

ME 428 – MATERIALS SCIENCE

Type (check one): Required: _____ Elective: ✓

2005-2006 Catalog Data: ME 428. Materials Science. Fundamental concepts of materials science including the structure and properties of materials. The internal structures of metals, ceramics, and polymers are examined to develop an understanding of their mechanical, electrical, physical, and chemical properties. Prerequisites: CHEM 115 and Junior standing. *One semester; three credits.*

Prerequisites: CHEM 115, Junior standing

Co-Requisites: None

Textbook: Donald R. Askeland, *The Science and Engineering of Materials*, 3rd Edition, PWS Publishing

Other Required Materials: None

Other References: None

Instructor: Dr. Bernard B. Beard, Associate Professor of Mechanical Engineering

Course Objectives: Develop an understanding of the relationship between structure, processing and properties of materials. Develop an awareness of types of materials available and an understanding of their general behavior and to recognize the effects of environment to service conditions on the material's performance.

Prerequisites by Topics: General Chemistry

Topics:

1. Atomic structure
2. Imperfections in the atomic arrangement
3. Diffusion
4. Mechanical testing
5. Strengthening mechanisms for metals
6. Ferrous alloys
7. Nonferrous alloys
8. Ceramic materials
9. Polymers
10. Composite materials

Class Schedule: Two 75-minute sessions per week

Prepared by: Dr. Bernard B. Beard **Date:** November 2005

**Professional Component:
ME 428 – MATERIALS SCIENCE**

Category (check one)	<input type="checkbox"/> Math/Basic Science <input checked="" type="checkbox"/> Engineering <input type="checkbox"/> General Education <input type="checkbox"/> Other
Design (check one)	<input type="checkbox"/> Significant <input type="checkbox"/> Some <input checked="" type="checkbox"/> None
Realistic Constraints (check all that apply)	<input checked="" type="checkbox"/> Economic <input checked="" type="checkbox"/> Environmental <input type="checkbox"/> Sustainability <input checked="" type="checkbox"/> Manufacturability <input type="checkbox"/> Ethical <input type="checkbox"/> Health & Safety <input type="checkbox"/> Social <input type="checkbox"/> Political

Relationship to Program Outcomes:

Check all that apply:

- (a) an ability to apply knowledge of mathematics, science, and engineering
- (b) an ability to design and conduct experiments, as well as to analyze and interpret data
- (c) an ability to design a system, component, or process to meet desired needs
- (d) an ability to function on multi-disciplinary teams
- (e) an ability to identify, formulate, and solve engineering problems
- (f) an understanding of professional and ethical responsibility
- (g) an ability to communicate effectively
- (h) the broad education necessary to understand the impact of engineering solutions in a global and societal context
- (i) a recognition of the need for and an ability to engage in life-long learning
- (j) a knowledge of contemporary issues
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice