

Physical Ceramics 1

EMA 4144 Section: 1G68

Class Periods: Tuesday, Period 3 09:35-10:25 am
Thursday, Period 3-4 09:35-11:30 am

Location:

T | Period 3 Room: TUR 2303
R | Period 3 - 4 Room: CBD 0234

Academic Term: Fall 2018

Instructor:

G. Bahar Basim

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205 C PS&T Building

Office Hours: Wednesday 1:00 pm-3:00 pm [205C PS&T]

Course Description

Structure of complex ceramic compounds and glasses. Influence of structural imperfections and stoichiometry on physical characteristics, surface and interfacial phenomena, diffusion and phase transformations in ceramic systems.

Course Pre-Requisites / Co-Requisites

EMA 3050

Course Objectives

In this course the student is introduced to modern ceramic materials, their structure, properties, applications, potential uses and limitations. The specific objectives are to:

- Appreciate the factors that render ceramics unique and different from other materials
- Comprehend the bonding/property relationships in ceramics
- Understand the fundamental role of point defects and stoichiometry on the electric, dielectric, and diffusional properties of ceramics
- Gain knowledge of optical, magnetic and dielectric properties of ceramics
- Discover the critical role of flaws, surfaces and interfaces on mechanical properties

Materials and Supply Fees

N/A

Required Textbooks and Software

- Title : Ceramic Materials: Science and Engineering
- Author : C. Barry Carter and M. Grant Norton
- Publication date and edition: 2013, Springer 2nd Edition
- ISBN number : **9781461435228**

Course Schedule

Class Date	Topic	Chapters
Aug 23 (2H)	<ul style="list-style-type: none"> Syllabus Review Introduction History 	CN 1
Aug 28	<ul style="list-style-type: none"> History 	CN 2
Aug 30 (2H)	<ul style="list-style-type: none"> Background_ Atomic Structure, Thermodynamics and Kinetics 	CN 3
Sep 4	<ul style="list-style-type: none"> Bonds and Energy Bands_ Primary Forces 	CN 4
Sep 6 (2H)	<ul style="list-style-type: none"> Bonds and Energy Bands_ Secondary Forces Models Crystals, and Chemistry 	CN 4 CN 5
Sep 11	<ul style="list-style-type: none"> Binary Compounds 	CN 6
Sep 13 (2H)	<ul style="list-style-type: none"> Complex Crystal and Glass structures Case Study 1: (Effect of Crystallographic orientation on CMP) 	CN 7
Sep 18	<ul style="list-style-type: none"> Complex Crystal and Glass structures (Student Presentations) 	CN 7
Sep 20 (2H)	<ul style="list-style-type: none"> Equilibrium Phase Diagrams 	CN 8
Sep 25	<ul style="list-style-type: none"> Review 	CN 1-8
Sep 27 (2H)	• Midterm #1	CN 1-8
Oct 2	<ul style="list-style-type: none"> Furnaces 	CN 9
Oct 4 (2H)	<ul style="list-style-type: none"> Characterizing Structure, Defects and Chemistry Point Defects, Charge, and Diffusion 	CN 10 CN 11
Oct 9	<ul style="list-style-type: none"> Are Dislocations Unimportant 	CN 12
Oct 11 (2H)	<ul style="list-style-type: none"> Surfaces, Nanoparticles, and Foams 	CN 13
Oct 16	<ul style="list-style-type: none"> Case Study 2: Nucleation and growth mechanisms of thin films 	CN 13
Oct 18 (2H)	<ul style="list-style-type: none"> Interfaces in Polycrystals Review 	CN 14 CN 9-14
Oct 23	<ul style="list-style-type: none"> Class Project Study 	
Oct 25 (2H)	• Midterm #2	CN 10-14
Oct 30	<ul style="list-style-type: none"> Phase Boundaries, Particles, and Pores 	CN 15
Nov 1 (2H)	<ul style="list-style-type: none"> Phase Boundaries, Particles, and Pores Laboratory practice on particles 	CN 15
Nov 6	<ul style="list-style-type: none"> Mechanical Testing 	CN 16
Nov 8 (2H)	<ul style="list-style-type: none"> Laboratory practice on mechanical testing Plasticity 	
Nov 13	<ul style="list-style-type: none"> Plasticity Fracture 	
Nov 15 (2H)	<ul style="list-style-type: none"> Fracture Case Study 3 (Mechanical testing) 	
Nov 20	<ul style="list-style-type: none"> Case Study 4 (Plasticity) Case Study 5 (Fracture) 	
Nov 22 (2H)	No Class - Thanksgiving	
Nov 27	Review Session	CN 1-18
Nov 29 (2H)	Midterm #3	CN 15-18
Dec 4	Class Project Presentation	

Course Website

The course website is on the Canvas system <http://elearning.ufl.edu/>, where you can find the syllabus, lecture notes, homework problems, announcements, and your grades. Please check it frequently.

Behavior in class

- No behavior that can distract the other students in class will be allowed.
- Jean-Jacques Rousseau Principle “Ones freedom ends where the others freedom starts.”
- Destructive behavior will result in your dismissal from the class.

Reports

Reports will be assigned on the covered chapters and the assignments will be posted to Canvas with the due dates. Reports are needed for the follow up class discussions. **Late reports will be graded by 20% reduction in the assigned total and will only be accepted if submitted to the next class after the assignment is due.**

Presentations

There will be two presentation assignments on the selected subjects as detailed in the class schedule.

Class Project

There will be group project assignment which will be completed throughout the semester and presented at the end of the year.

In Class Exercises (ICE)

There will be multiple “in class” exercises during the class hours. Students will be allowed to work in small groups or will be asked to work individually depending on the type of given assignment. ICE will either be graded or assigned as bonus point as an indicator of class participation.

Bonus points

There may be some bonus point activities that will be assigned during the class hours.

Attendance

Attendance is not required but highly encouraged since there will be In Class Exercises (ICE) and pop-quizzes. Students are encouraged to ask questions and participate. The fundamental concepts will be repeated as required based on the ICE discussions as well as quiz averages as needed.

There is no make-up for the pop-quizzes and the In-Class Exercises. If you miss a quiz or a graded ICE, you will get “0”. However, 2 lowest quiz grades and 2 lowest ICE (among the graded ones) grades will not be accounted for your final grade.

Exams

There will be 3 Midterm exams throughout the semester. The exam content may change, and the dates are tentative and will be finalized after the add/drop period. Each exam is weighted equally, and each exam will be worth 20% of your final grade. Review sessions will be given prior to each exam. The tentative exam dates are as follows;

Midterm Exam 1 : Thursday, September 27, 2018
Midterm Exam 2 : Thursday, October 25, 2018
Midterm Exam 3 : Thursday, November 29, 2018

Final Exam : *There will be no final exam scheduled.*

You have two weeks after the Midterm results are posted to resolve any questions about scores and grades. No changes to your exam grade will be made after that time.

Midterm Exam Rules

- All cell phones must be turned off and they cannot be used in place of a calculator.
- 1 letter size paper can be used as a cheat sheet for the exams that only contains the formula relevant to the chapters included in the exam.
- You are responsible to know all the functions of your calculators
- Show all your work as needed
- Any suspicious activity during exam will result in marking of your exam paper to be evaluated accordingly.

Exam Conflicts with other course exams

The official UF policy on exam conflict resolution states that when two exams conflict, the course with the higher number will take priority. There will be no exceptions to this rule.

Make-up exams

Make up exams will be provided only with the **prior approval of the instructor.**

Excused absences must be consistent with university policies in the Graduate Catalog (<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#attendance>) and require appropriate documentation. Additional information can be found here: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

In general, acceptable reasons for excused absence from an exam include illness, serious family emergencies, special curricular requirements, military obligation, court-imposed legal obligations, and religious holidays. In all cases, you will be required to provide written documentation, and obtain prior instructor approval. You will not be excused from any exam without following the policy above, with no exceptions. Students not in attendance for the scheduled exam will receive a score of zero. **You must notify the instructor no less than 1 week of the scheduled exam of your intent and justification for missing the exam.** Make-up exams for excused absences as well as exam conflicts must occur within 1 week of the missed exam and may occur before the missed exam.

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Reports/ICE (10)	100 each	20%
Presentations (2)	10 each	10%
Project (1)	100 each	10%
Midterm Exam 1	100	20%
Midterm Exam 2	100	20%
Midterm Exam 3	100	20%
		100%

Grading Policy

Percent	Grade	Grade Points
90.0 - 100.0	A	4.00
87.0 - 89.9	A-	3.67
84.0 - 86.9	B+	3.33
81.0 - 83.9	B	3.00
78.0 - 80.9	B-	2.67
75.0 - 79.9	C+	2.33
72.0 - 74.9	C	2.00
69.0 - 71.9	C-	1.67
66.0 - 68.9	D+	1.33
63.0 - 65.9	D	1.00
60.0 - 62.9	D-	0.67
0 - 59.9	E	0.00

A "C-" will not be a qualifying grade for critical tracking courses. In order to graduate, students must have an overall GPA and an upper-division GPA of 2.0 or better (C or better). Note: A C- average is equivalent to a GPA of 1.67, and therefore, it does not satisfy this graduation requirement.

More information on UF grading policy may be found at:

<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades>

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

Syllabus Changes

I reserve the right to make changes in the syllabus as needed. Any changes will be clearly announced on canvas and in class.

Students Requiring Accommodations

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc>) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Course Evaluation

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu/evals>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/>.

University Honesty Policy

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (<https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Software Use

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual

violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <http://registrar.ufl.edu/catalog0910/policies/regulationferpa.html>

Campus Resources:

Health and Wellness

U Matter, We Care:

If you or a friend is in distress, please contact umatter@ufl.edu or 352 392-1575 so that a team member can reach out to the student.

Counseling and Wellness Center: <http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Assault Recovery Services (SARS)

Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu.
<https://lss.at.ufl.edu/help.shtml>.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/>.

Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.
<https://teachingcenter.ufl.edu/>.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers.
<https://writing.ufl.edu/writing-studio/>.

Student Complaints Campus: https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf.

On-Line Students Complaints: <http://www.distance.ufl.edu/student-complaint-process>.