

# TEXAS ACADEMY OF MATHEMATICS AND SCIENCE

## Computer Science + Computer Engineering Course Descriptions

Students at the Texas Academy of Mathematics and Science must pass all courses taken. Not every course listed below is a required course. The course descriptions have been taken from the University of North Texas catalog:

**BMEN 1300** *Discover Biomedical Engineering*

The course focuses on describing, explaining and predicting natural phenomena using a combination of two, 50-minute lectures and a 3-hour laboratory, every week. Students will learn about the origin and history of healthcare practices. Students will learn about human anatomy and physiology and thus be able to describe and explain natural phenomena that occur in the human body. They will also learn to describe naturally occurring action potentials in muscles and nerve cells, and predict the resulting bio-potentials such as electrocardiogram (ECG) and electromyogram (EMG), with reference to homeostasis or a disturbance to it. Students will learn about various systems in the body and how their working can be enhanced while improving the quality of life.

**CHEM 1410** *General Chemistry for Science Majors*

Fundamental concepts, states of matter, periodic table, structure and bonding, stoichiometry, oxidation and reduction, solutions, and compounds of representative elements.

**CHEM 1413** *Honors General Chemistry*

Fundamental concepts, states of matter, periodic table, structure, solutions and compounds of representative elements.

**CHEM 1420** *General Chemistry for Science Majors*

Thermodynamics, reaction rates, equilibrium, electrochemistry, organic chemistry, polymers, radioactivity and nuclear reactions.

**CHEM 1423** *Honors General Chemistry*

Thermodynamics, reaction rates, equilibrium, electrochemistry and nuclear chemistry. This course is strongly advised and may be required for students planning to engage in undergraduate chemical research.

**CHEM 1430** *Laboratory Sequence for General Chemistry*

Laboratory techniques, weighing, errors and significant figures, identification and purification of substances, and elementary quantitative analysis.

**CHEM 1440** *Laboratory Sequence for General Chemistry*

Quantitative, gravimetric and volumetric analyses; coordination compounds.

**CSCE 1030** *Computer Science I*

Introduction to Computer Science and Engineering, problem solving techniques, algorithmic processes, software design and development.

**CSCE 1040** *Computer Science II*

Continuation of CSCE 1030. Software Design, structured programming, object-oriented design and programming.

**CSCE 1035** *Computer Programming I*

Overview of computers and programming. Focus is on problem analysis and techniques used in the development of algorithms and computer programs using a modern programming language. Topics include data types, expressions, statements, and operators, input/output, conditional statements, iteration, functions, lists, and debugging. No prior knowledge of programming is assumed.

- CSCE 1045** *Computer Programming II*  
Continues the progression of students' software development skills through programming, designing, and implementing larger software projects and emphasizes more advanced topics such as dynamic data structures and object-oriented paradigms using one or more modern programming languages.
- CSCE 2100** *Foundations of Computing*  
Introduces students to data models and formalisms used in computer science. Data models such as sets, relations, graphs, and trees will be discussed along with their underlying theory. Formalisms such as propositional logic, Boolean logic, combinatorics, and automata will also be presented within the context of computer science. By the end of the foundation courses, each student will have a solid foundation in conceptual and formal models and levels of abstraction as used in the field of computer science, as well as greater proficiency in software development.
- CSCE 2110** *Foundations of Data Structures*  
Introduces students to the basics of more organized software developments. This include the basics of using Integrated Development Environments (IDE), proper debugging and testing strategies, and the use of code repositories. Students will be expected to work in teams to develop programming solutions in C or C++. Additionally, the effective use of regular expressions to parse text and the use of hash tables to store data will be covered. By the end of the foundation courses, each student will have a solid foundation in conceptual and formal models and levels of abstraction as used in the field of computer science, as well as greater proficiency in software development.
- EENG 1910** *Introduction to Electrical Engineering*  
Learning to Learn (L2L) is based on sound cognitive and pedagogical techniques that improve learning outcomes and make lifelong learning habitual. Students develop an understanding of how engineering is learned and how they can facilitate and develop the lifelong learning process, both individually and in teams. Topics covered include consciousness and self-awareness, knowledge representation, cognition, learning styles, memory, language, reading, effective verbal and written communication, project-based learning, critical thinking, problem solving and creativity, design process, globalization and contemporary issues, professionalism, and ethics.
- ENGL 1315** *Writing about Literature I*  
Writing as a means of critical thinking using readings from poetry and drama as sources for essay topics. Emphasis on the process of perfecting the essay through the writing of several drafts.
- ENGL 1325** *Writing about Literature II*  
Study of relationship between writing and research with research topics drawn from readings from prose fiction. Emphasis on the process of perfecting the essay through the writing of several drafts.
- ENGL 2321** *British Literature*  
Selected works of British literature from the Anglo-Saxon period to the present. Students will study works of prose, poetry, drama, and fiction in relation to their historical and cultural contexts. Texts will be selected from a diverse group of authors and traditions.
- ENGL 2326** *American Literature*  
Selected works of American literature from the wide range of cultures that comprise the nation and over the full range of literary history on the North American continent, including works of prose, poetry, drama, and fiction in relation to their historical and cultural contexts. Texts will be selected from among a diverse group of authors.

- ENGL 2331** *World Literature*  
Comparative and critical reading skills from a global perspective, tracing significant literary themes, texts, movements and genres across a wide range of world literatures and cultures from ancient times to the present day.
- ENGL 2341** *Forms of Literature*  
A study of one or more genres including, but not limited to, drama, poetry, creative nonfiction, novels, graphic novels, comics, or film, or the study of a topic or theme as represented in multiple literary forms.
- ENGL 2351** *Mexican American Literature*  
A survey of Mexican American/Chicanx literature from Mesoamerica to the present. Students will study literary works of fiction, poetry, drama, essays, and memoirs in relation to their historical, linguistic, political, regional, gendered, and cultural contexts. Texts will be selected from a diverse group of authors, literary movements, and media forms. Topics and themes may include the literary performance of identity and culture, aesthetic mediation of racialization, struggle and protest, and artistic activism.
- ENGR 1304** *Engineering Graphics*  
Fundamentals and principles of engineering drafting practices used in technical processes.
- ENGR 2720** *Digital Logic*  
Digital system design; number systems and codes; Boolean algebra; logic gates; programmable logic devices and hardware description languages; arithmetic operations and circuits; combinational circuits; code converters, multiplexers and demultiplexers; sequential circuits; flip-flops, registers and shift registers; finite state machines; microprocessor fundamentals.
- ENGR 2730** *Digital Logic Lab*  
Provides experiences in applying the principles and methodologies of digital electronics. Emphasis is placed on design, testing, debugging and implementation using Field Programmable Gate Arrays (FPGAs) and hardware description languages such as VHDL or Verilog. Project documentation and reporting are also included.
- HIST 2610** *United States History to 1865*  
From colonial origins through the Civil War.
- HIST 2620** *United States History since 1865*  
From the Civil War to the present.
- INFO 3010** *Introduction to Data Science*  
This course focuses on learning across STEM Disciplines using a variety of technologies: cloud computing, mobile devices, MOOCs, virtual labs, etc. Students learn problem-solving and inquiry skills, and apply those to interpret, aggregate, and create arguments based on evidence. Real-world problems with data driven and focused outcomes are used to follow a process, develop a solution, perform analysis, and communicate findings.
- LTEC 3000** *Foundations of Learning Technologies in STEM*  
This course introduces the student to concepts, principles, topics, technologies, and the profession of data science. Students study and understand different types of data and how data can be acquired, stored, organized, analyzed, and presented to meet a variety of needs on data products. Assignments and the term project allow students to handle real-world data challenges. Students learn to use data to answer questions and make informed decisions. The course will explore natural language processing, databases, financial modeling, statistical analysis, social network analysis, and data visualization. Ethical issues regarding data science process are also discussed.

- MATH 1650** *Pre-Calculus*  
Preparatory course for calculus: trigonometric functions, their graphs and applications; sequences and series; exponential and logarithmic functions and their graphs; graphs of polynomial and rational functions; general discussion of functions and their properties.
- MATH 1710** *Calculus I*  
Limits and continuity, derivatives and integrals; differentiation and integration of polynomial, rational, trigonometric, and algebraic functions; applications, including slope, velocity, extrema, area, volume and work.
- MATH 1720** *Calculus II*  
Differentiation and integration of exponential, logarithmic and transcendental functions; integration techniques; indeterminate forms; improper integrals; area and arc length in polar coordinates; infinite series; power series; Taylor's theorem.
- MATH 2700** *Linear Algebra and Vector Calculus*  
Vector spaces over the real number field; applications to systems of linear equations and analytic geometry in  $E_n$ , linear transformations, matrices, determinants and eigenvalues.
- MATH 2730** *Multivariable Calculus*  
Vectors and analytic geometry in 3-space; partial and directional derivatives; extrema; double and triple integrals and applications; cylindrical and spherical coordinates.
- MATH 3410** *Differential Equations I*  
First-order equations, existence-uniqueness theorem, linear equations, separation of variables, higher-order linear equations, systems of linear equations, series solutions and numerical solutions.
- MATH 3680** *Applied Statistics*  
Descriptive statistics, elements of probability, random variables, confidence intervals, hypothesis testing, regression, contingency tables.
- MTSE 1100** *Discover How and Why Materials "Matter"*  
This course serves as the heart of the MSE first year experience. Topics include rationale for materials choices, composition and design of everyday items and how materials science and engineering drives innovation. Basic analysis and experimental design. A team-based hands-on project teaches the student to think critically and creatively by applying a range of analysis techniques borrowed from many engineering and science disciplines.
- PHYS 1710** *Mechanics*  
Laws of motion; inertia, acceleration, force, energy, momentum and angular momentum. Rotational and oscillatory motion. Gravitation.
- PHYS 1730** *Laboratory in Mechanics*  
Laboratory to accompany PHYS 1710.
- PHYS 2220** *Electricity and Magnetism*  
Electric fields, dc and ac circuits, magnetic fields and magnetic induction. Electric and magnetic properties of matter.
- PHYS 2240** *Laboratory in Wave Motion, Electricity, Magnetism, and Optics*  
Laboratory to accompany PHYS 2220.

**PSCI 2305**     *US Political Behavior and Policy*

Explores the connection between the will of the people and the policies implemented by government by focusing on individual political values and attitudes, the mechanisms that connect individual beliefs to government action (parties, interest groups, the media, and elections), and the outcomes of government policy.

**PSCI 2306**     *US and Texas Constitutions and Institutions*

An introduction to the institutions of government, with particular emphasis on the U.S. and Texas Constitutions. Focus on the structure and powers of the three branches of government (both national and Texas); the division of power between those branches (separation of powers); the division of power between the national and state governments (federalism); and issues related to civil rights and civil liberties. Satisfies the legislative requirement for a course emphasizing the Texas constitution.

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