

EMA4041L Ceramics Processing Laboratory 1

Fall 2017

Standardized Syllabus for the College of Engineering

1. Catalog Description Forming, drying, firing and testing of traditional ceramics.
2. Pre-requisites and Co-requisites: Prereq: EMA 3050
3. Course Objectives - Course Objectives - At the end of this course students will be able to understand and apply the basic principles of ceramic processing, including characterization techniques, colloid and surface science, sol-gel techniques, particle mechanics, ceramic forming and sintering.
4. Contribution of course to meeting the professional component. This is a 1 credit course. It provided 1 credit towards engineering sciences.
5. Relationship of course to program outcomes: This course addresses the following MSE Program outcomes (note: Numbers refer to the list of MSE Program outcomes):
 1. Apply knowledge of mathematics, science and engineering principles to materials science and engineering.
 2. Design and conduct materials science and engineering experiments and analyze and interpret the data.
 3. Design a materials science and engineering system, component or process to meet desired needs within realistic economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability constraints.
 4. Communicate technical data and design information effectively in speech and in writing to other materials engineers.

ABET

- (b) an ability to design and conduct experiments, as well as to analyze and interpret data
- (c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- (d) an ability to function on multidisciplinary teams
- (g) an ability to communicate effectively

6. Instructor: Dr. Nancy Ruzycki

- a. Office location: RHN 135
- b. Telephone: 352.846.2991
- c. E-mail address: nruzycki@mse.ufl.edu
- d. Office hours: Monday 5th , or by appointment

7. Teaching Assistant: TBD

8. Meeting Times: TBD

9. Class/laboratory schedule: laboratory once a week for two hours.

10. Meeting Location: **Labs** – Rhines 115/141 Tuesday 5th and 6th period 11:45 – 1:40 PM.

11. Materials and Supply Fees: \$50.00

12. Textbooks and Software Required: none required, recommended: MATLAB, CrystalMaker

13. Recommended Reading:

Title – Ceramic Processing, by M.N. Rahaman, CRC, Taylor and Francis, 2007. ISBN 0-8493-7285-2
Title - CERAMIC MATERIALS by C.B. Carter & M.G. Norton, 2013 Second Edition (Springer), ISBN number 978-1-4614-3522-8

14. Course Outline - Below is the tentative schedule of topics, activities, reading assignments, exams, and homework. See Sakai for Chapter and Unit Objectives, Learning Outcomes, assignments, and rubrics. This outline is subject to change.

There may be changes/substitutions to the laboratories listed below, depending upon available equipment, and student progress.

Students are expected to dress properly for laboratory class. Closed toed shoes are required for class. Pants are preferred. There is no food or drink of any kind in the laboratory. Students are required to complete four modules in addition to the safety module. Each module has skills criteria that have to be met for successful completion of the module.

Module	Topic	Content/Outcomes
Safety	Hazards Assessment	Hazards assessment, SOPs, experimental outlines
Glass Processing	Borate Glasses Alkali Borate Glass Bioglass	Glass structure Glass melts Glass pouring Glass quenching Raman XRD
Sol Gel	LNO TiO ₂ BioGlass BaTiO ₃	Sol-Gel basics Sol-gel processing Controlling structure during sol-gel Controlling particle size during sol-gel SEM XRD
Solid State Sintering and Microstructure	BaTiO ₃ MgTiO ₃ -CaTiO ₃ BiFeO ₃	Basics of Solid State Sintering Process of pressing and green pellets Controlling grain size and porosity during sintering
Solution Processing	LNO Soft Solution Processing	Basics of solution processing Novel method of soft solution processing Spin Coating RTA XRD

		SEM
Co-precipitation	BaTiO ₃ Fe ₃ O ₄	Basics of Co-Precipitation Methods of co-precipitation Controlling for particle size XRD SEM
Advanced ceramic processing	Electrospinning 3D printing Ceramic Foams	Basics of Electrospinning 3D printing and ceramics Ceramic Foams and structures

15. **Writing Requirement.** Each Topic listed above may have a student product which will be graded as a formal assessment. There will be a rubric for each product. Student products may include, but are not limited to; lab reports, Hazard Assessments, SOPs, posters, abstracts, research proposals, users manuals, program codes, technical letters, oral presentations.

Resources for Writing include:

Recommended Writing Manual: Alley, Michael "The Craft of Scientific Writing", 3rd Edition, Springer ISBN-10 0387947663

University's Writing Studio (www.writing.ufl.edu)

Recommended style manual is: IEEE Editorial Style Manual.

http://www.ieee.org/conferences_events/conferences/publishing/style_references_manual.pdf

16. Attendance and Expectations - Attendance is **strongly** suggested since significant amount of participation, as well as individual and collaborative work will be performed during the class sessions and will be worth as much as 20% of the course points. **Students are expected to comply with all laboratory guidelines, protocols, and procedures. Students who do not comply with these requirements or who behave disorderly or disrespectfully WILL be asked to leave. 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 cellphone 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. No audio/video recording is allowed without express permission of lecturer.

17. Grading: Students will be graded according to the following:

Student Daily notebooks	15%
Student Hazards assessments, experimental outlines, SOPS	50%
Student Skills criteria and outcomes for each module	25%
Student characterization and analysis of products/results from modules	10%

18. Grading Scale - Grades will not be curved and there is no extra credit.

Grade Earned percentiles total:

A 93; A- 88; B+ 84; B 80; B- 76; C+ 72; C 68; C- 65; D+ 62; D 59; D- 56; E 50

“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. For more information on grades and grading policies, please visit:

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

19. Make-up Exam Policy – Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found in the online catalog at: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>.

20. 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.

21. 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.

22. UF Counseling Services –Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:

- UF Counseling & Wellness Center, 3190 Radio Rd, 392-1575, psychological and psychiatric services.
- Career Resource Center, Reitz Union, 392-1601, career and job search services.

23. 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 higher standard.

24. Students are expected to provide feedback on the quality of instruction in this course based on 10 criteria. These evaluations are conducted online at <https://evaluations.ufl.edu>. 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>.

25. Diversity and Inclusion: This course supports diversity and inclusion for all students .Effective engineering practice relies on the ability to recognize and embrace diversity in all its forms, including viewpoints.