I. Description of Course:

1. Department/Course: ETEC - 107
2. Title: Properties of Materials
3. Cross Reference:
4. Units: 0.5
   Lec Hrs: 0.25
   Lab Hrs: 0.75
   Tot Hrs: 18.00
5. Repeatability: No
6. Grade Options: Grade Only (GR)
7. Degree/Applicability: Credit, Degree Applicable, Not Transferable (D)
8. General Education: Advisory
9. Field Trips: Not Required
10. Requisites: MATH 151 Algebra I

II. Catalog Description:

This course surveys materials, properties, and applications for technicians. Topics will include a brief introduction to the properties of metals, polymers, ceramics, and composites.

III. Class Schedule Description:

This course offers a survey of materials, properties, and applications.

IV. Counselor Information:

This course is designed to help prepare the student for an entry-level position as technician in manufacturing facilities or engineering services where some exposure to engineering principles is helpful.

II. Student Learning Outcomes

The student will:

1. Compare properties of materials such as metals, polymers, ceramics and composites
2. Discuss the mechanical, electrical, thermal, and magnetic properties of common materials
3. Identify evidence for corrosion, stress, wear, cracking or other conditions that may lead to failure
4. Briefly describe common materials and methods used in the construction of buildings, roads, computer chips, vessels, pipes, etc.

III. Course Outline:

LECTURE
A. Introduction to chemistry
   1. Atoms and molecules
   2. Density
   3. Solids
4. Liquids
5. Gases
6. Energy and temperature
   i. Units
   ii. Phase change
      1. Solid – liquid
      2. Liquid – gas
   iii. Heating
B. Electrical and magnetic forces
C. Investigation of specific material properties
   1. Metal
      A. Strength
      B. Ductility
      C. Resistance to fracture, brittleness
      D. Resistance to fatigue
      E. Resistance to creep
      F. Resistance to corrosion
   2. Properties and characteristics of major material types
      A. Elastomers (rubbers)
      B. Plastics, thermoplastics, thermosets, reinforced polymer composites
      C. Semiconductor materials
      D. Construction materials (concrete)
      C. Ceramics, glass
      D. Solar materials
      E. Biomedical materials
3. Architecture
   A. Seismic considerations
      B. Eco-friendly materials
4. Maintenance and prevention
   A. Inspection and diagnosis
   B. Sensors
   C. Recent advances in materials

LAB

Keeping a lab notebook
Keeping a lab notebook

A.

1. Following protocols
   Mass

2. Volume
   a. Density
   b. 
      i. Liquids
      ii. Solutions
      iii. Metals

3. Graphing

4. The effect of heat and cold on materials

5. Investigation of specific materials
   a. Metals and alloys
   b. Polymers and plastics
   c. Glass
   d. Semiconductors
   e. Cement, concrete, and asphalt
   f. Wood
   g. Laminated composite

6. Corrosion

7. Tensile testing

8. Heat treating

9. Defects and failure: exploration of common causes of failures
   a. Stationary parts: pipes, vessels, coatings,
   b. Moving parts: rotating shafts

10. Visco-elasticity and creep, composite materials, stiffness and strength

11. Comparison of building materials

IV. Course Assignments:

   A. Reading Assignments
      1. Read online articles pertaining to materiels science.

   B. Projects, Activities, and other Assignments
      1. Keep a laboratory notebook.

   C. Writing Assignments
      1. Complete short essays which summarize important principles of materials science.

V. Methods of Evaluation:

   A. Tests, quizzes, and final exam will pertain to principles, properties, and uses of of materials.

   B. Short written assignments will be graded, eg. "discuss properties of stainless steel which make it superior to iron; list its common applications."

   C. Laboratory notebooks will be graded.

VI. Methods of Instruction:

   A. Lecture
   B. Laboratory
   C. Discussion
   D. Demonstration
   E. Audiovisual

VII. Textbooks:
Recommended


Supplemental

VIII. Supplies:

CID 3538