



## Materials Engineering 5-6 Syllabus

### Course Goals

#### 1 Form & Function

Students learn about the different categories of materials and how they are used in daily life.

#### 2 Properties of Materials

Students test the physical, chemical, and mechanical properties of various materials. They will explore how materials can be manipulated to enhance their function.

#### 3 Nanomaterials

Students will investigate the properties of nanomaterials through activities that focus on their molecular components.

#### 4 Materializing!

Students will practice combining different materials to build cost-effective, spacious, and durable structures.

### Course Topics

#### 1 Demystifying Materials

Students learn about the classifications and properties of materials commonly used in household products and public structures.

#### 2 Material Making

Students experiment with combining and manipulating substances to make simple materials that are integral to more complex products and resources.

#### 3 Harnessing Heat

Students investigate the mechanisms of solar panels and heat resistant materials. They explore the benefits and drawbacks of including them in structures.

#### 4 Aerodynamics

Students understand how to utilize materials towards efficient aerodynamics and use this knowledge to create parachutes and flyers.

#### 5 Making the Most

Students create an art project that repurposes non-recyclable materials. They will be collecting materials for this project throughout the session.

#### 6 Mighty Material House

Students are challenged to use their knowledge from the session towards creating a house that is durable, weather resistant, and cost effective.

### Course Schedule

## **Day 1**

### **Mysteries of Materials**

Students will participate in an icebreaker and understand the basics of materials engineering.

### **Classifying Materials**

Students will practice classifying common materials into different categories in order to understand their use.

## **Day 2**

### **Beam Building**

Students explore the properties of composites using inexpensive materials and processing techniques to create beams.

### **Bubble Solution**

Students will learn about material science in a chemistry based context, and understand how surface tension factors into making bubbles.

## **Day 3**

### **Cardboard vs. Cement**

Students will experiment with two common building materials- cardboard and cement. They will learn about the benefits and drawbacks to using each material.

### **Silly Putty**

Students will learn about polymers and their functions. They will create their own silly putty and understand how materials in various proportions can affect its characteristics

## **Day 4**

### **Solar Panels**

Students will learn about how solar panels work and observe how they can harness solar energy to provide heat and electricity.

### **Starlite Material**

Students will discover the workings of thermal insulation and heat transfer through "starlite material"

## **Day 5**

### **Molecular Structures**

Students will learn about the molecular structures that polymers are made of. They will understand why polymers have different properties.

### **Kinetic Sand**

Students will apply their knowledge of polymers to create kinetic sand and understand its properties

## **Day 6**

### **Flimsy Materials**

Students will experiment with building strong structures using flimsy materials

### **Cleaning up an Oil Spill**

Students will investigate the effectiveness of different approaches to cleaning up oil spills

## Day 7

### **Aerodynamics: Parachute**

Students will learn about the aerodynamic properties of various materials by creating parachutes

### **Aerodynamics: Flyers/Helicopters**

Students will simplify their understanding of aerodynamics by making small flyers.

## Day 8

### **Patching Holes**

Students will investigate the properties of various flimsy materials to determine which one is best for waterproofing a roof

### **Pennies & Ketchup**

Students will explore the cleaning properties of uncommon household substances

## Day 9

### **Reactions: Bath Bombs**

Students will explore the results of combining materials together, and understand what properties of materials cause them to react

### **Mighty Material House**

As a culmination of their knowledge throughout this session, students will build their own "Mighty Material House", a durable, sustainable, and budget-friendly structure.

## Day 10

### **Mighty Material House**

As a culmination of their knowledge throughout this session, students will build their own "Mighty Material House", a durable, sustainable, and budget-friendly structure.

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