Career Cluster Technologies II

Career Cluster Technologies II provides students in Grade 8 with a more in-depth study of the knowledge and processes needed to further increase their level of technological literacy. This course is aligned with the International Technology Education Association’s Standards for Technological Literacy. It includes instruction in technologies related to the sixteen career clusters and related pathways. Courses may be taught for a minimum of nine weeks to a maximum of two semesters. For a 35-hour rotation course, content standards 1, 2, 4, 7, 8, 10, 11, and 20 must be included. For a 70-hour course, the following standards 1, 2, 4, 5, 7, 8, 10, 11, 15, 16, 17, 18, 19 and 20 must be included. All standards must be included in a one-credit course.

Students gain knowledge of advances and innovations in technology and gain skills in the application of technologies in diverse areas including, but not limited to, medicine, agriscience, energy and power, communication, transportation, manufacturing, and construction technologies.

Career and technical student organizations are integral, cocurricular components of each career and technical education course. These organizations serve as a means to enhance classroom instruction while helping students develop leadership abilities, expand workplace-readiness skills, and broaden opportunities for personal and professional growth.

Nature of Technology

Students will:

1. Interpret characteristics, core concepts, and the scope of technology.
   - Determining effects of goal-directed research and commercialization on the diffusion of technology into society
   - Explaining how inventions and innovations are the result of specific, goal-directed research
   - Explaining how the development of technologies is driven by the motivation for profit and by demands of the market

2. Identify core concepts of technology.
   - Interpreting systems as building blocks of technology embedded in larger technological, social, and environmental systems
   - Explaining how the stability of a technological system is influenced by all components in a system, especially those in the feedback loop
   - Explaining how the selection of resources involves trade-offs between competing values such as availability, cost, desirability, and waste
   - Describing how new technologies create new processes
   - Explaining the measure and effect of quality control
   - Explaining processes of planning, organizing, and control in work management
   - Classifying layers of control and feedback loops used to provide information in complex systems
3. Interpret relationships among various technologies, including connections between technology and other fields of study.
   - Explaining how technology expands when an existing application is used for a different function
   - Describing how technological innovation occurs when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields
   - Justifying the use of knowledge protection, including the patent process
   - Recognizing that technological progress promotes the advancement of science and mathematics

### Technology and Society

4. Critique cultural, social, economic, environmental, political, and historical effects of technology.
   - Explaining how changes caused by the use of technology can range from gradual to rapid and from subtle to obvious
   - Describing how making decisions regarding the use of technology involves comparing positive and negative effects of trade-offs
   - Describing ethical considerations involved in the development, selection, and use of technologies
   - Explaining how the transfer of a technology from one society to another can cause cultural, social, economic, and political changes affecting both societies
   - Describing how technologies are devised to conserve water, soil, and energy
     Examples: reusing, reducing, recycling
   - Illustrating how new technologies reduce the use of nonrenewable resources

5. Appraise the influence of technology on history.
   - Illustrating how most technological development has been the result of a series of refinements to a basic invention
   - Describing how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials
   - Explaining the relationship of technological know-how and scientific knowledge in the early history of technology
   - Describing how the development of many technological devices has produced long-lasting effects on technology and society through various historical ages including the Iron Age, the Middle Ages, the Renaissance, the Industrial Revolution, and the Information Age

6. Interpret the role of society in the development and use of technology.
   - Identifying how different cultures develop technologies to satisfy individual and shared needs, wants, and values
   - Describing how the decision to develop a technology is influenced by corporate cultures, societal opinions, and demands
   - Explaining how different factors contribute to the design of and demand for various technologies
     Examples: advertising, strength of economy, corporate goals of the company
Design

7. Describe attributes of design.
   - Explaining why design problems are seldom presented in a clearly defined form
   - Explaining the process of refining and improving a design
   - Explaining how requirements of a design compete with each other
     Examples: criteria, constraints, efficiency

8. Explain attributes associated with engineering design.
   - Summarizing how established design principles are used to evaluate existing designs, collect data, and guide the design process
   - Explaining how engineering design is influenced by personal characteristics, including creativity, resourcefulness, and the ability to visualize and think abstractly
   - Demonstrating how a prototype of a working model is used to test a design concept by making actual observations and necessary adjustments
   - Explaining the process of engineering design, including factors involved in the process

9. Interpret the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
   - Describing the nature of research and development in business and industry
   - Explaining why technological problems must be researched before they can be solved
   - Explaining why all problems are not technological and why every problem cannot be solved using technology
   - Explaining why many technological problems require a multidisciplinary approach

Abilities for a Technological World

10. Apply the design process to solve problems in and beyond the laboratory and classroom.
    - Specifying criteria and constraints for the design
    - Using two-dimensional and three-dimensional representations of the design solution
    - Explaining how testing and evaluation of the design in relation to preestablished requirements are parts of the design process
    - Developing a product or system with accompanying documentation

11. Utilize tools needed to use, maintain, and assess technological products and systems.
    - Summarizing processes and procedures for communication to different audiences using appropriate oral and written techniques
    - Diagnosing a malfunctioning system using tools, materials, machines, and knowledge
    - Explaining why it is necessary to troubleshoot, analyze, and maintain systems to ensure precision and safe and proper function
    - Arranging operation systems to function according to design
    - Explaining why using computers, calculators, and data collection devices to access, retrieve, organize, process, maintain, interpret, and evaluate data and information for communication is important for system maintenance
12. Assess the impact of products and systems on society.
   - Collecting information to evaluate quality
   - Synthesizing data to analyze trends and draw conclusions regarding the effect of technology on the individual, society, and the environment
   - Describing the use of assessment techniques to make decisions about the future development of technology
     Examples: techniques—trend analysis, experimentation

The Designed World

13. Interpret advances and innovations in medical technologies.
   - Describing how medical technologies of prevention and rehabilitation, vaccines and pharmaceuticals, medical and surgical procedures, and genetic engineering are systems by which health is protected and maintained
   - Describing how telemedicine reflects the convergence of technological advances in the fields of medicine, telecommunication, virtual presence, computer engineering, informatics, artificial intelligence, robotics, materials science, and perceptual psychology health care
   - Describing how the sciences of biochemistry and molecular biology have made it possible to manipulate genetic information found in living creatures

   - Describing how agriculture includes a combination of businesses used to produce, process, and distribute food, fiber, fuel, chemicals, and other useful products
   - Explaining how biotechnology has applications in the areas of agriculture, food and beverages, drugs and medicine, energy, the environment, and genetic engineering
   - Identifying components of conservation
     Examples: controlling soil erosion, reducing sediment in waterways, conserving water
   - Explaining why engineering design and management of agricultural systems require knowledge of artificial ecosystems and effects of technological development on flora and fauna

15. Interpret advances and innovations in energy and power technologies.
   - Explaining the law of conservation of energy
   - Classifying major forms of energy, including thermal, radiant, electrical, mechanical, chemical, and nuclear
   - Describing the second law of thermodynamics
   - Distinguishing renewable and nonrenewable forms of energy
   - Identifying required components of a power system
16. Apply concepts associated with information and communication technologies.
   - Illustrating ways communication systems transfer information, including human to human, machine to human, human to machine, and machine to machine
   - Describing purposes and common uses of communication systems
   - Examples: informing, persuading, controlling, managing, educating
   - Explaining the operation of typical communication system components, including source, encoder, transmitter, receiver, storage, decoder, and destination
   - Demonstrating graphic and electronic means of communications
   - Analyzing elements of common language, including symbols, measurements, conventions, icons, graphic images, and languages for the purpose of promoting clear communications

17. Analyze advances and innovations in transportation services and methods for their effect on lifestyle and a mobile population.
   - Explaining the relationship of transportation to the effective operation of other technologies
   - Describing the nature of designing intermodalism
   - Analyzing the design of intelligent and non-intelligent transportation systems to determine dependence on other processes and to effectively operate a system

18. Interpret advances and innovations in manufacturing technologies.
   - Describing various service processes used to maintain product condition, including installing, troubleshooting, recalling, maintaining, repairing, altering, upgrading, and retrofitting
   - Classifying materials as natural, synthetic, or mixed
   - Distinguishing between durable and nondurable goods
   - Comparing types of manufacturing systems, including customized production, batch production, and continuous production
   - Explaining how interchangeability of parts and international standards increase the effectiveness of manufacturing processes
   - Analyzing chemical technologies to determine their use in manufacturing
   - Describing essentials of marketing a product, including establishing product identity and conducting research on product potential and advertising, product distribution, and product sales

19. Explain concepts associated with construction technologies.
   - Identifying the role of construction technologies in creating infrastructure as the underlying base of a system
   - Explaining how structures are constructed using a variety of processes and procedures
   - Explaining constraints normally associated with construction technologies, including function, appearance, strength, maintenance, available utilities, building codes, safety, style, convenience, and efficiency
   - Describing why ease of maintenance, alteration, and renovation are considerations when designing a structure
   - Selecting prefabricated materials for a given project

20. Describe the relationship of technology to Alabama’s sixteen career clusters and associated pathways.
   - Illustrating how pathways guide students through secondary and postsecondary education leading to a credential
   - Identifying employment opportunities associated with the clusters
   - Applying employment skills for securing and retaining a job