COURSE SYLLABUS

ENGR 3450.001-Engineering Materials / Intro to Materials Science and Engineering

(Class Tu/Th 3:30 -4:50 PM, B192)

Spring 2010

Credits: 3

Note for Non-Materials Science and Engineering Majors:

ENGR 3451 - Engineering Materials Lab

(Tuesday or Thursday 5:00 -7:50 PM, F162) Instructor: Ali Nouri*; Credit: 1*

As materials is a field that transcends all disciplines of science and engineering, it is beneficial for every scientist and engineer to know something about different materials. The discipline itself focuses on the STRUCTURE and PROPERTIES of materials, but in the larger sense this is just the initial portion of the well known engineering sequence:

STRUCTURE – PROPERTIES – DESIGN – PERFORMANCE

In this course you will have the opportunity to learn something about the fundamentals of the structure/properties relationships of all types of materials (**ceramics**, **metals** and their alloys, **polymers** and composites thereof).

COURSE OBJECTIVES

1. Understand the concepts of atomic bonding, crystal structures, imperfections, diffusion, mechanical properties, electron energy, and dislocations as related to processing and performance of engineering materials.
2. Understand the relationship between structure-processing-properties for selection of existing materials and development of new materials in the design of parts, structures, and devices.
3. Understand the microstructure characteristics, electronic properties, materials formation, and manipulation of microstructure for application in engineering design and materials processing.
4. Understand the relations between the composition, temperature and phase fractions applied to equilibrium phase diagrams for given material systems.
5. Apply numerical solutions with clear insight into the basis for the selected solution for properties and characteristics of the given material using materials property data.

COURSE OUTCOME

1. Demonstrate an ability to analyze crystalline structures, and calculate Miller Indices, packing factor and density of selected unit cells, non-crystalline behavior, and anisotropy (Course Objective 1).
2. Show the application of materials microstructure in the design of materials and their processing to obtain required properties (Course Objectives 2, 3, 5).
3. Demonstrate the effect of materials microstructure at the atomic scale on the engineering properties of materials (Course Objectives 2, 3).
4. Demonstrate an ability to analyze strengthening by strain hardening, solid solution and grain size reduction, and use of Hall Petch relation, etc (Course Objectives 2, 3, 4).
5. Develop an experiment to characterize materials properties for an engineering application (Course Objectives 2, 3, 4, 5).

INSTRUCTOR

Professor:	Dr. Thomas Scharf
Office:	E-117 Discovery Park
Telephone:	940.891.6837

E-Mail: scharf@unt.edu
Office Hours: Wednesday 1 PM – 3 PM.

You may also make an appointment at possible convenient times. Finally, e-mail is often useful for questions. Also, you can contact the TA below for assistance.

Teaching Assistant:

Oseoghaghare (Gary) Okobiah, e-mail: OseoghaghareOkobiah@my.unt.edu Office: E-140
Office hours: Thursday 1 PM – 3PM

LECTURE SLIDES

Lecture slides will be posted at least one hour before each class on the website: www.mtse.unt.edu/public/scharf so you can print them out before class to take notes on them.

TEXTBOOK

Fundamentals of Materials Science and Engineering, An Integrated Approach, by: William D. Callister & David G. Rethwisch, 3rd Edition, John Wiley, 2008. ISBN-10: 0470125373
The Instructor will supply additional handouts and references.

HOMEWORK

At least 4 homework sets will be assigned and graded. The purpose of the homework is to aid in learning the material. To this end, some collaboration among students in preparing the homework is acceptable. However, in the main, the work should be primarily yours. Because of this tight timeline, late homework will not be accepted.

GRADING POLICY

Homework	30%
Exams (2 exams covering materials in lectures)	40%
Comprehensive Final Exam	30%

ATTENDANCE

I consider attendance mandatory. If you are going to miss class notify me.

Course Schedule for 14 weeks (may be adjusted during the semester)

Schedule	Lecture Topics
Week 1 (January 19)	a. Orientation & Introduction b. Electronic & Atomic Structure
Week 2	a. Bonding b. Metallic Crystal Structures
Week 3	a. Ceramic Crystal Structures b. Other Structures
Week 4	a. Miller Indices b. Polymer Structures
Week 5	a. Polymer Structures (continued) • Exam 1 (on Thursday)
Week 6	Imperfections in Crystals
Week 7	Diffusion
Week 8	Mechanical Properties of metals
Week 9	Mechanical Properties of other materials
Week 10	a. Deformation and Strengthening Mechanisms • Exam 2 (on Thursday)
Week 11	Phase Diagrams
Week 12	Phase Transformations
Week 13	Electrical Properties
Week 14	Material Applications
Week 15 (Pre-final week)	Make-up & Review
Week 16 (Final exam Week)	TBD