

Standardized Syllabus for the College of Engineering

EMA 4145  
Section 0958

Physical Ceramics 2

Spring 2018

1. Course Description: This course covers the main physical properties of ceramic compounds including electrical, dielectric, optical, magnetic, and thermal properties. Biomedical and energy applications, as well as sustainability considerations of ceramic materials will also be covered. (3 Credit Hours)
2. Course Objectives: Provide a broad overview of the properties of materials with particular emphasis ceramic compounds. Relate these properties to the physical, chemical, and structural aspects of ceramics introduced in Physical Ceramics 1.
3. Prerequisites: Students are expected to be EXCEPTIONALLY-versed in the concepts laid out in EMA3010, EMA3050, EMA3066, and EMA4144.
4. Contribution of course to meeting the professional component: This course provides 3 credits towards engineering topics.
5. Relation to MSE Program Outcomes:

Outcome	Coverage*
a. Ability to apply knowledge of mathematics, science, and engineering to materials systems. Demonstrated through homework problems and exams.	High
b1 Ability to conduct experiments, analyze and interpret data.	
b2 Ability to conduct and analyze design of experiments (DOE).	
c Ability to apply and integrate knowledge of structure, properties, processing, and performance to solve materials selection and design problems within realistic constraints.	
d Ability to function on multi-disciplinary teams. Demonstrated through in-class exercises and course projects.	Low
e Ability to identify, formulate, and solve engineering problems. Demonstrated through homework problems and exams.	High
f Understanding of professional and ethical responsibility.	
g Ability to communicate effectively in both oral and written form. Demonstrated through in-class participation and project presentations.	Low
h1 Understanding of the economic impact of engineering solutions.	
h2 Understanding of the global, societal, and environmental impact of engineering solutions.	
i Ability to engage in lifelong learning. Demonstrated through assigned homework on material not covered in class or textbook.	Medium
j Knowledge of contemporary issues. Demonstrated through homework on recent materials related news.	Medium
k Ability to use the techniques, skills, and tools needed for practice as a materials engineer. Demonstrated through in-class exercises, homework problems, and exams.	Medium

\* Coverage is given as high, medium, or low. An empty box indicates that this outcome is not a part of the course.

6. Instructor: **Dr. Juan C. Nino**
  - a. Office location: **166 Rhines Hall**
  - b. Telephone: **(352) 846 3787**
  - c. E-mail address: **jnino@mse.ufl.edu**
  - d. Office hours: **Open door policy; M 9:30 – 11:00 am; by appointment; or by e-mail.**
7. Meeting Times: **T Period 3, 9:35 – 10:25 am**  
**R Periods 3 & 4, 9:35 – 11:30 am**
8. Meeting Location: **WEIL 279**
9. Textbook Required
  - e. Title: **Ceramic Materials: Science and Engineering**
  - f. Author: **C. Barry Carter and M. Grant Norton**
  - g. Publication date and edition: **2013 Second Edition (Springer)**
  - h. ISBN: **978-1-4614-3522-8**
10. On the Web: This course will use CANVAS extensively as a communication and archival tool. The students can access all relevant course information (course notes, homework, problem sets, solutions, announcements, grades, etc.) via the CANVAS entry link: <http://elearning.ufl.edu/>

11. Conduct, Attendance and Expectations: Proper behavior in class is always important and leads to a relaxed and productive educational environment. Thus, **eating, drinking, texting, news reading, social media use, working on homework for this or other courses, or other activities that are not part of the class are not allowed. Students who do not comply with these requirements or who behave disorderly or disrespectfully WILL be asked to leave the classroom. Leaving your cell phone on, leaving early or arriving late** can be VERY distracting, you should avoid it. **All electronic devices (laptops, cell-phones, etc.) should be turned off or in silent mode.** If your cell phone rings during class it will be confiscated for the remainder of the class period. The use of smartphones, laptops, tablets or similar personal computers is not allowed unless specific in-class activities requires them, and when explicitly indicated by the instructor. Exceptions may be granted if explicitly requested by the individual student the first day of class and for note taking purposes only. No audio/video recording is allowed.
12. How to Ensure a Response to Your E-mail: ONLY e-mail me at [jnino@mse.ufl.edu](mailto:jnino@mse.ufl.edu). DO NOT USE CANVAS MAIL. Furthermore, because of the volume of e-mails I receive, you always need to identify yourself and the course. **In the subject line you should always include the course number (EMA4145).** Please begin your e-mail with a salutation. [I know that personal e-mails and texts are often sent without even a name to address the recipient at the opening of the communication, but professionally that is unacceptable]. Close your e-mails by typing your name. Check your e-mail for grammar and spelling. Be concise. If I have to sift through what you have written, my response time drops significantly. All of these guidelines are to promote professionalism. If you need help with writing, please visit UF's The Writing Studio.
13. Grading: Attendance is **strongly** suggested since significant amount of participative as well as individual and collaborative work will be performed during the class sessions and will be worth as much as 10% of the course. The course grade is based on numerical scores that include homework, group problems, exams, and participation with a cumulative final according to the following weighting system:

<b>Participation</b>	<b>10 %</b>
<b>Homework</b>	<b>10 %</b>
<b>Exam 1</b>	<b>20 %</b>
<b>Exam 2</b>	<b>20 %</b>
<b>Exam 3</b>	<b>20 %</b>
<b>Exam 4</b>	<b>20 %</b>

Exams are “open book”; this means that you can consult the course textbook. During the exam you are not allowed to communicate with other human beings (besides the instructor), as this will be considered cheating and will be result in disciplinary action. **There will be no make-up exams given the advanced exam scheduling.** Exceptions will be made only due to verified personal emergency supported by written documentation. **There will be no final exam.** Homework is to be uploaded on Canvas. Turnitin tool will be used where appropriate.

14. Grading Scale: The final grade of the course will be calculated based on the percentage of maximum course score as follows:

Percentage	≥92	≥88	≥84	≥80	≥76	≥72	≥68	≥65	≥62	≥59	≥56	<56
Letter Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E
Grade Points	4.0	3.67	3.33	3.0	2.67	2.33	2.0	1.67	1.33	1.0	0.67	0

In the event that the class average is below 70%, the distribution will be shifted so that the average equals 70%. 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. For more information on grades and grading policies, please visit:

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

15. Course Outline: Below is the tentative schedule of topics, book chapters, exams, and homework.

Date	Topic	Reading Assignments
Jan		C & N
	<b>Introduction and Review of Conceptual Prerequisites</b>	
9	Course Description, Objectives and Methodology, Prerequisites Review	
11	EMA 4144 Review	
	<b>Defect Equilibria</b>	<b>Ch 11</b>
16,18	Point Defects, Defect Reactions, Defect Equilibria, Brouwer Diagrams	
23	Exercises and Applications	
	<b>Electrical Conductivity</b>	<b>Ch30</b>
25	Generalized Equations - From Defects to Conductivity	
30	Ionic Conductivity, Semiconductors, Superconductors*	
Feb		
1	Exercises and Applications*	
6	<b>Exam 1 in Class*</b>	
	<b>Dielectric Ceramics</b>	<b>Ch 31</b>
8	Macro- and Microscopic Behavior, Polarization Mechanisms	
13	Dielectric Spectrum, Non-linear Dielectrics	
15	Exercises and Applications	
	<b>Optical Ceramics</b>	<b>Ch 32</b>
20	Refraction, Reflection, Transmission, Scattering	
22	Color, Gems	<b>Ch 36</b>
27	Exercises and Applications	
Mar		
1	<b>Exam 2 in Class</b>	
	<b>Magnetic Ceramics</b>	<b>Ch 33</b>
13	Magnetic Dipoles, Fundamental Equations	
15	Exercises and Applications	
	<b>Thermal Properties in Ceramics</b>	<b>Ch 34</b>
20	Heat Capacity, Thermal Conductivity, Thermal Expansion	
22	Exercises and Applications	
27	<b>Exam 3 in Class</b>	
	<b>Bioceramics</b>	
29	Bioceramics and Bioinspired ceramics	<b>Ch35</b>
Apr	<b>Ceramics in Energy Applications</b>	
3	Nuclear Fuels, Waste Forms, PV Cells	<b>Ch 37</b>
5	SOFCs, Batteries, Hydrogen Production, Energy Harvesting	
	<b>Sustainability Considerations</b>	<b>Ch 38</b>
10	Critical Materials, Life-Cycle Assessments, Embodied Energy	
12	Exercises and Applications	
	<b>Special Topics (AI, ML)</b>	<b>Handouts</b>
17	Ceramics in Artificial Intelligence and Machine Learning	
19	Exercises and Applications	
24	<b>Exam 4 in Class</b>	

16. Requirements for class attendance and make-up exams, assignments, and other work are consistent with university policies that can be found at:

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

Homework is due online in e-learning, no late homework will be accepted. If you have trouble with on time submission on e-learning you need to get a trouble ticket from the UF help desk before the deadline and also send an email alerting the instructor about the problem before the deadline. Late submissions without trouble ticket and email alert will not be considered.

17. Honesty Policy – All students admitted to the University of Florida have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a UF student and to be honest in all work submitted and exams taken in this course and all others. Note that failure to comply with this commitment will result in disciplinary action compliant with the UF Student Honor Code Procedures.  
See <https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>
18. Accommodation for Students with Disabilities – Students Requesting classroom accommodation must first register with the Dean of Students Office. That office will provide the student with documentation that he/she must provide to the course instructor when requesting accommodation.
19. UF Counseling Services –Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:
  - a. UF Counseling & Wellness Center, 3190 Radio Rd, 392-1575, psychological and psychiatric services.
  - b. Career Resource Center, Reitz Union, 392-1601, career and job search services.
20. Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu) so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.
21. 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.
22. Record keeping – All materials from this class that students did not pick up (graded exams, etc.) within 1 year of the end of class will be shredded on or after May 15, 2019.
23. 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.