COURSE TITLE: Engineering 45 Engineering Materials (required)

CATALOG DESCRIPTION: Basic principles of mechanical, electrical and chemical behavior of metals, polymers and ceramics in engineering applications; topics include bonding, crystalline structure and imperfections, phase diagrams, corrosion, and electrical properties. Laboratory experiments demonstrate actual behavior of materials; topics include metallography, mechanical properties of metals and heat treatment. Lecture two hours; laboratory three hours. 3 units. (CAN ENGR 004)

GOALS:
Understanding the fundamentals of materials science including crystal structures and microstructures, relationships between microscopic behavior and macroscopic physical properties, and the steps required for appropriate material selection. Students will be able to conduct several types of standard materials tests, analyze the data generated and present their results orally and in lab report form.

MEASUREMENT: Student performance is measured using the standard CSUS grading scale, A-F. Students must earn a C- or better in E 45 to complete the course. Measurement of the extent to which each objective is met is done using standard tools (homework, exams, lab reports, oral reports). The final exam is comprehensive. The specific tools are indicated for each objective.

OBJECTIVES: By the end of the semester, the student will be able to:
1. know and understand the basic materials classifications (Metallography Lab Report, homework, Exam 1, final)
2. understand atomic bonding and crystal structures for some common engineering materials (Metallography Lab Report, homework, Exam 1, final)
3. understand the relationship between crystal structures, including directions, planes, and defects, and measured macroscopic properties both mechanical and electrical (Metallography Lab Report, homework, Exam 1, final)
4. understand the mechanisms for elastic and permanent deformation in typical engineering materials (Stress-Strain and Elastic Deformation Lab Report, Plastic Deformation Lab Report, homework, exam 1, final)
5. understand the processes of solid state diffusion (homework, exam 2, final)
6. utilize binary equilibrium phase diagrams and their use in prediction of properties (Heat Treatment of Steel Lab Report, homework, exam 2, final)
7. understand how heat treatment is used to vary microstructure and physical properties (Heat Treatment of Steel Lab Report, homework, exam 3, final)
8. understand fundamentals of physical properties of metals, ceramics, polymers, and composites (homework, exam 3, final)
9. understand fundamentals of electrical properties of conductors and semiconductors (homework, exam 3, final)
10. understand fundamentals of electrochemical behavior (Corrosion Lab Report, homework, exam 3, final)
11. utilize experimental skills required to measure and evaluate materials including microstructural analysis, mechanical and electrical properties (all labs, all exams)
12. know how to prepare lab reports and present experimental results (all labs)

Prepared by: Susan Hall Date: Spring 2003