Crawford Central School District

7th Grade STEM

Cochranton Junior Senior High School

STEM

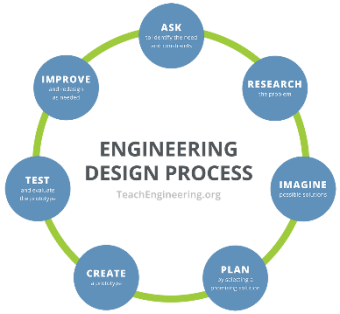
Course Description: This 9-week course is an introduction to integrated, interdisciplinary, and student-centered approach to learning that encourages curiosity, creativity, artistic expression, collaboration, computational thinking, communication, problem solving, critical thinking, and design thinking through hands on projects and inquiry. These approaches will be explored more in-depth within the 8th Grade STEM rotation.

Unit Title: Structural Design and Engineering Disciplines

Time: 3 weeks

Connections: CC.2.1.7.E.1, CC.2.1.7.E.4, CC.2.3.7.A.2 8, CC.2.1.7.C.1, CC.2.3.7.A.1, 3.2.7.B, 3.2.7.B1, 3.4.7.C1, 3.4.8.C2, 3.4.7.C3,3.4.7.E7, CC.2.3.7.A.2

Resources/Activities: Popsicle Sticks, Spaghetti, Midwest Miter Snips, Hot Glue, Wood Glue, Weights, Scale

Concept	Competencies	Vocabulary	Standards
-Students will be able to know and interpret the Engineering and Design Process.	-Students will be able to identify and explain the basic foundations of the Engineering Design Process.		CC.2.1.7.E.1, CC.2.1.7.E.4, CC.2.3.7.A.2 8, CC.2.1.7.C.1, CC.2.3.7.A.1, 3.2.7.B, 3.2.7.B1, 3.4.7.C1, 3.4.8.C2, 3.4.7.C3,3.4.7.E7, CC.2.3.7.A.2
-Students will be able to research, imagine and plan.	-Students will brainstorm and plan out a structure by researching and identifying design shapes and geometry.	-Static -Dynamic -Angles -Research and Development -Geometric Shapes -Brainstorming List	
-Students will be able to design and create.	-Students will use various material and geometric shapes often used in Structural Engineering to design and create and explore.	-Objective -Conservative Design -Troubleshooting -Architect -Refinements	
-Students will be able to test and analyze/improve.	-Students will physically test using load bearing weight to determine stressed areas of their structural designs.	-Refinements -Factor Of Safety -Analysis -Qualitative vs. Quantitative -Trade-Offs	

Unit Title: Introduction Artificial Intelligence

Time: 1 week

Connections: 3.4.7.E, 3.4.7.D3, 3.4.7.B, 3.4.7.C

Resources/Activities: YouTube, Student Devices, Articles, https://www.futureoftech.org/artificial-intelligence/

Concept	Competencies	Vocabulary	Standards
-Students will be able to understand the basics of artificial intelligence and the impacts of it on society.	-Students will be explore various AI modalities.	-Artificial Intelligence research	3.4.7.E, 3.4.7.D3, 3.4.7.B, 3.4.7.C
- Students will be able to understand the technologies behind AI.	Learn about the powerful algorithms that enable artificial intelligence (AI) to interpret a wide range of data and perform complicated tasks. Explore advanced AI applications such as machine learning and unsupervised learning that allow systems to teach themselves, predict the unknown and defeat champion gamers.	-Computer Vision -Speech Recognition - Data -Reinforcement Learning -Supervised Learning	
- Students will be able to understand the history behind AI.	Explore a timeline of the history of artificial intelligence (AI). Learn about the significant milestones of AI development, from cracking the Enigma code in World War II to fully autonomous vehicles driving the streets of major cities.	-Iteration -Machine Learning -Super-computer -Artificial Neutral Network -Natural Language Process	
- Students will be able to understand the societal and ethical concerns of AI as it pertains to working with AI in the future.	-Learn how the near-miraculous capabilities of artificial intelligence (AI) raise troubling concerns about its unintended consequences. Discover efforts to build a set of ethical values into current AI systems.	-Bias -Friendly AI -Technological Singularity -Defense Advanced Research Projects Agency (DARPA)	

Unit Title: Impact and Safety Restraint Testing

Time: 2 weeks

Connections: 3.2.7B, 3.2.7.b1-7 3.5.6-7.N, 3.2.9-12.K, 3.2.6-8.P, CC.2.2.7.B.2, 3.5.6-8.C, 3.5.9-12PP, 3.2.7B, 3.4.7D2

Resources/Activities: Eggs, crash track, crash track vehicles, straws, paper clips, pencils, rubber bands, tape, balloons, cotton balls, paper, etc.

Concept	Competencies	Vocabulary	Standards
-Students will be able to understand the basic principles of impact safety and restraint testing.	-Students will be able identify and research varying impact safety restraints in modern and technological systems.	-Air bags -Seatbelts -Autonomous -Forces -Factor of Safety -Failure	3.2.7B, 3.2.7.b1-7 3.5.6-7.N, 3.2.9-12.K, 3.2.6-8.P, CC.2.2.7.B.2, 3.5.6-8.C, 3.5.9-12PP, 3.2.7B, 3.4.7D2
- Students will be able to identify and demonstrate understanding of different types of energies, energy transfer and forces.	-Students will research, develop, and test different types of materials to determine their ability to absorb forces and energies.	-Yield Strength -Elasticity -Plasticity -Momentum -Inertia	
-Students will be able to the engineering design process in order to produce a solution to an opened ended design problem.	-Students will be required to design a mobile structure to withstand a dynamic impact.	-Newton's Laws of Motion -Efficiency -Velocity -Stability -Center of Mass -Impulse	
-Students will be able to test and analyze and collaborate.	-Students will take the data collected and use it to discuss possible improvements and iterations to their designs to increase their efficiency and increase their impact resistance.	-Design process -Revaluation -Peer review -Iteration -Efficiency	

Unit Title: Simple Machines

Time: 2 weeks

Connections: 3.2.6-8.G, 3.2.6-8.H, 3.4.7A2,3.4.3A2, 3.2.7B, CC.2.1.7.E.1, CC.2.1.7.E.4, CC.2.3.7.A.2 8

Resources/Activities: Hot Glue, Construction Project, marbles, small paper cups, paper towels, string, jumbo paper clips, rubber bands, PVC Pipe.

Concept	Competencies	Vocabulary	Standards
-Students will be identify the six simple machines.	-Students will test simple machines within a modular lab structure using hands on activities.	-Screws -Incline Plane -Lever -Wheel and Axle -Wedge -Pulley	3.4.7A2,3.4.3A2, 3.2.7B, CC.2.1.7.E.1, CC.2.1.7.E.4, CC.2.3.7.A.2 8
- Students will develop a Rube Goldberg Machine using each of the simple machines.	-Students will use their understanding Simple Machines as well as the Engineering Design Process to develop a Rube Goldberg Machine.	-Engineering Design Process -Simple Machines -Efficiency	

Unit Title: Introduction to 3D Modeling and Design

Time: 1 week

Connections: 3.5.6-8 J, 3.5.6-8 K, 3.5.6-8 M, 3.5.6-8 O, 3.5.6-8 Q, 3.5.6-8 R, 3.5.6-8 S, 3.5.6-8 T, 3.5.6-8 U, 3.5.6-8 V

Resources/Activities: SolidWorks, Balsa Wood (.125”x.125 and .25”x.25”), Midwest Miter Snips, Hot Glue, Super Glue, Wood Glue, Weights (Sand), Scale

Concept	Competencies	Vocabulary	Standards
-Students will navigate through the SolidWorks Software and differentiate between applied and sketched features.	-Identify the principal components of the SolidWorks user interface. -Distinguish between sketched and applied features. - Explain how different dimensioning methodologies convey different design intents.	-Command Manager -Feature Design Tree -Standard Toolbar -Features -Planes -Axis -Constraints	3.5.6-8 J, 3.5.6-8 K, 3.5.6-8 M, 3.5.6-8 O, 3.5.6-8 Q, 3.5.6-8 R, 3.5.6-8 S, 3.5.6-8 T, 3.5.6-8 U, 3.5.6-8 V
- Students will be able to create basic parametric models using SolidWorks software and analyze mathematical and scientific principles associated with them.	-Students will create a new part in SolidWorks: -Sketch on a plane and insert a new sketch -Add Sketch Geometry -Establish Sketch Relations - Understand the state of a sketch -Calculate Volume of the part -Calculate Surface area of the part -Use SolidWorks mass properties to verify and check volume, surface area and mass.	-Geometric Relationships -Extrude -Revolve -Sweep -Loft -Line -Horizontal -Vertical -Perpendicular -Parallel	