Unit 2 Materials and Structures

Content Area: **Science**
Course(s): **Prin of Enginee**
Time Period: **Semester 1**
Length: **10 weeks**
Status: **Published**

Standards

CS.9-12.8.1.12.AP.5	Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.
CS.9-12.8.2.12.ED.1	Use research to design and create a product or system that addresses a problem and make modifications based on input from potential consumers.
CS.9-12.8.2.12.ED.2	Create scaled engineering drawings for a new product or system and make modification to increase optimization based on feedback.
CS.9-12.8.2.12.NT.1	Explain how different groups can contribute to the overall design of a product.
CS.9-12.8.2.12.NT.2	Redesign an existing product to improve form or function.

Enduring Understandings

1. Laws of motion describe the interaction of forces acting on a body.
2. Structural member properties including centroid location, moment of inertia, and modulus of elasticity are important considerations for structure design.
3. Static equilibrium occurs when the sum of all forces acting on a body are equal to zero.
4. Applied forces are vector quantities with a defined magnitude, direction, and sense, and can be broken into vector components.
5. Forces acting at a distance from an axis or point attempt or cause an object to rotate.
6. In a statically determinate truss, translational and rotational equilibrium equations can be used to calculate external and internal forces.
7. Free body diagrams are used to illustrate and calculate forces acting upon a given body.

Essential Questions

1. Why is it crucial for designers and engineers to construct accurate free body diagrams of the parts and structures that they design?
2. Why must designers and engineers calculate forces acting on bodies and structures?
3. When solving truss forces, why is it important to know that the structure is statically determinate?

Knowledge and Skills

It is expected that students will:

- Create free body diagrams of objects, identifying all forces acting on the object.
- Mathematically locate the centroid of structural members.

- Calculate moment of inertia of structural members.
- Differentiate between scalar and vector quantities.
- Identify magnitude, direction, and sense of a vector.
- Calculate the X and Y components given a vector.
- Calculate moment forces given a specified axis.
- Use equations of equilibrium to calculate unknown forces.
- Use the method of joints strategy to determine forces in the members of a statically determinate

Resources

Instructional Resources

2.1 CareerFieldDescription.doc
2.1.RU CareerFieldDescriptionRubric.doc
2.1.1.A Centroids.docx
2.1.1.A Centroids.pptx
2.1.2.A BeamDeflection.docx
2.1.2.A IntroductionStructuralMemberProperties.pptx
2.1.3.A FreeBodyDiagrams.docx
2.1.3.A IntroductionStatics.pptx
2.1.4.A CalculatingForceVectors.docx
2.1.4.A ForceVectors.pptx
2.1.5.A CalculatingMoments.docx
2.1.5.A Moments.pptx
2.1.6.A StepByStepTrussSystem.docx
2.1.6.A CalculatingTrussForces.pptx
2.1.7.A CalculatingTrussForces.docx
2.1.8.A.VEX TrussTesterAssemblyProcedure.docx
2.1.8.P TrussTesterBuildInstructions.pdf
2.1.8.P.VEX TrussTestingProcedure.docx
2.1.8.P.SSA TrussDesign.docx

Assessments

https://docs.google.com/document/d/1wR7bQF-8AQoRrt0g4C3hKja0yjwDjC9_BiAmONWbTcI/edit

Modifications

https://docs.google.com/document/d/1ODqaPP69YkcFiyG72fIT8XsUIe3K1VSG7nxuc4CpCec/edit?usp=sharing