

Materials Science and Engineering (MTSE) 3010
(Bonding and Structure)

Fall 2015

Credits: 3

During this course we will discuss how elements can be combined to produce non-crystalline and crystalline solids with specified properties in order to understand the links between chemical bonding, crystal structures and physical properties. We will also specify the microstructure, and the mesoscale structure of materials, such as metals, ceramics, electronic materials, and polymers.

Professor:	Thomas Scharf
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Telephone:	940.891.6837
E-Mail:	scharf@unt.edu
Office Hours:	Wednesday 2 PM – 4 PM
Class Hours:	T/R 4:00-5:20 PM
Class Location:	Discovery Park B192

Main Textbook

Structure of Materials - An Introduction to Crystallography, Diffraction & Symmetry
by Marc De Graef and Michael McHenry (2nd edition, 2012)
ISBN# 978-1-107-00587-7 Cambridge University Press
<http://som.web.cmu.edu/>

Supplementary Textbook

Structure and Bonding in Crystalline Materials
By Gregory S. Rohrer
ISBN# 0-521-66379-2 Cambridge University Press

The Instructor will supply additional handouts and references

Course Notes

Course notes for each class will be posted on website:
<http://engineering.unt.edu/materials/node/240>

Homework

Four 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 and blatant copying will result in failing grade. Late homework will not be accepted.

Exams

There will be two examinations: midterm and a comprehensive final.

Grading

Homework is 35%, Midterm is 30%, Final is 35%

Attendance

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

TA

Eunho Cha (EunhoCha@my.unt.edu); Office hours: Fri. 1 PM – 3 PM (E-142), or email him to set up an appointment

Academic Integrity

As is understood by the vast majority of students, our basic relationship is based on trust.

Course Syllabus (*Subject to Change*)

Date	Topic	Homework
Aug 25	Introduction and Review of Simple Bonding Models	
Aug 27	Periodic Trends & Bonding Force/Energy	
Sept 1	Lennard-Jones Model	
Sept 3	Lennard-Jones Model (cond.)	
Sept 8	Born-Mayer-Huggins Model	
Sept 10	Crystal Lattice & Unit Cells	Hwk 1 out
Sept 15	Metallic Crystal Structures	
Sept 17	Ceramic Bonding & Crystal Structures	Hwk 1 in
Sept 22	Ceramic Bonding & Crystal Structures (cond.)	
Sept 24	Interstitial Compounds	
Sept 29	Introduction to Crystallography	Hwk 2 out
Oct 1	2-D & 3-D Bravais Lattices	
Oct 6	Primitive and Basis Vectors in Crystal Structures	Hwk 2 in
Oct 8	Basic Symmetry Operations	
Oct 13	Midterm	
Oct 15	2-D Point & Plane Groups	
Oct 20	3-D Point Groups	
Oct 22	3-D Point Groups (cond.)	
Oct 27	Neumann's Law and Tensor Properties	Hwk 3 out
Oct 29	3-D Space Groups	
Nov 3	3-D Symmetry Elements in Crystalline Materials	
Nov 5	Relationships between planes and directions	Hwk 3 in
Nov 10	Introduction to XRD & Indexing Crystal Systems	
Nov 12	Structure Factors	
Nov 17	XRD Intensity Calculations	
Nov 19	XRD Intensity Calculations (cond.)	Hwk 4 out
Nov 24	Texture Determination and Pole Figures	
Nov 26	No class – Thanksgiving	
Dec 1	Stereographic Projection and Texture/Anisotropy	Hwk 4 in
Dec 3	Structure of Non-crystalline (amorphous) Solids	
Dec 10	Final Exam 2:00-4:00 p.m.	