Fairfax Collegiate

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Civil Engineering 5-6 Syllabus

Course Goals

1 History of Civil Engineering
Students discover the importance of civil engineering throughout human history, from the Great Wonders of the ancient world to the towering structures of today. They learn the purpose historic marvels of engineering and their effect on different populations around the globe.

2 Laws of Physics
Students learn the basic laws of physics and their applications, including the energy of motion and the forces that govern relationships between objects.

3 Physical Systems
Students learn about mass, static and dynamic forces, and stress. Students apply their lessons to the construction of bridges, skyscrapers, roller coasters, and other architectural projects.

Course Topics

1 Origins of Civil Engineering
Students review the history of civil engineering and explore the future of the civil discipline.

2 Newton's Laws
Students learn about the fundamental laws of physics as stated in Newton's Three Laws of Motion

3 Properties of Physics
Students learn the relationships between force, energy, and mass, and how each of those is measured.

4 Potential Energy
Students learn what potential energy is and how it is measured.

5 Kinetic Energy
Students learn what kinetic energy is and how it is measured.

6 Ancient World Wonders
Students learn about the most impressive engineering feats of years long past.

7 Construction Materials and Technology
Students learn about the materials science behind civil engineering.

8 Modern Engineering Marvels
Students learn about the largest and most impressive construction projects of the last century.

9 Static Loading

Students learn about the effects of static loading in engineering and how these forces are distributed.

10 Dynamic Loads
Students learn about the effects of dynamic forces in engineering and how force is distributed.

Course Schedule

Day 1

Icebreaker and Course Introduction
Students get to know each other and their instructor, and they will briefly review classroom rules.

Investigating the Origins of Civil Engineering
Students review the history of civil engineering. They discuss what needs prompted civil construction projects, and how engineering helps solve large problems. Students think about humanity's needs as a population, how they've changed over time, how they've stayed the same, and why.

Paper Tower
Students experiment with paper, pencils, and tape to see how tall and how sturdy a tower they can build.

Day 2

Force, Energy, and Mass
Students learn the relationships between force, energy, and mass, and how each is measured. They also investigate the ways that gravity influences these interactions.

Great Wonders of the Ancient World
Students learn about the most impressive engineering feats of years long past, what materials were used, and how large-scale construction was accomplished without modern technology.

Friction Experiment
Students experiment with friction as it applies to different materials.

Day 3

Modern Engineering Marvels
Students learn about the largest and most impressive construction projects of the last century. They also explore what civil engineering could lead to in the future.

Potential and Kinetic Energy
Students learn how potential energy is transferred to kinetic energy and how to harness it.

Roller Coaster Hill
Students construct a simple roller coaster hill using K'Nex.

Day 4

Roller Coaster Physics
Students learn the physics concepts that are important when building a functioning roller coaster.

Roller Coaster Loop Design
Students use their knowledge of kinetic energy to improve their roller coaster hill and design a loop for their coaster.

Day 5

Physics and Newton's Laws
Students learn about the fundamental laws of physics as stated in Newton's Three Laws of Motion. They test the validity of each law by constructing and observing K'Nex models.

Super Coaster
Students combine forces and ideas with one another to create one giant roller coaster.

Day 6

Engineering Design Process
Students learn about and practice the engineering design process.

Static Forces
Students learn about the effects of static loading in engineering, and how these forces are distributed. They also learn how to design and stabilize a simple structure.

K'Nex Tower
Students replicate the balsa tower challenge using only K'Nex materials.

Day 7

Skyscraper Physics
Students learn about the physics principles that govern the building of skyscrapers.

Balsa Tower
Students design a tower out of balsa wood using their knowledge of static loads. They attempt to create the tallest, stable tower possible with strict material limits.

Day 8

Dynamic Forces
Students learn about the effects of dynamic forces in engineering, and how stress is distributed across a stationary structure.

K'Nex Bridge Weight Capacity
Students replicate the Balsa Bridge activity except with K'Nex materials.

Day 9

Bridges Physics
Students learn about different types of bridges and in what situations each type is used.

Balsa Bridge Weight Capacity
Students design and construct a bridge made out of balsa wood, utilizing their knowledge of physics to create a stable structure. With limited materials, they must make their bridge as strong as possible and test the bridge capacity with incrementally stronger weights.

Day 10

Building a City
Students work together to engineer an entire city using K'nex pieces.

Counting Kits
Students reassemble both K'Nex kits.

Paper Tower, Part 2
Students again design and create a paper structure, this time using knowledge they learned over the course of the class.

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