

# Foundations of Technology

<b>Levels:</b>	<b>Grades 9-10</b>
<b>Units of Credit:</b>	<b>0.50</b>
<b>CIP Code:</b>	<b>21.0104</b>
<b>Core Code:</b>	<b>38-01-00-00-040</b>
<b>Prerequisite:</b>	<b>None</b>
<b>Skill Test:</b>	<b>610</b>

## **COURSE DESCRIPTION**

“Foundations of Technology” is an action-based engineering and technology educational course emphasizing design and problem solving techniques, and understanding the following technical systems: communication, electrical, fluid, mechanical, and structural. In this course students develop an understanding of how these systems evolved, are utilized, and the significance that they have in our history and at the present time.

It is designed to nurture students to become technologically literate productive citizens who exhibit appropriate critical thinking, problem solving and team work skills.

## **CORE STANDARDS, OBJECTIVES, AND INDICATORS**

### **STANDARD 1**

**Students will understand the importance of technology and how it impacts our lives. (Align with National Technology Content Standards: 1-7)**

**Objective 1:** Students will recognize that technology is how humans modify the world around them to meet their needs and wants or to solve problems and extend their capability.

**Objective 2:** Students will describe and compare the relationships of technology and science.

**Objective 3:** Students will explain both positive and negative impacts of technology on our society, environment, and economy. Ethical implications will also be described.

### **STANDARD 2**

**Students will understand the components of the basic technological system model. (Align with National Technology Content Standards: 2)**

**Objective 1:** Students will identify how communication, electrical, fluid, mechanical, and structural systems may be used in these seven areas: communication, construction, manufacturing, transportation, bio-medical, agriculture and power and energy.

**Objective 2:** Students will describe the basic technological system model which includes input, process, output, and feedback.

**Objective 3:** Students will identify the technological system inputs (resources) as materials, time, energy, tools/machines, capital, information, and human resources. They will discuss management strategies of resources including the following: reducing, recycling, reusing, and renewing resources.

**Objective 4:** Students will identify and explain the three major types of processes for technological systems as problem solving/design, production and management.

**Objective 5:** Students will recognize and be able to discuss system outputs as having desirable and undesirable, intended and unintended, and immediate and delayed aspects.

### **STANDARD 3**

**Students will understand and apply design principles in developing a process, product or system. (Align with National Technology Content Standards: 2-3, 8-13)**

**Objective 1:** Students will understand and apply design principles including the following: structure, function, appearance, safety, durability, reliability, economic and financial feasibility, marketability, quality control, environmental impacts, manufacturability, maintainability, and human factors of engineering (ergonomics), ease of use, ease of assembly, social appropriateness.

**Objective 2:** Students will classify technologies as inventions or innovations. They will also be able to identify how technological innovations are created or enhanced through connections to other fields of study.

**Objective 3:** Students will understand the concepts and value of planned failure, durable goods and non-durable goods.

**Objective 4:** Students will assess trade-offs in terms of the outputs of technological systems. They will also be able to analyze trade-offs in optimizing product design.

### **STANDARD 4**

**Students will describe and apply the basic steps in the design/problem solving process. Students will document the design process in a portfolio.**

- a. Stage 1: Problem statement and design brief
- b. Stage 2: Investigation and research
- c. Stage 3: Generate alternative solutions
- d. Stage 4: Choose the best solution
- e. Stage 5: Modeling and prototyping
- f. Stage 6: Test and evaluate

**Objective 1:** Students will utilize briefs and specifications (criteria and constraints) in order to maximize a solution in their design work. Students will differentiate between a problem/opportunity and a solution.

**Objective 2:** Students will investigate and research data that will be useful in developing a design solution using a variety of mediums which may include the following: interview, Internet, databases, books, magazines, video, observation, measurement, and surveys.

**Objective 3:** Students will brainstorm and creatively generate a multitude of possible solutions to the stated problem or opportunity.

**Objective 4:** Students will analyze potential solutions based on design principles (see standard 3) and make a decision as to the best solution.

**Objective 5:** Students will implement the chosen solution. They will develop and communicate their design using technical sketching and/or drawing techniques, make graphical, mathematical and/or physical models and prototypes.

**Objective 6:** Students will test their design for features such as durability, ease of assembly, reliability, strength, environmental impact, quality, safety and other design principles (see standard 3).

**Objective 7:** Students will prepare an evaluation of the design product. This should include an evaluation of the product, the process and themselves.

**Objective 8:** Students will present their solution in a professional manner using a portfolio which may include: engineering drawings, posters, models, power point presentations, web site, or other appropriate methods.

## **STANDARD 5**

**Students will use resources, tools, materials, and processes safely and efficiently. (Align with National Technology Content Standards: 14-20)**

**Objective 1:** Students will follow general laboratory safety practices.

**Objective 2:** Students will follow specific equipment safety practices.

**Objective 3:** Students will identify potential safety hazards and make appropriate precautions or corrections.

**Objective 4:** Students will be able to describe manufacturing processes for changing materials which are: casting and molding, forming, separating, conditioning, assembling, and finishing.

**Objective 5:** Students will use tools, equipment, materials, and processes to produce a working model or prototype of a solution to a technical problem.

## **STANDARD 6**

**Identify components and properties, build a representation and perform operations associated with communication, electrical, mechanical, fluid, and structural systems. (Align with National Technology Content Standards: 11-20)**

**Objective 1:** Students will be able to communicate an idea graphically using sketches, isometric drawings, orthographic drawings, schematics, charts, and graphs using either sketching mechanical drawing or computer-aided design (CAD) techniques.

**Objective 2:** Students will define and explain the following electronic terms and concepts: electricity, electronics, conductor, insulator, semi-conductor, series circuit and parallel circuit, voltage, and resistance.

**Objective 3:** Students will assemble an electronic circuit. They will understand the use of schematics, function of basic electronic components, and electronic measurement.

**Objective 4:** Students will define and explain the characteristics of mechanical system functions being that of changing speed, power, distance, and direction and apply them in mechanical systems.

**Objective 5:** Students will assemble a mechanical system using gears, pulleys and levers. They will understand the basic components of mechanical components and be able to calculate mechanical advantage.

**Objective 6:** Students will define and explain advantages and disadvantages of pneumatic versus hydraulic systems (i.e., quick, slow, powerful, clean, dirty, cost, etc.). They will understand the concept of fluid power as it relates to air and liquid.

**Objective 7:** Students will assemble a fluid power system. Students will understand the function of the basic fluid power components: pump, tank, valve, cylinder, piston, and actuator and be able to calculate pressure and force in the system.

**Objective 8:** Students will be able to define and explain basic structural terminology including: compression, tension, torsion, stress, strain, triangulation, static load, and dynamic load.

**Objective 9:** Students will assemble a structural system.

## **STANDARD 7**

**INTEGRATE THE TECHNOLOGY STUDENT ASSOCIATION (TSA) LEADERSHIP PROGRAM.  
(ALIGN WITH NATIONAL TECHNOLOGY CONTENT STANDARDS: 1-20)**

**Objective 1:** Students will understand and develop positive work ethics and leadership skills which include: responsibility, cooperation, dependability, delegation, team work, and integrity.

**Objective 2:** Participate in sponsored TSA events.

**Objective 3:** Participate in service-learning opportunities.

**Objective 4:** Recognize accomplishment.

**Objective 5:** Develop partnerships with local, state and national chapters and other organizations.