Unit 5: Structural Design

Content Area: **Technology**
Course(s): **Engineering Design 1**
Time Period: **December**
Length: **6 blocks**
Status: **Published**

Enduring Understandings

1. Cost and efficiency of structures are interrelated.

2. Materials science is an important factor to consider when deciding which products to use in a structure.

3. Quality of construction is an essential part of the efficient design of structures.

Essential Questions

1. Why does cost of materials and labor affect the design of a structure?

2. How does a combination of forces affect a structure?

3. How does the phrase, “A chain is only as strong as its weakest link.” apply to the field of structural engineering?

4. How is the design process used when solving a structural engineering problem?

5. What information can we gain from destructive testing of a structure?

Content

Vocabulary:

Structural integrity, Point of failure, Stress point, Fracture, Destructive testing, Non-destructive testing, Strength-to-weight ratio, Dead load, Live load, Compression, Tension, Bending, Torsion, Shear, Stress, Strain, Elastic deformation, Modulus of elasticity, Plastic deformation, Cantilever, Force, Static load, Dynamic load, Beam, Arch, Girder, Truss, Gusset, Bending moment, Newton, Tensile strength, Hooke’s law, Structure, Load factor, Materials science, Natural structure, Man-made structure, Deflection, Material failure, Composite material

Skills

1. Apply the design process to design and build a structure that meets instructor created specifications.

2. Document work completed on a structural engineering project using an engineering portfolio.

3. Identify where different forces are affecting a structure.

4. Calculate a structure's efficiency.

5. Conduct an analysis of structural engineering data.

Resources

Desktop computers

Structural testing software

Structural prototyping tools

Structural prototyping equipment

Structure testing device

Standards

TECH.8.1.12.F.CS2	Plan and manage activities to develop a solution or complete a project.
TECH.8.2.12.C.5	Create scaled engineering drawings of products both manually and digitally with materials and measurements labeled.
TECH.8.2.12.D.3	Determine and use the appropriate resources (e.g., CNC (Computer Numerical Control) equipment, 3D printers, CAD software) in the design, development and creation of a technological product or system.
TECH.8.2.12.D.5	Explain how material processing impacts the quality of engineered and fabricated products.
TECH.8.2.12.E.1	Demonstrate an understanding of the problem-solving capacity of computers in our world.