

# TechCenter21: Technology Education Correlation to: *Massachusetts Science and Technology/Engineering Curriculum Framework*

## Instructional Content Areas (Modules)

Introduction to Technology

Aerodynamic Principles

Aerospace

Alternate Energy

Biosphere

CAM/CNC Mill

Communications

Construction & CAD

Desktop Publishing

Electronics & Control

Engineering Structures

Environmental Management

Graphic Design

Hydraulics

Lasers & Fiber Optics

Manufacturing/Automation

Mechanisms

Multimedia Basics

Pneumatics

Power & Energy

Road Transportation

Robotics

Video Production

Waste Management

Weather Monitoring

CO<sub>2</sub> Race Car Design

Structure Design for Earthquake



**APPLIED EDUCATIONAL SYSTEMS, Inc.**

(800) 220-2175

[www.aeseducation.com](http://www.aeseducation.com)

## Overview

This document demonstrates the correlation between the *Science and Technology/Engineering Curriculum Framework – Strand 4: Technology/Engineering* standards as published by the Massachusetts Department of Education and the TechCenter21 curriculum supplied by Applied Educational Systems. The TechCenter21 (TC21) modules and group projects are listed alphabetically across the top row. Each module includes ten activities. The *Strand 4: Technology/Engineering* standards are listed down the second column. The X's marked in the matrix formed by the standards and TC21 modules indicate that the standard is covered as part of that module.

Note that some standards are covered in several TC21 modules. This broad coverage is a reflection of the curriculum development philosophy and process at Applied Educational Systems. The TC21 curriculum includes *core themes* written into each and every module as part of the planning and development of the curriculum. Core themes are areas of educational content deemed of critical importance. Repeated exposure to core themes enables students to internalize and apply critical concepts in real world scenarios. Through repeated exposure in a variety of contexts, students achieve ever-increasing levels of sophistication in understanding and application.

Source for *Science and Technology/Engineering Curriculum Framework – Strand 4: Technology/Engineering* standards listed on the following pages:

<http://www.doe.mass.edu/frameworks/scitech/2001/0501.doc>

<b>Science and Technology/Engineering Curriculum Framework</b>		TechCenter21 Course	Introduction Unit	Aerodynamics	Aerospace	Alternate Energy	Biosphere	CAM/CNC Milling	Communications	Construction/CAD	Desktop Publishing	Electronic Control	Engineer Structures	Environmental Management	Graphic Design	Hydraulics	Lasers and Fiber Optic	Manufacturing & Automation	Mechanism	Multimedia	Pneumatics	Power and Energy	Road Transportation	Robotics	Video Production	Waste Management	Weather	CO <sub>2</sub> Race Car Design	
<b>Materials, Tools and Machines</b>																													
<b>1 - Materials, Tools, and Machines - Broad Concept: Appropriate materials, tools, and machines enable us to solve problems, invent, and construct.</b>																													
1.1 - Given a design task, identify appropriate materials (e.g., wood, paper, plastic, aggregates, ceramics, metals, solvents, adhesives) based on specific properties and characteristics (e.g., weight, strength, hardness, and flexibility).		✓		X	X				X			X										X						X	
1.2 - Identify and explain appropriate measuring tools, hand tools, and power tools used to hold, lift, carry, fasten, and separate, and explain their safe and proper use.		✓	X	X		X						X			X			X	X			X	X				X	X	
1.3 - Identify and explain the safe and proper use of measuring tools, hand tools, and machines (e.g., band saw, drill press, sanders, hammer, screwdriver, pliers, tape measure, screws, nails, and other mechanical fasteners) needed to construct a prototype of an engineering design.		✓		X			X					X			X	X		X	X			X				X	X	X	
<b>Engineering Design</b>																													
<b>2 - Engineering Design - Broad Concept: Engineering design is an iterative process involving modeling and optimizing for developing technological solutions to problems within given constraints.</b>																													
2.1 - Identify and explain the steps of the engineering design process, i.e., identify the need or problem, research the problem, develop possible solutions, select the best possible solution(s), construct a prototype, test and evaluate, communicate the solution(s), and redesign.		✓		X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X
2.2 - Demonstrate methods of representing solutions to a design problem, e.g., sketches, orthographic projections, multiview drawings.		✓		X				X	X	X	X	X	X	X									X		X			X	X
2.3 - Describe and explain the purpose of a given prototype.		✓		X								X										X					X	X	
2.4 - Identify appropriate materials, tools, and machines needed to construct a prototype of a given engineering design.		✓		X				X	X	X	X	X	X	X								X		X			X	X	
2.5 - Explain how such design features as size, shape, weight, function, and cost limitations would affect the construction of a given prototype.		✓	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

<p style="text-align: center;"><b>Science and Technology/Engineering Curriculum Framework</b></p>	TechCenter21 Course	Introduction Unit	Aerodynamics	Aerospace	Alternate Energy	Biosphere	CAM/CNC Milling	Communications	Construction/CAD	Desktop Publishing	Electronic Control	Engineer Structures	Environmental Management	Graphic Design	Hydraulics	Lasers and Fiber Optic	Manufacturing & Automation	Mechanism	Multimedia	Pneumatics	Power and Energy	Road Transportation	Robotics	Video Production	Waste Management	Weather	CO <sub>2</sub> Race Car Design
	2.6 - Identify the five elements of a universal systems model: goal, inputs, processes, outputs, and feedback.	✓	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
<b>Communication Technologies</b>																											
<b>3 - Communication Technologies – Broad Concept: Ideas can be communicated through engineering drawings, written reports, and pictures.</b>																											
3.1 - Identify and explain the components of a communication system, i.e., source, encoder, transmitter, receiver, decoder, storage, retrieval, and destination.							X								X												
3.2 - Identify and explain the appropriate tools, machines, and electronic devices (e.g., drawing tools, computer-aided design, and cameras) used to produce and/or reproduce design solutions (e.g., engineering drawing, prototypes, and reports).	✓					X	X	X	X				X				X						X				
3.3 - Identify and compare communication technologies and systems, i.e., audio, visual, printed, and mass communication.	✓						X		X				X				X					X					
3.4 - Identify and explain how symbols and icons (e.g., international symbols and graphics) are used to communicate a message.	✓												X														
<b>Manufacturing Technologies</b>																											
<b>4 - Manufacturing Technologies – Broad Concept: Manufacturing is the process of converting raw materials (primary process) into physical goods (secondary process), involving multiple industrial processes, e.g., assembly, multiple stages of production, quality control.</b>																											
4.1 - Describe and explain the manufacturing systems of custom and mass production.	✓															X											
4.2 - Explain and give examples of the impacts of interchangeable parts, components of mass-produced products, and the use of automation, e.g., robotics.	✓															X						X					
4.3 - Describe a manufacturing organization, e.g., corporate structure, research and development, production, marketing, quality control, distribution.																											
4.4 - Explain basic processes in manufacturing systems, e.g., cutting, shaping, assembling, joining, finishing, quality control, and safety.	✓															X											

<h2 style="text-align: center; margin: 0;">Science and Technology/Engineering Curriculum Framework</h2>		TechCenter21 Course																									
		Introduction Unit	Aerodynamics	Aerospace	Alternate Energy	Biosphere	CAM/CNC Milling	Communications	Construction/CAD	Desktop Publishing	Electronic Control	Engineer Structures	Environmental Management	Graphic Design	Hydraulics	Lasers and Fiber Optic	Manufacturing & Automation	Mechanism	Multimedia	Pneumatics	Power and Energy	Road Transportation	Robotics	Video Production	Waste Management	Weather	CO <sub>2</sub> Race Car Design
<b>Construction Technologies</b>																											
<b>5 - Construction Technologies – Broad Concept: Construction technology involves building structures in order to contain, shelter, manufacture, transport, communicate, and provide recreation.</b>																											
5.1 - Describe and explain parts of a structure, e.g., foundation, flooring, decking, wall, roofing systems.		✓					X			X																	X
5.2 - Identify and describe three major types of bridges (e.g., arch, beam, and suspension) and their appropriate uses (e.g., site, span, resources, and load).		✓								X																	
5.3 - Explain how the forces of tension, compression, torsion, bending, and shear affect the performance of bridges.		✓								X																	X
5.4 - Describe and explain the effects of loads and structural shapes on bridges		✓																									X
<b>Transportation Technologies</b>																											
<b>6 - Transportation Technologies – Broad Concept: Transportation technologies are systems and devices that move goods and people from one place to another across or through land, air, water, or space.</b>																											
6.1 - Identify and compare examples of transportation systems and devices that operate on each of the following: land, air, water, and space.		✓	X	X										X							X					X	
6.2 - Given a transportation problem, explain a possible solution using the universal systems model.		✓	X	X									X								X					X	
6.3 - Identify and describe three subsystems of a transportation vehicle or device, i.e., structural, propulsion, guidance, suspension, control, and support.		✓		X																	X					X	
6.4 - Identify and explain lift, drag, friction, thrust, and gravity in a vehicle or device, e.g., cars, boats, airplanes, rockets.		✓	X	X																						X	

<h2 style="text-align: center; color: white;">Science and Technology/Engineering Curriculum Framework</h2>	TechCenter21 Course	Introduction Unit	Aerodynamics	Aerospace	Alternate Energy	Biosphere	CAM/CNC Milling	Communications	Construction/CAD	Desktop Publishing	Electronic Control	Engineer Structures	Environmental Management	Graphic Design	Hydraulics	Lasers and Fiber Optic	Manufacturing & Automation	Mechanism	Multimedia	Pneumatics	Power and Energy	Road Transportation	Robotics	Video Production	Waste Management	Weather	CO <sub>2</sub> Race Car Design	
	<h3>Bioengineering Technologies</h3>																											
<p><b>7 - Bioengineering Technologies – Broad Concept: Bioengineering technologies explore the production of mechanical devices, products, biological substances, and organisms to improve health and/or contribute improvement to our daily lives.</b></p>																												
<p>7.1 - Explain examples of adaptive or assistive devices, e.g., prosthetic devices, wheelchairs, eyeglasses, grab bars, hearing aids, lifts, braces.</p>																												
<p>7.2 - Describe and explain adaptive and assistive bioengineered product, e.g., good, bio-fuels, irradiation, integrated pest management.</p>																												