Standardized Syllabus for the College of Engineering

EMA 6445 Electroceramics Spring 2015
(Section 041E and 0414)

1. Course Description: The basic crystallographic, physical, chemical and mathematical principles of ceramic conductors, dielectrics and ferroelectrics and their applications are discussed. Emphasis is placed on structure-processing-microstructure property relationships. (3 Credit Hours).

2. Course Objectives: At the end of the course the students should be familiar with the important fundamental material science and engineering concepts in electroceramics and will be able to apply these concepts when addressing and analyzing general and critical problems in materials science and engineering. In addition, the student should be able to discuss the physical, chemical and mathematical principles governing the observed property behavior of electroceramic compounds. Ultimately, based on the analysis of their own experimental data (from the student's current research project), the student should be able to postulate structure-property relationships and utilize them as the basis for tailoring and improving the performance of electroceramic materials.

3. Instructor: **Dr. Juan C. Nino**
   a. Office location: **172 Rhines Hall**
   b. Telephone: **(352) 846 3787**
   c. E-mail address: **jnino@mse.ufl.edu**
   d. Office hours: **Open door policy; T 10:30-11:30 am; via e-mail or by appointment**

4. Meeting Times: **M 9:35 – 10:25 am, W 9:35 – 10:25 am**

5. Meeting Location: **CSE E112**

6. Textbooks:

   Required

a. Title:	**ELECTROCERAMICS**
b. Author:	**A.J. Moulson & J.M. Herbert**
c. Publication date and edition:	**2003 Second Edition (Wiley)**
d. ISBN:	**978-0-471-49748-6**

   Recommended

a. Title:	**FUNDAMENTALS OF CERAMICS**
b. Author:	**M.W. Barsoum**
c. Publication date and edition:	**2003 Second Edition (IoP)**
d. **ISBN:**	**0-7503-0902-4**

7. **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: https://lss.at.ufl.edu/

8. Conduct, Attendance and Expectations: Attendance is **strongly** recommended as the actual emphasis given to each of the topics and course flow will be heavily influenced by the students attending class. Proper behavior in class is always important and leads to a relaxed and productive educational environment. Thus, **eating**, **drinking**, **texting**, **reading of newspapers 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 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. Use of smartphones, laptops, tablets or similar personal computers is not allowed unless explicitly requested by the individual student the first day of class and for note taking purposes only.

9. How to Ensure a Response to Your E-mail: ONLY e-mail me at 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 (EMA6445) and your first and last name**. 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.

10. Course Outline: Below is the tentative schedule of topics to cover.

Date	Topic
Jan	
	Introduction and Review of Conceptual Prerrequisites
7	Course Description, Objectives and Methodology
	AMP1 Review (Crystallography, Density, Ceramic Structures…)
	Defect Equilibria
14	Defect Reactions, Defect Equilibria, Brouwer Diagrams
21	Exercises and Applications
26	**Exam 1-1 (10%)**
28	**Exam 1-2 (15%)**
Feb	**Electrical Conductivity**
2	Generalized Equations
4	Ionic Conductivity
9	Exercises and Applications
11	**Dissertation Review Exercise (10%)**
16	Electronic Conductivity, Intrinsic Semiconductors
18	Extrinsic Semiconductors, Non-stoichiometric Semiconductors
23	Exercises and Applications
25	**Exam 2 (15%)**
Mar	**Dielectric Ceramics**
9	Macro- and Microscopic Behavior, Polarization Mechanisms
11	Electronic Polarization, Ionic Polarization
16	Dipolar Polarization, Dielectric Spectrum
18	**Dissertation Review Exercise (10%)**
23	Impedance Spectroscopy
25	Universal Dielectric Response and Related Analyses
30	**Exam 3 (15%)**
Apr	**Ferroelectrics and Piezoelectrics**
1	Ferroelectric Phenomena, Crystallographic Considerations
6	Ferroelectric Domains and Hysteresis
8	Piezoelectric Ceramics
13	Lead-Free Piezoelectrics (BT, PZT, KNN, etc.)
15	**Dissertation Review Exercise (10%)**
20	Review of Best Practices in Published Research
22	**Exam 4 (15%)**

11. Grading: **Exams.** There will be four exams presented in class totaling 70% of the course grade (see the breakdown on the schedule above). The other 30% comes from at home and in-class dissertation review exercises. The exams are "open book"; this means that you can consult the course notes and you can consult other sources you deem appropriate (books, internet, etc.). However, as part of your consultation process 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 final exam.**

12. Grading of Exams: Each exam will normally consist of a number of problems with a numerical/symbolic answer. Each problem will be graded according to the following criteria when applicable (**examples will be given in class to further clarify the grading criteria**):
    a. Interpretation of problem situation and utilization of appropriate concept(s) and strategy towards solution (total 10%): Short statement describing the situation and indicating what you plan to do so solve the problem.
    b. Concept translation into equation(s) and mathematical or symbolic manipulation (total 20%): Writing the appropriate equation(s) to be used and algebraically solve for the variable(s) in question.
    c. Variable/constant value replacement and usage within equation(s) (total 30%): Manipulation of the variables and constants for direct replacement in equations and the replacement itself.
    d. Numerical/symbolic answer (total 30%): Calculation of the final answer including the appropriate units and/or symbols in the correct notation.
    e. Final comment (total 10%): Comment on the validity and/or meaning of the answer obtained.

    Details of the format and grading of the Review Exercises will be given in class.

13. 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 72%, the distribution will be shifted so that the average equals 72%. In order to graduate, graduate students must have an overall GPA and an upper-division GPA of 3.0 or better (B or better). Note: a B- average is equivalent to a GPA of 2.67, and thus, it does not satisfy this graduation requirement. For more information on grading policies, please visit: http://gradschool.ufl.edu/catalog/current-catalog/catalog-general-regulations.html#grades.

14. Make-up Exam Policy: No make-up of the exam will be given. Students who do not attend the exam session at the scheduled time will receive a score of zero points in that exam. Exceptions will be made only in extraordinary circumstances (verified personal emergency, conflict with **previously** scheduled activities, etc.). In such cases an additional exam will be scheduled during the finals week. This exam will be comprehensive and will replace the grade of the missed exam.

15. Honesty Policy – All students admitted to UF 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.

16. 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.

17. UF Counseling Services – Resources are available on-campus for students having personal problems or lacking clear career or academic goals. The resources include:
    - University Counseling Center, 301 Peabody Hall, 392-1575, Personal and Career Counseling.
    - SHCC mental Health, Student Health Care Center, 392-1171, Personal and Counseling Center for Sexual Assault/Abuse Recovery and Education (CARE), Student Health Care Center, 392-1161, sexual assault counseling.
    - Career Resource Center, Reitz Union, 392-1601, career development assistance and counseling.

18. Software Use – All faculty, staff and student 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.