Career & Technology
Principles of Engineering

Unit Name	Definition and Types of Engineering		1st Six Weeks – 4 days		
Academic Alignment with TEKS	**CTE TEKS**	**Content/Vocabulary**	**Guiding Questions**	**Activities**	**Resources and Web links**
LESSON 1 **English** **Science §112.47 2(D)** **Social Studies**	Students will have an understanding of engineering and be able to identify engineering achievements through history. Students will be able to identify five historical engineering role models, including minorities and women. Students will be able to identify problems for engineers to solve in the future. Students will be able to define attributes associated with being a successful engineer.	ABET, Inc. Automation Bronze Age Chronological Engineering Engineering Technology Experimentation Fulcrum Hypothesis Inclined Plane Industrial Age Information Age Innovation Iron Age Role Model Screw Space Age Stone Age Synthetic Theory Time Line	1. In what ways did prehistoric engineers overcome limitations of the time to perform the same functions as modern engineers? 2. Which engineering feat of the twentieth century do you feel was the most significant and what were some of the underlying principles that finally made it possible? 3. Which areas of current research do you think are going to have the greatest impact in the next ten years and how will that research affect current problems? 4. What were the attributes possessed by early engineers that would help you become a successful engineer today?	Students will give a short oral presentation about the inventions researched. Students will break into discussion groups to discuss what they believe is the greatest invention of the 20th century. The teacher will divide the students into groups to discuss the attribute that a successful engineer would need to possess.	PowerPoints: Histoy of Engineering Career Pathways

Unit Name	Definition and Types of Engineering		1st Six Weeks --		
Academic Alignment with TEKS	**CTE TEKS**	**Content/Vocabulary**	**Guiding Questions**	**Activities**	**Resources and Web links**
LESSON 2 **English** **Science §112.47 2(D)** **Social Studies**	Understand that an engineering team must work together to solve problems, with each team member having individual and collective responsibilities. Understand the role of out-sourcing in the engineering process, and how effective communication is essential. Understand how gender-bias, racial-bias, and other forms of stereotyping and discrimination can adversely affect communications within an engineering team. Understand how ethics influences the engineering process. Understand how social, environmental, and financial constraints influence the engineering process.	Benchmark Constraints Contribution Gender-Bias Innovation Interactive Interpersonal Skills Racial-Bias Solution Stereotyping Systematic TQM Working Relationship	1. A new highway is being contemplated to ease congestion in your city. Your assignment is to create a team to decide the route of the highway and where the interchanges will be. Using a community in your neighborhood as a guide, what types of people would you select to be on your team?	Student groups will discuss what functions and roles that teams need. Student groups will report to the class about their views of teams Students will break into teams again to discuss problems that pose dilemmas in their solution.	Oakes, Leone, Gunn. (2002). *Engineering your future* (3rd ed.). Great Lakes Press, Wildwood, MO.

Unit Name	Definition and Types of Engineering		1st Six Weeks --		
Academic Alignment with TEKS	**CTE TEKS**	**Content/Vocabulary**	**Guiding Questions**	**Activities**	**Resources and Web links**
LESSON 3 **Math §111.33 1(B)** **English** **Science 2(B)(D)** **Social Studies**	Students will have an understanding of the difference between engineering disciplines and job functions. Students will understand the professional and legal responsibilities associated with being an engineer. Students will research and discover the educational requirements to become an engineer. Students will become familiar with an area of engineering by preparing for and conducting an interview with an engineer in that field of engineering.	Conflict Of Interest Ethics Public Welfare Dilemma Job Function Traditional Discipline Non-Traditional Whistle Blowing	1. Why would anyone want to be an engineer? 2. What type of engineers would spend most of the day engaged in physical activities? 3. What other types of jobs do engineers get?	Engineering Career Field Research Interview with an Engineer	PowerPoint Engineering Fields

Unit Name	Communication and Documentation		1st Six Weeks – 7 days		
Academic Alignment with TEKS	**CTE TEKS**	**Content/Vocabulary**	**Guiding Questions**	**Activities**	**Resources and Web links**
LESSON 1 **Math §111.34 6(C)** **English** **Social Studies**	Students will compose sketches use proper sketching techniques in the solution of design problems. Students will select the appropriate sketching styles for presentation of a design problem to a group. Students will use proper proportioning while producing annotated sketches.	Angle Center Line Circle Contour Detail Diagonal Dimension Dimension Line Dimensioning Edge Ellipse Essence Extension Line Feature Freehand Ground Line Horizon Line Horizontal Isometric Line Line Segment Line Weight Lines Mass Object Object Line Oblique Order of Views Orthographic Pattern Picture Plane Profile Line Projection Plane Proportion Scale Shape Sketch Station Point Surface Vanishing Point Vertical Views	1. How do they know Leonardo Da Vinci came up with the concepts of the parachute and helicopter? 2. The mayor of your town has asked you and two friends to design a sitting area in the town park. He would like to speak with you next week about your concepts. What types of sketches should you bring to the meeting to be sure he understands your ideas?	. Perspective Sketching Orthographic Sketching Orthographic Sketching - Solutions	PowerPoint Sketching

Unit Name	Communication and Documentation		1st Six Weeks – 7 days		
Academic Alignment with TEKS	**CTE TEKS**	**Content/Vocabulary**	**Guiding Questions**	**Activities**	**Resources and Web links**
LESSON 2 **English** **Science** **Social Studies**	Students will plan and compose a written technical report about the research they conduct about a career field in engineering.	Communication Design Brief Desktop Publishing Resume Technical Writing	1. What does technical writing mean and what are the benefits of its use?	. Students will create a written report following the basic outline given in the Written Report Format.	Written report guidelines (word document)

Unit Name	Communication and Documentation		1st Six Weeks – 7 days		
Academic Alignment with TEKS	**CTE TEKS**	**Content/Vocabulary**	**Guiding Questions**	**Activities**	**Resources and Web links**
LESSON 3 **Math** **§111.33** **1(B)** **English** **Science** **§112.47** **2(B)(C)(D)** **Social Studies**	Students will be able to design and create tables, charts, and graphs to illustrate data they have collected. Students will evaluate and select an appropriate type of table, chart, or graph to accurately communicate collected data for written work or presentations.	Bar Chart Cell Chart Data Graph Histogram Line Graph Pictograph Pie Chart Plotting Qualitative Quantitative Spreadsheet Statistics Table	1. Given a collection of data what considerations should be used to select the type of display? 2. Statistics never lie but liars use statistics. How can you tell the difference?	. Graphing with Excel Tutorial	PowerPoint EXCEL

Unit Name	Communication and Documentation		1st Six Weeks – 7 days		
Academic Alignment with TEKS	**CTE TEKS**	**Content/Vocabulary**	**Guiding Questions**	**Activities**	**Resources and Web links**
LESSON 4 **English** **Social Studies**	Students will design and deliver a presentation utilizing appropriate support materials about research they have conducted. Students will create and assemble support materials to appropriate demonstrate concepts used in their presentations.	Eye Contact Graphics Posture Visual Aids	1. What are some things that can be done to prepare for and deliver an effective oral presentation? 2. You have been asked to redesign the entrance to the school. You are to give a presentation to the school board next week. Describe things you would prepare in advance for your presentation?	Career Research Presentation	Rubric for Oral Presentations

Unit Name	**Design Process**		**1st Six Weeks – 3 days**		
Academic Alignment with TEKS	**CTE TEKS**	**Content/Vocabulary**	**Guiding Questions**	**Activities**	**Resources and Web links**
LESSON 1 **Math** **§111.33** **1(B)** **English** **Science** **§112.47** **2(D)** **Social Studies**	Students will examine the evolution of an invention to observe and report on how the design process is applied to continuously redesign and improve the product.	Attribute Listing *Constraints* Gender-Bias Interpersonal Skills Nominal Group Techr Outsourcing Solution Synthesis TQA	1. What is the most efficient way to solve a problem? 2. You have been asked to design a new sneaker. What are some of the questions you would ask in order to refine your task?	. Product Development Lifecycle Chart Invention Research Invention Card Evaluation	PowerPoint Design Process for Engineering Problem Solving Method Oakes, Leone, Gunn (2002). *Engineering your future (3rd ed.)*, Great Lakes Press, Wildwood, MO. Wright, P. (2002). *Introduction to engineering (3rd ed.)*, John Wiley & Sons Inc, NY, NY.

Unit Name	Engineering Systems		2nd/3rd Six Weeks – 30 days		
Academic Alignment with TEKS	**CTE TEKS**	**Content/Vocabulary**	**Guiding Questions**	**Activities**	**Resources and Web links**
LESSON 1 **Math** **§111.32** **1(C)(D)(E)** **3(A)** **English** **Science** **§112.47** **2(B)(C)(D)(F)** **5(A)(B)** **Social Studies**	Students will identify and explain the function of the essential components of a mechanical system on a display they create. Students will create a display of a mechanical system from a household item they disassemble. Students will mathematically explain the mechanical advantage gained and explain the function of the six different types of simple machines in a presentation on the SMET device. Students will apply simple machines to create mechanical systems in the solution of a design problem	Bearings Belt Cam Chain Communication Coupling Crankshaft Design Constraints Eccentric Force Friction Gear Gear Train Inclined Plane Kinetic Energy Lever Linkage Lubrication Mass Mechanical Energy Pitch Potential Energy Pulley Screw Simple Machine Spline Spring Thread Torque Wedge Wheel and Axle	1. Why are bicycles considered to be a very efficient mechanism for moving people? 2. What is the purpose of gears on a bicycle and why do they have so many?	. SMET project Reverse Engineering Project Mousetrap Cars	PowerPoints Mechanisms From Simple Machines Lever and Linkage Systems Pulley, Sprockets and Gears Gears Gear Cutting Cams- Eccentrics- Ratchets Couplings Bearings Reverse Engineering

Unit Name	Engineering Systems		2nd/3rd Six Weeks – 30 days		
Academic Alignment with TEKS	**CTE TEKS**	**Content/Vocabulary**	**Guiding Questions**	**Activities**	**Resources and Web links**
LESSON 2 **Math** **§111.32** **1(C)(D)(E)** **3(A)** **English** **Science** **§112.47** **5(B)** **7(A)(B)** **Social Studies**	Students will research and evaluate systems undergoing thermodynamic cycles for efficiency and present findings to the group. Students will give an oral presentation incorporating the first and second laws of thermodynamics, describing the concept and function of a heat engine of their choice	British Thermal Unit Calorie Chemical Energy Conduction Convection Density Elastic Potential Energy Electromagnetic Energy Gravitational Potential Energy Heat Capacity Heat Engine Infiltration Kinetic Energy K-value Mechanical Energy Nuclear Energy Radiation R-Value Thermal Energy Thermodynamics U-Value Work	1. How can I take the energy from a camp fire and use it to cool my ice chest? 2. How does a jet engine move an airplane?	. Chart for R-Values Conduction and Convection Heat Engines	PowerPoints Thermodynamics **http://www.scitoys.com/scitoys/scitoys/thermo/thermo.html**

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Academic Alignment with TEKS	**CTE TEKS**	**Content/Vocabulary**	**Guiding Questions**	**Activities**	**Resources and Web links**
LESSON 3 **Math** **§111.32** **1(C)(D)(E)** **3(A)** **English** **Science** **§112.45** **7(A)(B)** **Social Studies**	Students will evaluate and select specific fluid power sources for different functions. Students will create a flow diagram schematic sketch and compare it to an actual fluid power circuit during a presentation to the class. Students will mathematically calculate and explain the work being done by a specific fluid power device as part of an oral presentation. Students will safely demonstrate proper setup and adjustment of a fluid power system.	Accumulator Actuator Bernoulli's Law Boyle's Law Centrifugal Charles' Law Compressor Diaphragm Displacement Dynamics Filter Fluid Fluid Tank Hydraulic Fluid Kinetic Energy Pascal's Law Pressure Pump Reciprocating Regulator Statics Temperature Valve Viscosity Volume	1. How is a pneumatics system similar to a hydraulic one? 2. What devices that a dentist uses are run by fluid power	Conduct research on the four basic components of fluid systems. Pneumatics Trainer Tutorials	PowerPoints Fluid Power Basic Pneumatics Hydraulics Brakes Oakes, Leone, and Gunn. (2002). *Engineering your future (3rd ed.).* Great Lakes Press, Wildwood, MO. Wright, P. (2002). *Introduction to engineering (3rd ed.).* John Wiley & Sons Inc, NY, NY.

Unit Name	Engineering Systems		2nd/3rd Six Weeks – 30 days		
Academic Alignment with TEKS	**CTE TEKS**	**Content/Vocabulary**	**Guiding Questions**	**Activities**	**Resources and Web links**
LESSON 4 **Math §111.32 3(A)** **English** **Science §112.47 6(C)(D)(E)(F)** **Social Studies**	Students will create schematic drawings to facilitate experimental measurements of electrical circuits. Students will apply ohm's and watt's laws in designing safe electrical circuits. Students will appraise community needs and evaluate the impact supplying electrical generation has on their communities. Students will be able to estimate current consumption by a circuit and be able to compare estimates to accurate measurements they perform.	Alternator Analog Current Digital Generator Hysteresis I/O Interface Load Magnetism Memory Motor Ohm's Law Parallel Power Processor Receiver Rectification Relay Resistance Semiconductor Series Solenoid Strain Stress Switch Synchronous Transducer Voltage Watt's Law	1. How much electricity does your community use and what is the safest way for your community to generate electricity? 2. What are the problems your community is having with its electrical supply and what do you think can be done about it?	. Ohms Law Motor Generator	PowerPoints Basic Circuits Digital Multi-Meter Magnetism DC Motors and Generators AC Motors

Unit Name	Engineering Systems		2nd/3rd Six Weeks – 30 days		
Academic Alignment with TEKS	**CTE TEKS**	**Content/Vocabulary**	**Guiding Questions**	**Activities**	**Resources and Web links**
LESSON 5 **English** **Science §112.47 6(E)(F)** **Social Studies**	Students will design, diagram and implement a program to control a device they construct to perform a sorting operation. Students will select and apply concepts of mechanical, electrical, and control systems in solving design problems. Students will formulate a plan for evaluating the functioning of their sorting device and to make appropriate changes in design, circuitry, or programming. Students will demonstrate and defend their solution to the design problem in an oral presentation to the class.	Actuator Analog Automation CDS Cell Closed Loop Conveyer Digital Electronic Hard Drive Hopper I/O Interface Manual Mechanical Microprocessor Open Loop Photoresistor Phototransistor PLC Position Control Potentiometer Programming Language RAM Resistor Robotics ROM Switch	1. How can a control system be designed to make a marble sorter function? 2. How is it possible to have a machine interact with its surroundings and call attention if something goes wrong	. Fischer Building and Programming Tutorials Have you lost your marbles?	PowerPoint Introduction to RoboPro Industrial Controls Flexible Manufacturing Systems Optoelectronics Power Control Circuits

Unit Name	Statics and Strength of Materials		4th Six Weeks – 12 days		
Academic Alignment with TEKS	**CTE TEKS**	**Content/Vocabulary**	**Guiding Questions**	**Activities**	**Resources and Web links**
LESSON 1 **Math** **§111.34** **11(C)** **§111.35** **3(A)** **English** **Science** **§112.47** **4(D)** **5(C)** **Social Studies**	Students will mathematically analyze a simple truss to determine types and magnitude of forces supported in the truss. Students will be able to define, describe and analyze the stresses and forces acting on an object. Students will design, construct and test a model bridge to support the greatest amount of weight per gram of bridge mass. Students will prepare and present a mathematical analysis of a truss design as part of a 5 minute oral presentation about their bridge design.	Abutment Arch Bridge Beam Bridge Cable Stayed Bridge Compression Equilibrium Force Forces Free Body Diagram Friction Force Impending Motion Mass Moments Newton's Laws Resultant Scalar Quantity Suspension Bridge Tension Vector Quantity Weight	1. What are the forces that act on a bridge and how is failure prevented? 2. What factors are considered for the type of bridge selected for a given location?	. Free Body Diagrams Truss Calculations Bridge Design	PowerPoints Bridges Strength of Shapes Units of Measurement Forces and Static Equilibrium Vector Calculations Free Body Diagrams Moments Reaction Forces Math for Truss Calculation Truss Calculation with MDSolids

Unit Name	Statics and Strength of Materials		4th Six Weeks – 12 days		
Academic Alignment with TEKS	**CTE TEKS**	**Content/Vocabulary**	**Guiding Questions**	**Activities**	**Resources and Web links**
LESSON 2 **Math** **§111.34** **11(C)** **§111.35** **3(A)** **English** **Science** **§112.47** **5(C)** **Social Studies**	Students explain the use of factors of safety in the design process. Students will be able to explain the difference between the area of a cross section of an object and the second moment of the area (Moment of Inertia) and predict the relative strength of one shape vs. another. Students will be able to use a computer aided engineering package to analyze a shape. Students will explain the effects that stress has on a material and explain how the material will react.	Buckling Centroid Compression Deflection Modulus of Elasticity Moment of Inertia Reaction Shear Strain Stress Tension	1. How does the shape that you make an object affect not only its strength but also the impact on the environment? 2. Children's sand toys must be extremely light in weight. What design factors are used to increase the strength of those lightweight objects and how can ensure the safety of the children who are using them?	. Centroid Activity with MDSolids Moment of Inertia Activity with MDSolids	PowerPoint Centroid Stress Strain Deflection Factors of Design and Safety Gere and Timoshenko. (1996). *Mechanics of materials.* PWS Publishing/ITP, NY, NY.

Unit Name	Materials and Strength of Materials		5th Six Weeks – 19 days		
Academic Alignment with TEKS	**CTE TEKS**	**Content/Vocabulary**	**Guiding Questions**	**Activities**	**Resources and Web links**
LESSON 1 **Math §111.33 1(B)** **English** **Science §112.47 2(A)(B)(C)(D)(F)** **Social Studies**	Students will be able to identify and differentiate the five basic categories of solid engineering materials. Students will be able to compare and contrast the physical properties of organic, metals, polymers, ceramics, and composites. Students will be able to trace the production of raw material to finished product. Students will be able to collect, analyze, and test samples of the four basic materials. Students will be able to document and present laboratory data related to studies of material classifications	Alloy Carbide Ceramics Composite Compound Elastomers Element Ferrous Metal Nitride Organic Oxide Polymer Thermoplastic Thermoset	1. What is the difference between different materials and how can I begin to select the one that will give me the characteristics I want? 2. What steps can I take to help identify an unknown material?	Create a Materials Properties Display	PowerPoints® Categories of Materials Mott, R. (1990). *Applied strength of materials (2nd ed.).* Prentice Hall, Englewood Cliffs, NJ. ISBN 0-13-043415-9 Gere and Timoshenko (1996). *Mechanics of materials.* PWS Publishing/ITP, NY, NY.

Unit Name	Materials and Strength of Materials		5th Six Weeks – 19 days		
Academic Alignment with TEKS	**CTE TEKS**	**Content/Vocabulary**	**Guiding Questions**	**Activities**	**Resources and Web links**
LESSON 2 **Math** **§111.33** **1(B)** **English** **Science** **§112.47** **2(A)(B)(C)** **Social Studies**	Students will be able to identify and document the properties of materials. Students will be able to design an experiment to identify an unknown material. The student will be able to formulate conclusions through analysis of recorded laboratory test data for presentations in the form of charts, graphs, written, verbal, and multi-media formats. Students will be able to analyze word problems about forces acting on materials	Acoustical Brittle Chemical Composite Compression Creep Crystalline Density Dimensional Ductility Electrical Fatigue Force Fracture Grain Size Gravity Hardness Inclusion Load Mechanical Optical Phase Physical Porosity Resistance Spatial Configuration Strain Stress Tensile Thermal Toughness	1. Why are some materials used for specific purposes in preference to others? 2. How am I able to predict what will happen to the selected material for a specific use and decide if it will be safe for use	Material Properties Display Engineering Problems	PowerPoints® Properties of Materials

Unit Name	Materials and Strength of Materials		5th Six Weeks – 19 days		
Academic Alignment with TEKS	**CTE TEKS**	**Content/Vocabulary**	**Guiding Questions**	**Activities**	**Resources and Web links**
LESSON 3 **English** **Science §112.47 2(B)(D)** **Social Studies**	Students will be able to define and state examples of the major categories of Production Processes. Students will be able to analyze a component of a product and describe the processes used in its creation. Students will be able to interpret a drawing and produce a part. Students will give an oral presentation on the production processes used to create products from a category of materials and a demonstration about one of the processes	Abrading Adhesion Annealing Austenite Blow Molding Broaching Carbon Case Hardening Casting Cementite Cohesion Cold Forming Compression Molding Conditioning Counter Bore Countersink Critical Temperature Drilling EDM Extrusion Fastening Ferrite Finishing Flame Hardening Forging Grain Size Hardening Hot Forming Induction Hardening Injection Molding Knurling LASER Lathe Martensite Mechanical Fastener Milling Normalizing Pearlite Plastics Quenching Rolling Sawing Separating Shearing Spinning Tapping Tempering Temple Stick Thermal Thermoforming Thermoplastic Thermoset Threading Turning Water Jet	1. How can an existing product be changed to incorporate different processes to make it less expensive and give better performance? 2. How do I decide which processes to use with a given material?	Production Processes	PowerPoints Material Removal Heat Treating Metals Making the Tensile Testing Sample

Unit Name	Materials and Strength of Materials		5th Six Weeks – 19 days		
Academic Alignment with TEKS	**CTE TEKS**	**Content/Vocabulary**	**Guiding Questions**	**Activities**	**Resources and Web links**
LESSON 4 **Math** **§111.32** **1(C)(D)(E)** **3(A)** **English** **Science** **§112.47** **2(B)(D)(F)** **Social Studies**	Students will be able to state the difference between mass and weight. Students will be able to utilize a variety of precision measurement tools to measure appropriate dimensions, mass, and weight. Students will be able to understand and explain why companies have a need for quality control and will describe what customers and companies refer to when the term "quality" is used. Students will be able to calculate the mean, median, mode, and standard deviation for a set of data and apply that information to an understanding of quality assurance. Students will be able to explain the difference	Acceptance Level Accuracy ASTM Centi Concurrent Process Control Limit Cp Data Density Deviation English System Frequency Distribution Inspection Kilo Lot Mass Max Mean Mean Deviation Median Metric System Micro Micrometer Milli Min Mode Normal Distribution Process Control	1. How do you know when the measurements you are using are precise enough? 2. How are precision measurement and statistics used to keep the cost of the products you buy down? 3. What is the difference between product and process quality control and how do they affect the products you buy?	Measurement Quiz Precision Measurement Tools Micrometer Homework Intro to Statistics Lego Control Charts	PowerPoints® English Measurement System Metric Measurement System Precision Measurement Introduction to Statistics Statistics and Statistical Process Control

	between process and product control. Students will be able to distinguish between the characteristics of quality in a final product and the control of quality in each step of a process.	Quality Assurance Quality Control R-bar Reliability Sample Scale SI Sigma Specification Limits Spread Standard Deviation Statistical Process Control Tolerance Triple Beam Balance USL Variance Variation Caliper Weight X-bar			

Unit Name	Materials and Strength of Materials		5th Six Weeks – 19 days		
Academic Alignment with TEKS	**CTE TEKS**	**Content/Vocabulary**	**Guiding Questions**	**Activities**	**Resources and Web links**
LESSON 5 **Math** **§111.33** **1(B)** **English** **Science** **§112.47** **2(C)(D)** **Social Studies**	Students will be able to describe and safely conduct destructive and non-destructive material testing and will be able to use the data collected through these tests to compute and document mechanical properties. Students will be able to analyze a product that breaks and be able to explain how the material failed.	Axial Force Biological Compression Corrosion Creep Destructive Testing Discontinuities Elastic Modulus Electrochemical Fatigue Flexural Force Impact Malleability Necking Non-Destructive Testing Normal Stresses Offset Method Oxide Porosity Quality Assurance Quality Control Radiographic Resilience Rockwell Hardness Rupture Strength Shear Statistical Process Control Stress-Strain Curve Tensile Torsion Toughness Ultimate Strength Ultrasonic	1. Which products that I use daily have been subjected to destructive testing and how has that improved their function? 2. When one of my favorite things breaks, what should I be able to tell about what it is made from? 3. How can material testing help us to understand the composition, properties, and behavior of engineering materials?	Instructions for the SPC Device Material Testing Requirements Material Testing Formulas - Template	PowerPoints® Using the Statistical Process Control Analyzer Tensile Testing Using the Stress Analyzer for Tensile Testing Tensile Report Destructive Testing Calculations for the Teacher Test Specimen Calculations.xls

Unit Name	**Engineering for Reliability**		**6th Six Weeks –5 days**		
Academic Alignment with TEKS	**CTE TEKS**	**Content/Vocabulary**	**Guiding Questions**	**Activities**	**Resources and Web links**
LESSON 1 **Math** **§111.32** **6(G)** **§111.34** **8(B)** **English** **Science** **2(A)(B)(C)** **Social Studies**	Students will be able to diagram a system and identify the critical components. Students will be able to mathematically estimate chance of failure of a system given information on certain components. Students will list the causes of failure and be able to propose solutions. Students will prepare and defend a position on an ethical engineering dilemma.	Assembly Case Study Component Component Relational Sketch Critical Component Ethics Failure Liability MTBF Probability Redundant Reliability	1. You are an engineer for an automobile manufacturer. Your tests have shown that the seatbelts fail in 1:20,000 crashes. The cost of settling lawsuits is less than the cost of redesigning the seat belt. You have been asked to prepare a recommendation whether to make the improvements knowing that if the improvements are made your car will be less competitive which will cost the jobs of friends. Make the decision and defend your selection.	Failure Rate Predictions with Dice	PowerPoints® Factor of Safety Oakes, Leone and Gunn. (2002). *Engineering your future (3rd ed.).* Great Lakes Press, Wildwood, MO. Wright, P. (2002). *Introduction to engineering (3rd ed.).* John Wiley & Sons Inc, NY, NY.

Unit Name	Engineering for Reliability		6th Six Weeks –5 days		
Academic Alignment with TEKS	**CTE TEKS**	**Content/Vocabulary**	**Guiding Questions**	**Activities**	**Resources and Web links**
LESSON 2 **English** **Science §112.47 2(B)** **Social Studies**	Students will research the engineering, legal, social, and ethical issues related to a final design developed in a case study. Students will analyze an engineering failure for the purpose of presenting an aural report which identifies; causes, damage done, design failures, and other areas where the failure has impacted the environment or society. Students will prepare a written report explaining their analysis of an engineering failure.	Case Study Environment Ethics Modeling Process Performance Production Reliability	1. In what ways has looking at these case studies changed the approach you expect to use to make decisions in the future? 2. What is meant by the term ethical dilemma?	Case Study Assignment Reliability & Redundancy Test	Harris, Pritchard, and Rabins. (1995). *Engineering ethics: concepts and cases.* Wadsworth Publishing/ITP, Albany NY. Oakes, Leone, and Gunn. *Engineering your future (3rd ed.).* Great Lakes Press, Wildwood, MO, ©2002 Wright, P. (2002). *Introduction to engineering (3rd ed.).* John Wiley & Sons Inc, NY, NY.

Unit Name Kinematics			6th Six Weeks –9 days		
Academic Alignment with TEKS	**CTE TEKS**	**Content/Vocabulary**	**Guiding Questions**	**Activities**	**Resources and Web links**
LESSON 1 **Math** **§111.32** **2(A)** **3(A)(B)** **7(A)** **English** **Science** **§112.47** **2(A)(B)(C)(D)(E)** **Social Studies**	Students will be able to explain the difference between distance traveled and displacement. Students will design and build a device for the purpose of conducting experiments of acceleration, displacement, and velocity.	Acceleration Displacement Force Gravity Law of Gravitation Newton's Laws Newton's First Law Newton's Second Law Newton's Third Law Particle Velocity	1. You and a friend are taking an eight mile canoe trip down the river. When you arrive at the river you find the average water speed is two miles an hour. You have asked friends to pick you up. How fast do you have to paddle to make the connection in three hours? 2. You have been asked to explain how distance traveled and displacement are different concepts to a group of seven year old students. How would you explain the concept to them and what examples would you use?	Ballistic Device Project	

Unit Name Kinematics			6th Six Weeks –9 days		
Academic Alignment with TEKS	**CTE TEKS**	**Content/Vocabulary**	**Guiding Questions**	**Activities**	**Resources and Web links**
LESSON 2 **Math** **§111.33** **3(A)** **8(A)(B)** **9(D)(F)** **English** **Science** **§112.47** **2(A)(B)(C)(D)(E)** **4(B)(C)(D)** **Social Studies**	Students will be able to explain how velocity and acceleration are calculated. Students will be able to calculate range and initial acceleration from data they record from experiments. Students will design and produce a threefold pamphlet to include an explanation of their ballistic device, drawings and a summarization of data recorded from experiments. Students will be able to analyze test data and utilize the results to make decisions.	Acceleration Delta Firing Angle Free Fall Gravity Maximum Height Projectile Motion Range Scalar Quantity Vector Quantity Velocity	1. Are Mathematical calculations useful predictors of events and what outside factors might affect the results? 2. Galileo was excommunicated from the church for his work. What parts of his work did the people in charge at the time find threatening? Do you think that something like that might happen today?	Ballistic Device Project Calculating Velocity Calculating Range Mathematic Calculations with Excel	Meriam, J. and Kraige, L. (2002). *Engineering mechanics volume 2 dynamics*. John Wiley & Sons, Inc., NY, NY. Oaks, Leone, and Gunn. (2002). *Engineering your future: an introduction to engineering.* Great Lakes Press, St. Louis MO.