PROGRAM CONCENTRATION: Engineering & Technology
CAREER PATHWAY: Engineering
COURSE TITLE: Foundations of Engineering and Technology

Foundations of Engineering and Technology is the introductory course for all Georgia Engineering and Technology Education pathways. This course provides students with opportunities to develop fundamental technological literacy as they learn about the history, systems, and processes of invention and innovation.

ENGR-FET1 – Students will describe the career pathways that are encompassed by Georgia Engineering and Technology Education.

(a) Identify potential career opportunities related to engineering and technology.
(b) Explain the educational requirements and professional expectations associated with a chosen technological career path.
(c) Participate in co-curricular and extracurricular activities related to career interests.
(d) Participate in hands-on activities related to multiple engineering and technology pathways.

ENGR-FET2 – Students will describe the history of technological advancement.

(a) Identify key historical events and their impact on engineering and technology.
(b) Describe the issues of wealth, fame, power, and necessity that have influenced innovation and technological development.
(c) List key persons who have contributed to technological change.
(d) Describe the impact of governmental and political systems on technological innovation.
(e) Explain the interaction between technological development and social change.

Academic Standards:
SSUSH11 The student will describe the growth of big business and technological innovations after Reconstruction.

SSUSH21 The student will explain economic growth and its impact on the United States 1945-1970.

SSUSH24 The student will analyze the impact of social change movements and organizations of the 1960's.

SSWH21 The student will analyze globalization in the contemporary world.

ENGR-FET3 – Students will explain the universal systems model.

(a) Describe the processes of input, processing, output, and feedback that comprise the universal systems model.
(b) Demonstrate applications of the universal systems model across the spectrum of technologies.

(c) Describe the role of time, capital, people, tools and machines, energy, materials, and information within the universal systems model.

Academic Standards:
SCSh8. Students will understand important features of the process of scientific inquiry.

MM3P1. Students will solve problems (using appropriate technology).

ENGR-FET4 – Students will apply mathematics and science to the solution of a technological problem.

(a) Describe the role of mathematics and science in technological development.
(b) Construct a mathematical model for a known technological system.
(c) Explain the scientific principles behind a basic machine.

Academic Standards:
SCSh3. Students will identify and investigate problems scientifically.

SCSh6. Students will communicate scientific investigations and information clearly.

MM3P3. Students will communicate mathematically.

MM3P4. Students will make connections among mathematical ideas and to other disciplines.

ENGR-FET5 – Students will describe the essential systems and processes involved with invention, innovation, and entrepreneurship.

(a) Explain the problem solving processes used by engineers, designers, and other technologists.
(b) Demonstrate creative approaches to problem solving.
(c) Create a solution to a given problem.
(d) Test and evaluate a problem solution.
(e) Implement a problem solution.
(f) Develop marketing materials associated with a problem solution.

Academic Standards:
SCSh3. Students will identify and investigate problems scientifically.

SCSh4. Students use tools and instruments for observing, measuring, and manipulating scientific equipment and materials.

SCSh5. Students will demonstrate the computation and estimation skills necessary for analyzing data and developing reasonable scientific explanations.

SCSh8. Students will understand important features of the process of scientific inquiry.

ENGR-FET6 – Students will use visual and verbal communication to express basic design elements.

(a) Demonstrate fundamentals of technical sketching.
(b) Present a technical design using computer generated visuals.

Academic Standards:
MM3P3. Students will communicate mathematically.

MM3P4. Students will make connections among mathematical ideas and to other disciplines.

MM3P5. Students will represent mathematics in multiple ways.

STEM Standards (common to all Engineering &Technology courses)

Nature of Technology
ENGR-STEM1 – Students will recognize the systems, components, and processes of a technological system.

(a) Describe the core concepts of technology.
(b) Identify the relationships among technologies along with connections to contemporary issues.
(c) Apply lifelong learning strategies necessary to understand the characteristics and scope of technology.

Academic Standards:
SCSh1. Students will evaluate the importance of curiosity, honesty, openness, and skepticism in science.

SCSh7. Students analyze how scientific knowledge is developed.

MM3P4. Students will make connections among mathematical ideas and to other disciplines.

Technology and Society
ENGR-STEM2 – Students will identify the impact of engineering and technology within global, economic, environmental, and societal contexts.

(a) Describe the social, economic, and environmental impacts of a technological process, product, or system.
(b) Demonstrate ethical and professional behavior in the development and use of technology.
(c) Explain the influence of technology on history and the shaping of contemporary issues.

Academic Standards:
SCSh7. Students analyze how scientific knowledge is developed.

MM3P4. Students will make connections among mathematical ideas and to other disciplines.

Design

ENGR-STEM3 – Students will design technological problem solutions using scientific investigation, analysis and interpretation of data, innovation, invention, and fabrication while considering economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability constraints.

(a) Demonstrate fundamental principles of design.
(b) Design and conduct experiments along with analysis and interpretation of data.
(c) Identify and consider realistic constraints relevant to the design of a system, component, or process.

Academic Standards:

SCSh1. Students will evaluate the importance of curiosity, honesty, openness, and skepticism in science.

SCSh3. Students will identify and investigate problems scientifically.

SCSh4. Students use tools and instruments for observing, measuring, and manipulating scientific equipment and materials.

SCSh5. Students will demonstrate the computation and estimation skills necessary for analyzing data and developing reasonable scientific explanations.

SCSh8. Students will understand important features of the process of scientific inquiry.

MM3P1. Students will solve problems (using appropriate technology).

MM3P2. Students will reason and evaluate mathematical arguments.

Abilities for a Technological World

ENGR-STEM4 – Students will apply principles of science, technology, engineering, mathematics, interpersonal communication, and teamwork to the solution of technological problems.

(a) Work cooperatively in multi-disciplinary teams.
(b) Apply knowledge of mathematics, science, and engineering design.
(c) Demonstrate strategies for identifying, formulating, and solving technological problems.
(d) Demonstrate techniques, skills, and knowledge necessary to use and maintain technological products and systems.

Academic Standards:

SCSh3. Students will identify and investigate problems scientifically.

SCSh4. Students use tools and instruments for observing, measuring, and manipulating scientific equipment and materials.

SCSh5. Students will demonstrate the computation and estimation skills necessary for analyzing data and developing reasonable scientific explanations.

SCSh6. Students will communicate scientific investigations and information clearly.

SCSh8. Students will understand important features of the process of scientific inquiry.

MM3P4. Students will make connections among mathematical ideas and to other disciplines.

The Designed World

ENGR-STEM5 – Students will select and demonstrate techniques, skills, tools, and understanding related to energy and power, bio-related, communication, transportation, manufacturing, and construction technologies.

(a) Correctly and safely use common tools.
(b) Describe strategies for selecting materials and processes necessary for developing a technological system or artifact.
(c) Demonstrate fundamental materials processing and assembly techniques.
(d) Evaluate the interdependence of components in a technological system and identify those elements that are critical to correct functioning.
(e) Apply analytical tools to the development of optimal solutions for technological problems.

Academic Standards:

SCSh2. Students will use standard safety practices for all classroom laboratory and field investigations.

SCSh3. Students will identify and investigate problems scientifically.

SCSh4. Students use tools and instruments for observing, measuring, and manipulating scientific equipment and materials.

SCSh5. Students will demonstrate the computation and estimation skills necessary for analyzing data and developing reasonable scientific explanations.

MM3P1. Students will solve problems (using appropriate technology).

MM3P2. Students will reason and evaluate mathematical arguments.

MM3P4. Students will make connections among mathematical ideas and to other disciplines.

Reading

ENGR-STEM6 – Students will enhance reading by developing vocabulary and comprehension skills associated with text materials, problem descriptions, and laboratory activities associated with engineering and technology education.

(a) Reading in all curriculum areas.
(b) Discussing books.
(c) Building vocabulary knowledge.
(d) Establishing context.

Academic Standards:
ELAALRC2 The student participates in discussions related to curricular learning in all subject areas.

ELAALRC3 The student acquires new vocabulary in each content area and uses it correctly.

ELAALRC4 The student establishes a context for information acquired by reading across subject areas.

Leadership Development
ENGR-STEM7 – Students will develop leadership and interpersonal problem-solving skills through participation in co-curricular activities associated with the Technology Student Association.

(a) Demonstrate effective communication skills.
(b) Participate in teamwork to accomplish specified organizational goals.
(c) Demonstrate cooperation and understanding with persons who are ethnically and culturally diverse.

Academic Standards:
MM3P3. Students will communicate mathematically.

MM3P5. Students will represent mathematics in multiple ways.

SCSh6. Students will communicate scientific investigations and information clearly.

CTAE Foundation Skills

The Foundation Skills for Career, Technical and Agricultural Education (CTAE) are critical competencies that students pursuing any career pathway should exhibit to be successful. As core standards for all career pathways in all program concentrations, these skills link career, technical and agricultural education to the state's academic performance standards.

The CTAE Foundation Skills are aligned to the foundation of the U. S. Department of Education's 16 Career Clusters. Endorsed by the National Career Technical Education Foundation (NCTEF) and the National Association of State Directors of Career Technical Education Consortium (NASDCTEc), the foundation skills were developed from an analysis of all pathways in the sixteen occupational areas. These standards were identified and validated by a national advisory group of employers, secondary and postsecondary educators, labor associations, and other stakeholders. The Knowledge and Skills provide learners a broad foundation for managing lifelong learning and career transitions in a rapidly changing economy.

CTAE-FS-1 Technical Skills: Learners achieve technical content skills necessary to pursue the full range of careers for all pathways in the program concentration.

CTAE-FS-2 Academic Foundations: Learners achieve state academic standards at or above grade level.

CTAE-FS-3 Communications: Learners use various communication skills in expressing and interpreting information.

CTAE-FS-4 Problem Solving and Critical Thinking: Learners define and solve problems, and use problem-solving and improvement methods and tools.

CTAE-FS-5 Information Technology Applications: Learners use multiple information technology devices to access, organize, process, transmit, and communicate information.

CTAE-FS-6 Systems: Learners understand a variety of organizational structures and functions.

CTAE-FS-7 Safety, Health and Environment: Learners employ safety, health and environmental management systems in corporations and comprehend their importance to organizational performance and regulatory compliance.

CTAE-FS-8 Leadership and Teamwork: Learners apply leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.

CTAE-FS-9 Ethics and Legal Responsibilities: Learners commit to work ethics, behavior, and legal responsibilities in the workplace.

CTAE-FS-10 Career Development: Learners plan and manage academic-career plans and employment relations.

CTAE-FS-11 Entrepreneurship: Learners demonstrate understanding of concepts, processes, and behaviors associated with successful entrepreneurial performance.