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Fall Semester 2010: Course Syllabus
Course ENGR 3450.002 s3 credits No prerequisites
ENGINEERING MATERIALS

Time & Place: This course will be taught **Tuesdays and Thursdays, 9:30 – 10:50 AM, in Discovery Park (DP) Room D-201** starting August 26.

Background: Materials are everywhere around us - like air is - but students in various fields of **Engineering** (Electrical Engineering, Engineering Technology, Mechanical and Energy Engineering,) and also in **Science (Physics, Chemistry)** often do not know enough about them. **Materials Science and Engineering** students above all need the basics of their chosen discipline. After this course the students will be able to communicate successfully with people in most areas of industry - with obvious effects on the range of *jobs* available to them. Job performance for those already working will be enhanced. Using various materials and devices in everyday life will become easier too: “Why can we elongate a rubber band up to seven times its original length, but this is not doable for steel ?”; “Why an epoxy glue comes always in two little bottles, not in one ?”; “Why are frying pans covered with Teflon ?”. New classes of materials including smart materials and their uses will be explained. The course participants will find out why a specific class of materials has the properties it does. The course will give students the essential characteristics of any class of materials they will encounter, without dealing with unnecessary details. Effects of materials on the environment will be discussed. Mechanical, tribological, electrical and other properties of materials will be covered, together with materials testing. Connections to Chemistry, Physics and all fields of Engineering will be spelled out so as to connect to the existing knowledge of the students. To give now just one example, polyethylene is made by a chemical reaction of polymerization of ethylene gas.

Course Objectives:

- to understand why materials – of any kind – behave the way they do. To see connections between properties and processing, intermolecular forces and structures at several levels;
- to learn essential characteristics of each of the key classes of materials;
- to learn about the most important thermophysical, rheological, mechanical, electrical, magnetic and surface properties, and also about materials testing.

Textbook: No need to buy one ! Powerpoint presentations of each class will be provided, thus at the end of the semester each student will have a full textbook in his/her hand. Most existing textbooks do not cover several important classes of materials (organic raw materials, glassy metals, smart materials); we cover all classes.

Course Program

I. Foundations

1. Introduction
2. Intermolecular Forces

3. Thermodynamics and phase diagrams
4. Crystal structures
5. Non-crystal structures

II. Materials

6. Metals and alloys
7. Ceramics
8. Organic raw materials
9. Polymers
10. Electronic and optical materials
11. Liquid crystals and smart materials
12. Synthetic composites
13. Biomaterials

III. Behavior and properties

14. Rheology and processing
15. Mechanical properties
16. Electrical and dielectric properties
17. Magnetism
18. Surface behavior and tribology
19. Radiation, environment and recycling
20. Testing and selection of materials

Grade Distribution:

Homework reports and presentations	65 %
Plant trip and demonstration reports	20 %
Final examination	15 %

Doing homeworks (concepts, definitions, relationships, problem solving) and then reviewing them in class, the student can check himself/herself the extent of the learning progress made, and thus decide whether a given rate of effort needs to be maintained, increased, or possibly decreased. Industrial plant trips are eye-openers to some (and job searching opportunities too). The necessity of doing the homeworks takes off the pressure at the end of the semester ! A student working at an *even pace* can come to the final test with 85 % of the maximum number of points possible in the course already accumulated.

College of Engineering including the Department of Engineering Technology of the University of North Texas will make reasonable adjustments to ensure equal opportunity for qualified persons with disabilities to participate in all their programs and activities. Please see the instructor if special accommodations are required.