Course: ChE 366 – Materials Science and Engineering
Semester: Fall 2013

Course Format and Credit Hours: 3 hr Lecture
3 hr credits

Instructor: Dr. Robin Hissam, 413 Engineering Sciences Building
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Schedule: 1pm MWF

Location: 401 Engineering Sciences Building

Office Hours: T: 10-11am, W: 9-10am, Th: 2-3pm or by appointment

Course Objectives: Introduce the fundamentals, which give rise to the wide spectrum of materials of practical use to engineers, with emphasis on their mechanical behavior. The topics covered in this course will include structures of metals, ceramics, and organic materials; the dependence of properties upon these structures and bonding conditions; thermal and mechanical stresses; corrosion; synthesis and preparation of materials.

Expected Learning Outcomes:

Upon successful completion of this course, students will be able to:

1. Categorize crystal structures and calculate relevant parameters (4)
2. Classify crystal defects such as vacancies and dislocations (2)
3. Explain the relationship between stress and strain for all material types using key parameters including Young's Modulus, Tensile Strength, Ductility (3)
4. Relate processing techniques to the resulting materials properties (6)
5. Analyze phase diagrams of metal alloys in terms of fractions of various phases (4)
6. Predict the different forms of iron-carbon alloys produced when the material is cooled (3)
7. Identify the basic structures of ceramic materials (2)
8. Summarize properties of polymeric materials (2)
9. Apply knowledge of materials properties to explain why certain materials are used in certain applications (4)
10. Combine information about material type and properties to devise a plan for selecting a material for a given application (5)
11. Evaluate the impact of materials design on society (6)

Required Text: Callister, W. D., Rethwisch, D. G., *Fundamentals of Materials Science and Engineering: An Integrated Approach*, John Wiley & Sons, Inc., 2012, Fourth Edition.

Grading:

Problem Sets	15%
Exams (20% each)	60%
Final Exam	25%
Total	*100%*

Grade Assignment: These ranges are subject to change at the end of the semester at the discretion of Professor Hissam

100-90	A
89-80	B
79-70	C
69-60	D
59- 0	F

Grading Policy: No make up exams allowed except by prior arrangement with instructor. **Late assignments will not be accepted under any circumstances.** Exam grading appeals in writing on the day the exam is returned.

Problem Sets: **Problem sets can be worked on in groups; however, the work submitted must be your own.** Assignments that are copied will receive no credit. Problem set should be presented neatly and easy to follow. No credit will be given for answers without work. Credit will be deducted for work that is sloppy, missing units, or has improper significant figures.

Attendance Policy: Consistent with WVU guidelines, students absent from regularly scheduled examinations because of authorized University activities will have the opportunity to take them at an alternate time. Make-up exams for absences due to any other reason will be at the discretion of the instructor.

Social Justice Statement: "West Virginia University is committed to social justice. I concur with that commitment and expect to maintain a positive learning environment based upon open communication, mutual respect, and nondiscrimination. Our University does not discriminate on the basis of race, sex, age, disability, veteran status, religion, sexual orientation, color or national origin. Any suggestions as to how to further such a positive and open environment in this class will be appreciated and giving serious consideration.

If you are a person with a disability and anticipate needing any type of accommodation in order to participate in this class, please advise me and make appropriate arrangements with Disability Services (293-6700)"

"WVU recognizes the diversity of its students and the needs of those who wish to be absent from class to participate in Days of Special Concern, which are listed in the Schedule of Courses. Students should notify their instructor by the end of the second week of classes or prior to the first Day of Special Concern, whichever is earlier, regarding Day of Special Concern observances that will affect their attendance. Further, students must abide by the attendance policy of their instructors as stated on their syllabi. Faculty will make reasonable accommodation for tests or field trips that a student misses as a result of observing a Day of Special Concern."

Week	Date	Topic
1.	08/19/13	Introduction to Materials Science and Engineering Interatomic Bonding and Crystal Systems Metallic Crystal Structures
2.	08/26/13	Ceramic Crystal Structures Miller Indices, Directions, Planes X-ray Diffraction
3.	09/02/13	**NO CLASS 09/02/13** Polymer Structures Imperfections in Solids
4.	09/09/13	Diffusion **Exam #1**
5.	09/16/13	Composites Elastic Deformation
6.	09/23/13	Mechanical Properties of Metals Mechanical Properties of Ceramics Mechanical Properties of Polymers
7.	09/30/13	Deformation of Metals and Ceramics Deformation of Polymers
8.	10/07/13	Strengthening of Metals Failure Mechanisms Fatigue and Creep
9.	10/14/13	**NO CLASS 10/14/13** Unary and Binary Phase Diagrams Binary Phase Diagrams
10.	10/21/13	Iron Carbide Phase Diagram Polymeric Phase Diagrams
11.	10/28/13	Phase Transformations Phase Transformations of Polymers
12.	11/04/13	Thermal Properties **Exam #3**
13.	11/11/13	Processing of Metals Processing of Ceramics Processing of Polymers
14.	11/18/13	Nanomaterials and Biomaterials
15.	11/25/13	**THANKSGIVING BREAK**
16.	12/02/13	Materials Selection and Application
17.	12/09/13	**LAST CLASS 12/09/13**
	12/17/12	**FINAL EXAM (7-9pm)**