EMAT 362 – Ceramic Materials
(Formerly M&ME 4620)
Spring 2012
M W F 12:00-12:50 NRB 126

Course Outline

Instructor: Dr. Al Meier - ELC 212
Phone: x4305, email: AMeier@mtech.edu

Texts:


Credits: 3 Credit Hours -Lecture

Prerequisite: EMAT 351 (M&ME 3510) or consent of instructor.

Goals: This course is a required course in Metallurgical and Materials Engineering. It is a survey course, and the goal of this course is to provide an overview of the basic structures, properties, processing, and applications for ceramic materials. An effort is made to relate the unique properties and processing requirements of ceramic materials to their structures and bonding.

Tentative Lecture Topics:

I. Introduction 1 lecture
II. Ceramic Structures ~8 lectures
   -Bonding
   -Common Crystal Structures
   -Silicate Structures
   -Glasses
III. Thermal and Physical Properties ~2 lectures
IV. Mechanical Properties ~6 lectures
   -Brittle Fracture
   -Toughening
   -Creep
V. Processing ~12 lectures
   -Powder Processing
   -Forming Processes
   -Sintering
VI. Defects and Diffusion ~5 lectures
VII. Electrical Properties ~2 lectures
VIII. Glass Properties and Processing ~2 lectures
IX. Processing of Ceramic and Carbon Fibers ~1 lectures

X. Microstructural Development (time permitting) ~2 lectures

- Phase Diagrams
- Microstructures

Exams I and II (Evening Exams) 3 lectures

44 lectures

Office Hours:

Tues. 11:00-12:00
Wed. 2:00-3:00
Thurs. 11:00-12:00
By Appointment

I have an open door policy. If I am in my office, feel free to stop in and ask questions about the class or any other materials questions you may have. If you would like to meet at another time, please send me an email with several available times.

Attendance: I will only take attendance for the first 2 to 3 lectures in order to verify the class lists. If you miss class, it is your responsibility to make sure that any homework assignments due for that class period are submitted, to obtain any missed notes from your classmates, and to pick up any assignments or handouts. It is also your responsibility to attend the scheduled exam times. Please see me in advance if you know that you will not be able to attend the regularly scheduled test time. Excused absences will only be granted after an absence for unusual circumstances.

Exam Schedule: The exams are tentatively scheduled for the following times:

Exam I Thu. Mar. 1: 7:00-8:30 PM
Exam II Thu. April 12: 7:00-8:30 PM
Final Exam Fri. May 11: 8:00-10:00 AM

If you have a schedule conflict with these times, it is your responsibility to see me in advance to reschedule. Exams missed without prior arrangements will be penalized 50% on the make-up exam. 3 classes will be cancelled (replaced with Thursday evening exams) with the dates TBD.

Grading: The grade will be based on the three exams along with homework problem sets. As this course has transitioned from 2 to 3 credits, the total number of homework assignments has not been determined.

<table>
<thead>
<tr>
<th>Homeworks (~7-10)</th>
<th>150 pts</th>
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<tbody>
<tr>
<td>Exam I</td>
<td>125 pts</td>
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<tr>
<td>Exam II</td>
<td>125 pts</td>
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<tr>
<td>Final Exam II (cumulative)</td>
<td>175 pts</td>
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<td>Total</td>
<td>575 pts</td>
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The grades are based starting with standard percentiles (60, 70, 80, and 90%) with a curve downward to account for more challenging homework and exam problems. I generally do not assign “+” and “-” grades. I would be glad to discuss my grading
policies with you individually. I understand that grades are important but I do not want to make them a focus of this course.

**Exams**: Exams will be closed book and closed notes. I will provide a formula sheet. You will need to bring a basic, non-programmable calculator with log, trig, exp, and power functions. If you are unsure about your calculator, have it checked in advance. I will allow extra time for any students who need it. You can also bring colored pencils and a ruler to the exam. I will provide exam outlines prior to the exam.

**Homework**: This course is a materials engineering core course. There will be considerable homework in the form of problem sets. The homework will consist of three types of questions:

1.) Basic definitions to help with reviewing the notes.
2.) Problems related to lecture.
3.) Problems beyond the scope of the lecture requiring additional thought.

Homework problems may be beyond the level expected for exams. However, the homework problems should still be helpful in preparing for the exam. Anything in the notes is also fair game for the exams.

Homework is due at the start of class (12:00). For most assignments, solutions sets will be posted in a folder outside of ELC 212. Late homework will be penalized 20% prior to posting of the solution sets and 50% after the solution sets are posted or the graded assignments are returned. Prior to the exams, practice problem sets may be assigned. The problem sets will not be collected or graded but solution sets will be posted.

You will always have at least one week to complete a homework assignment. However, there may be overlapping homework assignments. The homework sets will vary size and difficulty depending on whether a given topic lends itself to homework problems. Working with other students on the homework is highly recommended as it provides an opportunity to exchange ideas. However, each student must turn in his or her own work. All assignments should be neat with justifications for all steps and calculations for problems. If you work with a spreadsheet, sample calculations should be provided along with a page from the spreadsheet verifying the matching result. Everyone must generate their own spreadsheets and figures.

**Special Accommodations**: If you have a documented learning disability and need extra test time or other accommodations, please see me and I will make my best to accommodate your needs.

**Academic Dishonesty**: In general, academic dishonesty will not be tolerated. You will be practicing engineers in a few years. Integrity and competence are critical to your professional success. Developing bad habits in college will hinder your professional development and will weaken the prestige of your degree.