

Course of Study: Materials Science II

Course Description:

The fundamental purpose of Materials Science II is for students to continue the foundation laid in Materials Science I and expand on and apply the understanding of the composition, formation, properties, and structure of various materials and changes in matter and energy to real world applications in a project based environment. The Material Science II program is dedicated to promoting scientific and technological literacy. The principal means of learning will be through hands-on laboratory investigations that integrate science and technology.

Course Credit: This course counts as 1 credit of science.

Purpose of Course:

The fundamental purpose of Materials Science II is for students to continue the foundation laid in Materials Science I and expand on and apply the understanding of the composition, formation, properties, and structure of various materials and changes in matter and energy to real world applications in a project based environment. Emphasis will be placed on manufacturing and engineering processes and the examination of the relationships between structure, properties, processing and performance, and exploration of the development of improved materials for the future of manufacturing. Topics will include safe laboratory practices, matter and its properties, crystal structure and geometries, metals, ceramics, polymers, and composites. Scientific methods will be used to gather, analyze, and represent data in a variety of ways including topics from life and physical science, current events/phenomena, and manufacturing applications. The principal means of learning will be through hands-on laboratory investigations that integrate science and technology. Guest speakers and field trips may be included, as time permits, to gain an appreciation for the use of materials in manufacturing and technology. Through the expanding study of materials science, students experience science and technology as an applicable and comprehensible subject that can be used in the everyday functions of their careers and lives. Students will be required to do further study outside of class that may include homework, projects, and video creation.

Course Content:

Themes	Topics
Classifying Matter	<ul style="list-style-type: none">• Scientific measurement and communications<ul style="list-style-type: none">○ Use numbers describe and distinguish specific characteristics of various materials with standardized language.• Distinguishing characteristics of different materials<ul style="list-style-type: none">○ Metals, ceramics, polymers, composites, glass, and other solids○ Determine appropriate material use in manufacturing processes
Structure of and Properties of Matter	<ul style="list-style-type: none">• Atomic structure<ul style="list-style-type: none">○ Atomic models/theory○ Electrons• Periodic table<ul style="list-style-type: none">○ Atomic size, ionization, electronegativity○ Properties: density, melting point, phase at room temperature, conductivity
Interactions of Matter	<ul style="list-style-type: none">• Intramolecular<ul style="list-style-type: none">○ Types of chemical bonding and strengths○ Chemical reaction types and reaction energy• Intermolecular<ul style="list-style-type: none">○ Properties of solids, liquids and gases○ Changes of state and kinetic-molecular theory<ul style="list-style-type: none">▪ Energy consideration of phase changes, behavior, laws
Designing Technological/ Engineering Solutions Using Science Concepts	<ul style="list-style-type: none">• Solve science-based engineering or technological problems through application of scientific inquiry.