one of the following Student Attributes: TUTEACH.

Repeatability: This course may not be repeated for additional credits.

SCTC 4396. Paradigms of Scientific Knowledge: Knowledge Discovery from Scientific Data. 3 Credit Hours.

In this course students will integrate study of descriptive research methods and corresponding statistical concepts that are applied to medicine and clinical research. Topics include ethical considerations, research techniques, graphing, variability, linear regression and correlation. Students will learn how data is used in science policy development. Basic statistical approaches, research protocols and ethics will be discussed. The class will be conducted as slide lecture and discussion; readings will be drawn from texts and scientific journals.

Class Restrictions: Must be enrolled in one of the following Classes: Junior 60 to 89 Credits, Senior 90 to 119 Credits, Senior/Fifth Year 120+ Credits.

Course Attributes: WI

Repeatability: This course may not be repeated for additional credits.

Pre-requisites: Minimum grade of C- in (MATH 1042, MATH 1942, MATH 1031, MATH 1044, or 'Y' in MATW) and ((CHEM 1032 and CHEM 1034) or (CHEM 1952 and CHEM 1954))

SCTC 4401. Cyber STEM Lessons. 3 Credit Hours.

This course provides instructors with research-based best practices for transferring teaching materials from a traditional classroom to a virtual one. Students will examine, interact with, and evaluate the application of a wide-range of technology-based innovations to achieve and assess learning goals and actively engage K-12 students in the online environment.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites: Minimum grade of C- in SCTC 1389 and (EDUC 2179, SCES 2189, or MAES 2189)

SCTC 4485. Integrating STEM Practice in Diverse Teaching Environments. 3 Credit Hours.

This course is typically offered in Fall, Spring, Summer I and Summer II.

This course will combine lecture instruction with significant field work. Students in the class will develop evidence-based lessons based on best practices literature. They will apply the best practice of scientists and engineers in multiple teaching venues and in classrooms with students of diverse backgrounds and abilities. Students will develop, implement and assess lessons that are discipline specific but integrated with other curricular themes. These lessons will incorporate technology, use of electronic/virtual lessons, real world problem solving and the design process. Students will develop these lessons with faculty mentors from their discipline in collaboration with master teachers in the TUteach program. Four unique lessons will be created. Students will practice the lesson and create a video of each lesson prior to delivery. These lessons will be reviewed prior to implementation in the school setting. Feedback will allow for modification of the lesson. Students will serve as peer reviewers for these lessons as well.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites: Minimum grade of C in (SCES 2189 (may be taken concurrently), SCTC 2385 (may be taken concurrently), or SCTC 3385 (may be taken concurrently))