Course Title: Mechanical Engineering
Board Approval Date:
Credit / Hours: .5 credit

Course Description:

Mechanical Engineering focuses on problem solving activities in the area of mechanical design. Students will be challenged with a number of assignments where they must design a mechanism to solve a given problem. Students will utilize various 3D CAD software packages to aid them in their project designs.

Learning Activities / Modes of Assessment:

Large group / Individual instruction
Worksheets
Participation & Clean Up
Individual / Group Work
Computer Aided Design
Computer Numeric Controlled Equipment
Tests and Quizzes
Checklists / Teacher Observation
Projects w/ Rubrics

Instructional Resources:

www.discoveryeducation.com
Technology Student Association
Learning Focused Schools
Online Tutorials
2D and 3D Architectural Software Programs

Course Pacing Guide

Course: **Mechanical Engineering**

Course Unit (Topic)	**Length of Instruction (Days/Periods)**
1. 1C Using SolidWorks to Design Mechanical Products	10 days
2. 1E Mouse Trap Vehicle Project	15 days
3. 2C Mechanism Design	20 days
4. 2E Marble Maze Project	10 days
5. 3C Mechanical Product Design and Build	15 days
6. 3E Mechanical Problem Solving Project	10 days
7. 4E Balance Beam Battle Bot Project	10 days

Topic: 1C - Using SolidWorks to Design Mechanical Products
Days: 10
Subject(s): Technology
Grade(s): 9th, 10th, 11th, 12th

Know:

3.4.12.A1. – Important
CHARACTERISTICS OF TECHNOLOGY - Compare and contrast the rate of technological development over time.

3.4.12.A2. – Essential
CORE CONCEPTS OF TECHNOLOGY - Describe how management is the process of planning, organizing, and controlling work.

3.4.12.A3. – Essential
TECHNOLOGY CONNECTIONS - Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).

3.4.12.E4. – Compact
INFORMATION AND COMMUNICATION TECHNOLOGIES - Synthesize the effects of information and communication systems and subsystems as an integral part of the development of the Information Age.

3.4.12.E7. – Important
CONSTRUCTION TECHNOLOGIES - Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.

Understand:

SolidWorks allows engineers to design a mechanical product.

Do:

3.4.12.A1. – Important
CHARACTERISTICS OF TECHNOLOGY - Compare and contrast the rate of technological development over time.

3.4.12.A2. – Essential
CORE CONCEPTS OF TECHNOLOGY - Describe how management is the process of planning, organizing, and controlling work.

3.4.12.A3. – Essential
TECHNOLOGY CONNECTIONS - Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).

3.4.12.E7. – Important
CONSTRUCTION TECHNOLOGIES - Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.

3.4.12.E6. – Essential
MANUFACTURING TECHNOLOGIES - Compare and contrast the importance of science, technology, engineering and math (STEM) as it pertains to the manufactured world.

Use SolidWorks to create the mechanical themed practice drawings.

3.4.12.E4. - INFORMATION AND COMMUNICATION TECHNOLOGIES - Synthesize the effects of information and communication systems and subsystems as an integral part of the development of the Information Age.

Topic: 1C - Using SolidWorks to Design Mechanical Products
Days: 10
Subject(s): Technology
Grade(s): 9th, 10th, 11th, 12th

Know:	Understand:	Do:
3.4.12.E6. – Essential MANUFACTURING TECHNOLOGIES - Compare and contrast the importance of science, technology, engineering and math (STEM) as it pertains to the manufactured world. Reference Geometry Patterns Mirror Swept Boss/Cut Lofted Boss/Cut Structural Member		

Topic: 1E Mouse Trap Vehicle Project
Days: 15
Subject(s): Technology
Grade(s): 9th, 10th, 11th, 12th

Know:

3.4.12.A2. – Essential
CORE CONCEPTS OF TECHNOLOGY - Describe how management is the process of planning, organizing, and controlling work.

3.4.12.A3. – Essential
TECHNOLOGY CONNECTIONS - Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).

3.4.12.C2. – Essential
ENGINEERING DESIGN - Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

3.4.12.C3. – Essential
RESEARCH & DEVELOPMENT, INVENTION & INNOVATION, EXPERIMENTATION/ PROBLEM SOLVING AND TROUBLESHOOTING - Apply the concept that many technological problems require a multi-disciplinary approach.

Understand:

Mechanical Engineers incorporate energy and power technologies as well as transportation technologies in many of their designs.

Do:

3.4.12.A2. – Essential
CORE CONCEPTS OF TECHNOLOGY - Describe how management is the process of planning, organizing, and controlling work.

3.4.12.A3. – Essential
TECHNOLOGY CONNECTIONS - Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).

3.4.12.C2. – Essential
ENGINEERING DESIGN - Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

3.4.12.C3. – Essential
RESEARCH & DEVELOPMENT, INVENTION & INNOVATION, EXPERIMENTATION/PROBLEM SOLVING AND TROUBLESHOOTING - Apply the concept that many technological problems require a multi-disciplinary approach.

3.4.12.D2. – Important
USING AND MAINTAINING TECHNOLOGICAL SYSTEMS - Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

3.4.12.E3. – Essential
ENERGY AND POWER TECHNOLOGIES - Compare and contrast energy and power systems as they relate to pollution, renewable and non-renewable resources, and conservation.

3.4.12.E5. – Important
TRANSPORTATION TECHNOLOGIES - Explain how the design of intelligent and non-intelligent transportation systems depends on many processes and innovative techniques.

Work with partners to brainstorm, design, construct, and test a mousetrap powered vehicle.

Brainstorm ideas for the design of the solution.

Topic: 1E Mouse Trap Vehicle Project
Days: 15
Subject(s): Technology
Grade(s): 9th, 10th, 11th, 12th

Know:	Understand:	Do:
3.4.12.D2. – Important USING AND MAINTAINING TECHNOLOGICAL SYSTEMS - Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly. **3.4.12.E5. – Important** TRANSPORTATION TECHNOLOGIES - Explain how the design of intelligent and non-intelligent transportation systems depends on many processes and innovative techniques. The parts of a mousetrap powered vehicle. Simple machines and their application in a mousetrap powered vehicle. Incorporating the following vocabulary into the vehicle design; kinematics, mechanisms, load, effort, fulcrum, motion, lever, mechanical advantage, linkage, rotary mechanisms, and gears. 3.4.12.A2. - CORE CONCEPTS OF TECHNOLOGY - Describe how management is the process of planning,		Create sketches of the solution. Decide which solution is going to be chosen. Build the device using the sketches. Test the device against other groups in the class.

Topic: 1E Mouse Trap Vehicle Project
Days: 15
Subject(s): Technology
Grade(s): 9th, 10th, 11th, 12th

Know:	Understand:	Do:
organizing, and controlling work.		

Topic: 2C - Mechanism Design
Days: 20
Subject(s): Technology
Grade(s): 9th, 10th, 11th, 12th

Know:

3.4.12.A1. – Important
CHARACTERISTICS OF TECHNOLOGY - Compare and contrast the rate of technological development over time.

3.4.12.A3. – Essential
TECHNOLOGY CONNECTIONS - Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).

3.4.12.C2. – Essential
ENGINEERING DESIGN - Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

3.4.12.C3. – Essential
RESEARCH & DEVELOPMENT, INVENTION & INNOVATION, EXPERIMENTATION/ PROBLEM SOLVING AND TROUBLESHOOTING - Apply the concept that many technological problems require a multi-disciplinary approach.

Understand:

SolidWorks will allow the user to assemble mechanisms that will move as they would in the real world.

Do:

3.4.12.A1. – Important
CHARACTERISTICS OF TECHNOLOGY - Compare and contrast the rate of technological development over time.

3.4.12.A3. – Essential
TECHNOLOGY CONNECTIONS - Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).

3.4.12.C2. – Essential
ENGINEERING DESIGN - Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

3.4.12.C3. – Essential
RESEARCH & DEVELOPMENT, INVENTION & INNOVATION, EXPERIMENTATION/PROBLEM SOLVING AND TROUBLESHOOTING - Apply the concept that many technological problems require a multi-disciplinary approach.

3.4.12.D2. – Important
USING AND MAINTAINING TECHNOLOGICAL SYSTEMS - Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

3.4.12.E6. – Essential
MANUFACTURING TECHNOLOGIES - Compare and contrast the importance of science, technology, engineering and math (STEM) as it pertains to the manufactured world.

Design a child's toy that will have at least 1 moving part that is powered off of the turning wheels.

The toy should conform to all safety codes for children under the age of 3.

Design a mechanism that solves a problem given by the instructor.

Topic: 2C - Mechanism Design
Days: 20
Subject(s): Technology
Grade(s): 9th, 10th, 11th, 12th

Know:	Understand:	Do:
3.4.12.D2. – Important USING AND MAINTAINING TECHNOLOGICAL SYSTEMS - Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly. **3.4.12.E4. – Compact** INFORMATION AND COMMUNICATION TECHNOLOGIES - Synthesize the effects of information and communication systems and subsystems as an integral part of the development of the Information Age. **3.4.12.E6. – Essential** MANUFACTURING TECHNOLOGIES - Compare and contrast the importance of science, technology, engineering and math (STEM) as it pertains to the manufactured world. Cam Gear Lineal Angular Reciprocating Ocsillating		Animate the mechanisms to show how they move. 3.4.12.E4. - INFORMATION AND COMMUNICATION TECHNOLOGIES - Synthesize the effects of information and communication systems and subsystems as an integral part of the development of the Information Age.

Topic: 2E Marble Maze Project
Days: 10
Subject(s): Technology
Grade(s): 9th, 10th, 11th, 12th

Know:

3.4.12.A2. – Essential
CORE CONCEPTS OF TECHNOLOGY - Describe how management is the process of planning, organizing, and controlling work.

3.4.12.A3. – Essential
TECHNOLOGY CONNECTIONS - Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).

3.4.12.C2. – Essential
ENGINEERING DESIGN - Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

3.4.12.C3. – Essential
RESEARCH & DEVELOPMENT, INVENTION & INNOVATION, EXPERIMENTATION/ PROBLEM SOLVING AND TROUBLESHOOTING - Apply the concept that many technological problems require a multi-disciplinary approach.

Understand:

An Engineer needs to build a structure that is functional based on a budgeted amount of materials.

Do:

3.4.12.A2. – Essential
CORE CONCEPTS OF TECHNOLOGY - Describe how management is the process of planning, organizing, and controlling work.

3.4.12.A3. – Essential
TECHNOLOGY CONNECTIONS - Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).

3.4.12.C2. – Essential
ENGINEERING DESIGN - Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

3.4.12.C3. – Essential
RESEARCH & DEVELOPMENT, INVENTION & INNOVATION, EXPERIMENTATION/PROBLEM SOLVING AND TROUBLESHOOTING - Apply the concept that many technological problems require a multi-disciplinary approach.

3.4.12.D2. – Important
USING AND MAINTAINING TECHNOLOGICAL SYSTEMS - Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

3.4.12.E3. – Essential
ENERGY AND POWER TECHNOLOGIES - Compare and contrast energy and power systems as they relate to pollution, renewable and non-renewable resources, and conservation.

3.4.12.E7. – Important
CONSTRUCTION TECHNOLOGIES - Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.

3.4.12.E6. – Essential
MANUFACTURING TECHNOLOGIES - Compare and contrast the importance of science, technology, engineering and math (STEM) as it pertains to the manufactured world.

Topic: 2E Marble Maze Project
Days: 10
Subject(s): Technology
Grade(s): 9th, 10th, 11th, 12th

Know:	Understand:	Do:
3.4.12.D2. – Important USING AND MAINTAINING TECHNOLOGICAL SYSTEMS - Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly. **3.4.12.E7. – Important** CONSTRUCTION TECHNOLOGIES - Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world. **3.4.12.E6. – Essential** MANUFACTURING TECHNOLOGIES - Compare and contrast the importance of science, technology, engineering and math (STEM) as it pertains to the manufactured world. How to use the technological problem solving method when given a problem. How to design a fixed route transportation system that will transport a marble for the longest time. 3.4.12.A2. - CORE CONCEPTS OF TECHNOLOGY - Describe how management is the		Work with partners to brainstorm, design, construct, and test a marble maze design. Brainstorm ideas for the design of the solution. Create sketches of the solution. Decide which solution is going to be chosen. Build the device using the sketches. Test the device against other groups in the class.

Topic: 2E Marble Maze Project
Days: 10
Subject(s): Technology
Grade(s): 9th, 10th, 11th, 12th

Know:	Understand:	Do:
process of planning, organizing, and controlling work.		

Topic: 3C - Mechanical Product Design and Build
Days: 15
Subject(s): Technology
Grade(s): 9th, 10th, 11th, 12th

Know:	Understand:	Do:
3.4.12.A1. – Important CHARACTERISTICS OF TECHNOLOGY - Compare and contrast the rate of technological development over time.	CAD programs can be used to develop actual parts using the CNC machines.	**3.4.12.A1. – Important** CHARACTERISTICS OF TECHNOLOGY - Compare and contrast the rate of technological development over time.
3.4.12.A2. – Essential CORE CONCEPTS OF TECHNOLOGY - Describe how management is the process of planning, organizing, and controlling work.		**3.4.12.A2. – Essential** CORE CONCEPTS OF TECHNOLOGY - Describe how management is the process of planning, organizing, and controlling work.
3.4.12.A3. – Essential TECHNOLOGY CONNECTIONS - Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).		**3.4.12.A3. – Essential** TECHNOLOGY CONNECTIONS - Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).
3.4.12.C2. – Essential ENGINEERING DESIGN - Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.		**3.4.12.C2. – Essential** ENGINEERING DESIGN - Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.
		3.4.12.C3. – Essential RESEARCH & DEVELOPMENT, INVENTION & INNOVATION, EXPERIMENTATION/PROBLEM SOLVING AND TROUBLESHOOTING - Apply the concept that many technological problems require a multi-disciplinary approach.
		3.4.12.D2. – Important USING AND MAINTAINING TECHNOLOGICAL SYSTEMS - Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.
		3.4.12.E5. – Important TRANSPORTATION TECHNOLOGIES - Explain how the design of intelligent and non-intelligent transportation systems depends on many processes and innovative techniques.
		3.4.12.E6. – Essential MANUFACTURING TECHNOLOGIES - Compare and contrast the importance of science, technology, engineering and math (STEM) as it pertains to the manufactured world.

Topic: 3C - Mechanical Product Design and Build
Days: 15
Subject(s): Technology
Grade(s): 9th, 10th, 11th, 12th

Know:	Understand:	Do:
3.4.12.C3. – Essential RESEARCH & DEVELOPMENT, INVENTION & INNOVATION, EXPERIMENTATION/ PROBLEM SOLVING AND TROUBLESHOOTING - Apply the concept that many technological problems require a multi-disciplinary approach. **3.4.12.D2. – Important** USING AND MAINTAINING TECHNOLOGICAL SYSTEMS - Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly. **3.4.12.E5. – Important** TRANSPORTATION TECHNOLOGIES - Explain how the design of intelligent and non-intelligent transportation systems depends on many processes and innovative techniques. **3.4.12.E6. – Essential** MANUFACTURING TECHNOLOGIES - Compare and contrast the importance of science, technology, engineering and math (STEM) as it pertains to the manufactured world.		Design a mechanical product in SolidWorks and use the files to develop G-Codes for CNC machines. Use the G-Codes to create the actual parts on the CNC machines. Assemble the parts to create the real product.

Topic: 3C - Mechanical Product Design and Build
Days: 15
Subject(s): Technology
Grade(s): 9th, 10th, 11th, 12th

Know:	Understand:	Do:
Computer Aided Machining (CAM) Computer Numberical Controlled (CNC) G-Code		

Topic: 3E Mechanical Problem Solving Project
Days: 10
Subject(s): Technology
Grade(s): 9th, 10th, 11th, 12th

Know:

3.4.12.A1. – Important
CHARACTERISTICS OF TECHNOLOGY - Compare and contrast the rate of technological development over time.

3.4.12.A2. – Essential
CORE CONCEPTS OF TECHNOLOGY - Describe how management is the process of planning, organizing, and controlling work.

3.4.12.A3. – Essential
TECHNOLOGY CONNECTIONS - Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).

3.4.12.C2. – Essential
ENGINEERING DESIGN - Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

Understand:

A Mechanical Engineer needs to effectively use problem solving skills in the development and creation of a solution to a specific problem.

Do:

3.4.12.A1. – Important
CHARACTERISTICS OF TECHNOLOGY - Compare and contrast the rate of technological development over time.

3.4.12.A2. – Essential
CORE CONCEPTS OF TECHNOLOGY - Describe how management is the process of planning, organizing, and controlling work.

3.4.12.A3. – Essential
TECHNOLOGY CONNECTIONS - Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).

3.4.12.C2. – Essential
ENGINEERING DESIGN - Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

3.4.12.C3. – Essential
RESEARCH & DEVELOPMENT, INVENTION & INNOVATION, EXPERIMENTATION/PROBLEM SOLVING AND TROUBLESHOOTING - Apply the concept that many technological problems require a multi-disciplinary approach.

3.4.12.D2. – Important
USING AND MAINTAINING TECHNOLOGICAL SYSTEMS - Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

3.4.12.E3. – Essential
ENERGY AND POWER TECHNOLOGIES - Compare and contrast energy and power systems as they relate to pollution, renewable and non-renewable resources, and conservation.

3.4.12.E5. – Important
TRANSPORTATION TECHNOLOGIES - Explain how the design of intelligent and non-intelligent transportation systems depends on many processes and innovative techniques.

Topic: 3E Mechanical Problem Solving Project
Days: 10
Subject(s): Technology
Grade(s): 9th, 10th, 11th, 12th

Know:	Understand:	Do:
3.4.12.C3. – Essential RESEARCH & DEVELOPMENT, INVENTION & INNOVATION, EXPERIMENTATION/ PROBLEM SOLVING AND TROUBLESHOOTING - Apply the concept that many technological problems require a multi-disciplinary approach. **3.4.12.D2. – Important** USING AND MAINTAINING TECHNOLOGICAL SYSTEMS - Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly. **3.4.12.E5. – Important** TRANSPORTATION TECHNOLOGIES - Explain how the design of intelligent and non-intelligent transportation systems depends on many processes and innovative techniques. **3.4.12.E6. – Essential** MANUFACTURING TECHNOLOGIES - Compare and contrast the importance of science, technology, engineering and math (STEM) as it pertains to the manufactured world. How to use the technological problem solving method when		**3.4.12.E6. – Essential** MANUFACTURING TECHNOLOGIES - Compare and contrast the importance of science, technology, engineering and math (STEM) as it pertains to the manufactured world. Develop and create a solution to a problem using the limited materials provided and the tools allowed. Completed solutions will be objectively measured and judged to determine the best and most effective solution to a specific problem. Work with partners to brainstorm, design, construct, and test a solution to a given problem. Brainstorm ideas for the design of the solution. Create sketches of the solution. Decide which solution is going to be chosen. Build the device using the sketches. Test the device against other groups in the class.

Topic: 3E Mechanical Problem Solving Project Days: 10
Subject(s): Technology Grade(s): 9th, 10th, 11th, 12th

Know:	Understand:	Do:
given a problem. How to develop and create a solution to a problem using the limited materials provided. How to effectively use problem solving skills in the development and creation of a solution to a specific problem. 3.4.12.A2. - CORE CONCEPTS OF TECHNOLOGY - Describe how management is the process of planning, organizing, and controlling work.		

Topic: 4E Balance Beam Battle Bot Project
Days: 10
Subject(s): Technology
Grade(s): 9th, 10th, 11th, 12th

Know:

3.4.12.A1. – Important
CHARACTERISTICS OF TECHNOLOGY - Compare and contrast the rate of technological development over time.

3.4.12.A2. – Essential
CORE CONCEPTS OF TECHNOLOGY - Describe how management is the process of planning, organizing, and controlling work.

3.4.12.A3. – Essential
TECHNOLOGY CONNECTIONS - Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).

3.4.12.C2. – Essential
ENGINEERING DESIGN - Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

Understand:

A Mechanical Engineer needs to effectively work with metal materials to create a vehicle with moving parts.

Do:

3.4.12.A1. – Important
CHARACTERISTICS OF TECHNOLOGY - Compare and contrast the rate of technological development over time.

3.4.12.A2. – Essential
CORE CONCEPTS OF TECHNOLOGY - Describe how management is the process of planning, organizing, and controlling work.

3.4.12.A3. – Essential
TECHNOLOGY CONNECTIONS - Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).

3.4.12.C2. – Essential
ENGINEERING DESIGN - Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

3.4.12.C3. – Essential
RESEARCH & DEVELOPMENT, INVENTION & INNOVATION, EXPERIMENTATION/PROBLEM SOLVING AND TROUBLESHOOTING - Apply the concept that many technological problems require a multi-disciplinary approach.

3.4.12.D2. – Important
USING AND MAINTAINING TECHNOLOGICAL SYSTEMS - Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

3.4.12.E3. – Essential
ENERGY AND POWER TECHNOLOGIES - Compare and contrast energy and power systems as they relate to pollution, renewable and non-renewable resources, and conservation.

3.4.12.E5. – Important
TRANSPORTATION TECHNOLOGIES - Explain how the design of intelligent and non-intelligent transportation systems depends on many processes and innovative techniques.

Topic: 4E Balance Beam Battle Bot Project
Days: 10
Subject(s): Technology
Grade(s): 9th, 10th, 11th, 12th

Know:	Understand:	Do:
3.4.12.C3. – Essential RESEARCH & DEVELOPMENT, INVENTION & INNOVATION, EXPERIMENTATION/ PROBLEM SOLVING AND TROUBLESHOOTING - Apply the concept that many technological problems require a multi-disciplinary approach. **3.4.12.D2. – Important** USING AND MAINTAINING TECHNOLOGICAL SYSTEMS - Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly. **3.4.12.E5. – Important** TRANSPORTATION TECHNOLOGIES - Explain how the design of intelligent and non-intelligent transportation systems depends on many processes and innovative techniques. **3.4.12.E6. – Essential** MANUFACTURING TECHNOLOGIES - Compare and contrast the importance of science, technology, engineering and math (STEM) as it pertains to the manufactured world. How to use the technological problem solving method when		**3.4.12.E6. – Essential** MANUFACTURING TECHNOLOGIES - Compare and contrast the importance of science, technology, engineering and math (STEM) as it pertains to the manufactured world. Work with partners to brainstorm, design, construct, and test a Balance Beam Battle Bot. Brainstorm ideas for the design of the solution. Create sketches of the solution. Decide which solution is going to be chosen. Build the device using the sketches. Test the device against other groups in the class.

Topic: 4E Balance Beam Battle Bot Project Days: 10
Subject(s): Technology Grade(s): 9th, 10th, 11th, 12th

Know:	Understand:	Do:
given a problem. How to develop and create a solution to a problem using the limited materials provided. How to effectively use problem solving skills in the development and creation of a solution to a specific problem. 3.4.12.A2. - CORE CONCEPTS OF TECHNOLOGY - Describe how management is the process of planning, organizing, and controlling work.		