

Crawford Central School District
8th Grade STEM
Cochranton Junior Senior High School
STEM

Course Description:

This 9-week course is an 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.

Unit Title:	Balsa Wood Bridge Project
Time:	3 weeks
Connections:	CC.2.1.8.E.1, CC.2.1.8.E.4, CC.2.3.8.A.2 8, CC.2.1.8.C.1, CC.2.3.8.A.1 8, 3.2.8.A6, 3.2.8.B1, 3.4.8.C1, 3.4.8.C2, 3.4.8.C3,3.4.8.E7
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 know how to use SolidWorks Software.	-Students will be able to use the basic components and skills within SolidWorks to produce 3D models.	-Features -Extrusions -Weldments -Force	CC.2.1.8.E.1, CC.2.1.8.E.4, CC.2.3.8.A.2 8, CC.2.1.8.C.1, CC.2.3.8.A.1 8, 3.2.8.A6, 3.2.8.B1, 3.4.8.C1, 3.4.8.C2, 3.4.8.C3,3.4.8.E7
-Students will be able to brainstorm and plan.	-Students will brainstorm and plan out a balsa wood structure (bridge) by researching and identifying varying bridge structures.	-Static -Dynamic -Truss -Pratt -Suspension -Materials	
-Students will be able to design using 3D Parametric Modeling Software.	-Students will use basic 2D and 3D sketching to create weldments in SolidWorks to design and balsa wood structure for testing.	-Weldments -Bill of Materials -Cuts Lists -Trim, Extend -Miter Joints etc..	
-Students will be able to test and analyze.	-Students will use Finite Element Analysis within SolidWorks to simulate Static and Dynamic Forces on their structure. -Students will physically test using load bearing weight to determine stressed areas of their bridge designs.	-FEA (Finite Element Analysis) -Dynamic -Static -Load -Stress -Factor Of Safety	

Unit Title: Hydraulics and Pneumatics

Time: 3 weeks

Connections: 3.5.6-8.N, 3.2.9-12.K, 3.2.6-8.P, CC.2.2.8.B.2, 3.5.6-8.C, 3.5.9-12PP

Resources/Activities: SolidWorks, Bass Wood Midwest, Miter Snips, Hot Glue, Wood Glue, Weights (Sand), Miter Box and Cutter, Syringes (Small and Large), Tubing, Plastic Clips, Safety Glasses, Hand Drill.

Concept	Competencies	Vocabulary	Standards
-Students will be able to determine the difference between pneumatics and hydraulics.	-Students will be able to understand the basics between hydraulic pneumatic movements though hands on modules.	-Pneumatics -Hydraulics -Pascal's Law	3.5.6-8.N, 3.2.9-12.K, 3.2.6-8.P, CC.2.2.8.B.2, 3.5.6-8.C, 3.5.9-12PP
- Students will be able to test center of mass, limits and collision detection using 3D modeling Software.	-Students will use teacher created SolidWorks assemblies of rotating platforms and lifters to test collision of parts as well as how center of mass affects balance and stability.	-Center of Mass -Collision Detection -Counter Weights -Radius/Diameter -Surface Area	
-Students will be able to brainstorm and plan.	-Students will brainstorm and plan using knowledge of hydraulics and pneumatics in order to move/lift objects.	-Brainstorming List -Linear Motion -Rational Motion -Fluid Dynamics	
-Students will be able to design and produce	-Students will sketch ideas from brainstorming and choose the most effective ideas to produce a simple machine.	-Gusset -Grommet/O-Rings -Range of Motion -Types of Angles -Proportionality	

-Students will be able to test and analyze.	-Students will test simple machines on the effectiveness of their assigned task using peer review and data analysis.	-Qualitative Data -Quantitative Data -Slope -Pressure -Force -Area	
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Unit Title: Drones

Time: 3 weeks

Connections: 3.5.6-8.N, 3.2.9-12.K, 3.2.6-8.P, CC.2.2.8.B.2, 3.5.6-8.C, 3.5.9-12PP

Resources/Activities: Parrot Mambo Drones (12), I-Pad Minis, Build-Fly-Code Portal, Drone

Concept	Competencies	Vocabulary	Standards
-Students will be able to understand the different uses of drones in commercial, military, and personal use.	-Students will be able to explain real world uses of drones.	-Application -Autonomous	3.5.6-8.C, 3.5.9-12PP, 3.2.8.A6
- Students will be able to understand the physics of flight of a common drone.	-Students will use the FTW portal to learn the basic physics of Newtons laws as it applies to flight.	-Lift -Aerodynamics -Yoke/Yaw -Drag -Payload	
-Students will be able to test and collect initial data.	-Students will run autonomous trials to collect usable data for future tasks.	-FTW Code -Looping -Rate, Speed, Distance -Displacement -AND OR ELSE	
-Students will be able to design, test, and analyze	-Students will take the data collected and use it to program drone flight for a task autonomously.	-Design process -Revaluation -Peer review -Programming	