

EASTERN ARIZONA COLLEGE

Materials of Industry

Course Design
2010-2011

Course Information

Division Industrial Technology Education
Course Number MSP 102
Title Materials of Industry
Credits 3
Developed by Newell Dryden
Lecture/Lab Ratio 3 Lecture/0 Lab

Transfer Status

ASU	NAU	UA
Non Transferable	CM Dept. Elective also satisfies CTE Departmental Elective	Non Transferable

Activity Course No
CIP Code 48.0500
Assessment Mode Pre/Post Test (20 Questions/100 Points)
Semester Taught Fall
GE Category None
Separate Lab No
Awareness Course No
Intensive Writing Course No

Prerequisites

None

Educational Value

Students will gain an understanding and an appreciation for the myriad of materials available to modern industry and the technologies which are possible because of the existence of these materials. The material in this course will aid students in understanding the advantages and limitations of engineering materials. All students could benefit from this course by gaining a more thorough understanding of the materials in the world we live in.

Description

This is a study of metals, ceramics, polymers and other commonly used industrial materials. This course explores the extraction, processing, refinement and utilization of a wide variety of industrial materials.

Supplies

None

Competencies and Performance Standards

1. Identify the molecular and granular structure of a wide variety of industrial materials

Learning objectives

What you will learn as you master the competency:

- a. Identify the structure of the atom.
- b. Describe 3 basic cubic structures of metals.
- c. Differentiate between compounds and mixtures.
- d. Describe 3 basic atomic bonds.

Performance Standards

Competence will be demonstrated:

- in completion of homework assignments and in the completion of chapter tests

Criteria - Performance will be satisfactory when:

- learner will diagram atomic and crystal structures for various metals and materials
- learner will define the terms which apply to the molecular structure of matter

2. Describe the processes of mining, milling classifying, smelting and electrolytic refining as they are used to produce metal products

Learning objectives

What you will learn as you master the competency:

- a. Explain the process of mining, crushing, milling, floating, concentrating, smelting, converting and electrolytic refining of metals.
- b. Describe the operation of the blast furnace and the open hearth furnace in the production of steel.

Performance Standards

Competence will be demonstrated:

- in the completion of selected class activities and in the completion of chapter tests

Criteria - Performance will be satisfactory when:

- learner diagrams the mining process
- learner lists the stops for extraction of metal ores
- learner differentiates between sulfide and oxide ore in copper production
- learner identifies the steps in the production of steel

3. List the major heat-treating processes and describe how they affect the properties of metals.

Learning objectives

What you will learn as you master the competency:

- a. List the type of local hardening techniques.
- b. List the reasons for local hardening.
- c. Describe heat-treating furnace operation
- d. Identify the effects of heat-treating on various metals.
- e. Define hardening, annealing, stress-relieving, case-hardening, normalizing and tempering.

Performance Standards

Competence will be demonstrated:

- in the completion of homework assignments.
- in the operation of the Rockwell hardness tester
- in the completion of chapter tests

Criteria - Performance will be satisfactory when:

- learner diagrams the components of a case-hardened structure
- learner lists the stops for thorough hardening of high carbon steel
- learner list the steps in carburizing, nitrating and carbo-nitriding
- learner identifies parts which have been case-hardened
- learner measures Rockwell hardness of a heat-treated part

4. Classify the different commonly used ceramics and describe their structure and application.

Learning objectives

What you will learn as you master the competency:

- a. To identify ceramic materials
- b. To list ceramic properties
- c. To describe the properties of cermets
- d. To compare methods of machining ceramics
- e. To explain common uses of ceramics
- f. To describe cemented carbides and their applications
- g. To measure the hardness of ceramics

Performance Standards

Competence will be demonstrated:

- in completion of classroom activities
- through objective tests

Criteria - Performance will be satisfactory when:

- learner identifies common ceramic materials
- learner lists most commonly used ceramics
- learner recognizes the effective application of different ceramic materials

5. Analyze the material strength of a variety of polymers and list their properties.

Learning objectives

What you will learn as you master the competency:

- a. To outline the history of polymeric materials.
- b. To list the natural polymers
- c. To describe properties of polymers
- d. To compare polymeric additions and describe their effects
- e. To define 18 different polymeric properties
- f. To describe 13 processes used to form plastic parts

Performance Standards

Competence will be demonstrated:

- in the completion of homework assignments
- in the completion of classroom activities
- in the completion of chapter tests on this material

Criteria - Performance will be satisfactory when:

- learner will diagram the structure of long chain polymers
- learner will define 8 different types of polymers
- learner will provide acceptable written responses to questions about the technology of polymeric materials

6. Discuss the elements of different types of corrosion and tell what can be done to eliminate or minimize each one.

Learning objectives

What you will learn as you master the competency:

- a. To list 8 major causes of corrosion
- b. To describe the effects of galvanic action on a variety of metals in electrolytic conditions

To show methods which can be used to control corrosion

Performance Standards

Competence will be demonstrated:

- in completing classroom activities
- in completing the chapter test on corrosion

Criteria - Performance will be satisfactory when:

- learner identifies the material which will corrode in a compound environment
- learner calculates corrosion potential
- learner identifies mechanical conditions which aggravate corrosion
- learner answers test questions correctly

7. Describe the processes of machining, welding, casting, extruding, conditioning and coating and their applications to a wide variety of commonly used industrial materials.

Learning objectives

What you will learn as you master the competency:

- a. To identify the source of industrial materials and describe the processes by which these materials are produced
- b. To list 12 different processes by which products are manufactured
- c. To describe the most common conditioning, assembling and finishing procedures

Performance Standards

Competence will be demonstrated:

- by completing the homework assignments
- by completing a chapter test on this material

Criteria - Performance will be satisfactory when:

- learner correctly chooses manufacturing processes

- learner prepares manufacturing outlines correctly
- learner gives definitions of 21 manufacturing process terms
- learner completes a test on this material and gives satisfactory responses to questions about the manufacturing processes

Types of Instruction

Classroom Presentation

Grading Information

Grading Rationale

Students are graded on 4 things. The chapter tests, the shop projects, and the final exam each count for 30%, and the students' attendance counts for 10% of the final grade.

Grading Scale

A	90% - 100%
B	80% - 89%
C	70% - 79%
D	60% - 69%
F	Below 60 %