

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.

Professional Component	# of credits
Math and science.	
Engineering.	1
General education.	
Other.	
Does it contain design (Y or N)?	

5. Relationship of course to program outcomes

Outcome	Assessed?	Assessment Method
a: Apply knowledge of math, science, and engineering.	Y	
b1: Conduct experiments, analyze and interpret data.	Y	
b2: Conduct statistical analysis.	Y	
c: Solve materials selection and design problems.		
d: Function on teams.	Y	
e: Identify, formulate, and solve engineering problems.	Y	
f: Understand professional and ethical responsibility.	Y	
g: Communicate effectively.	Y	
h1: Understand economic impact.	Y	
h2: Understand global, societal, and environmental impact.	Y	
i: Engage in lifelong learning.	Y	
j: Knowledge of contemporary issues.	Y	
k: Use techniques, skills, and tools of MSE.	Y	

6. Instructor – Dr. Nancy Ruzycki

a. Office location – 150 Rhines Hall

b. Telephone – (352) 846-2991

c. E-mail address – nruzycki@mse.ufl.edu

d. Class Web site (see Sakai)

e. Office hours – Wednesdays 4-5th periods (or by appointment)

7. Teaching Assistant – none

8. Meeting Times – Thursday 2-4th

9. Class/laboratory schedule – Class meets in lab one period weekly for three hours

10. Meeting Location – Rhines 115, Rhines 141 (Class starts in Rhines 115)

11. Material and Supply Fees – See ISIS

12. Textbooks and Software Recommended

a. Title – Ceramic Processing, by M.N. Rahaman, CRC, Taylor and Francis, 2007. ISBN 0-8493-7285-2

b. This course will use Sakai extensively as a communication and archival tool. The students can access all relevant course information (course notes, homework and exam solutions, announcements, grades, etc.) via the Sakai entry link: <https://lss.at.ufl.edu/>.

13. Recommended Reading (see 12 above)

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.

Each Topic will 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, posters, abstracts, research proposals, users manuals, program codes, technical letters, oral presentations.

15. Attendance and Expectations - 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 greater than 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 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. No audio/video recording is allowed with express permission of lecturer.

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.

Lab lessons for Fall 2014

Lesson number	Lab(s)	Content/concepts	Skills/techniques	Student product
1	Background reading, Experimental design, Safety and MSDS for ceramic Project	Preparation of oxidizing precursor material	Experimental design, risk assessment, preparation of Gantt charts	* Gantt Chart *Experimental outline
2	Synthesis of oxide and non-oxide Powders (2 – 3 weeks) Student independent experiment	Synthesis of Powders (Chapter 2, p. 37-91) Terminology; desirable powder characteristics; preparation techniques by mechanical and chemical methods; oxide and non-oxide powders.	SEM, sample prep, high temp furnace, XRD	* Student notebook * Student weekly report * Student ceramic product
3	Characterization of ceramic powders (2 weeks and ongoing) Student independent experiment	Powder Characterization (Chapter 3, p. 97-138) Physical characterization; chemical and phase composition; surface characterization.	SEM, sample prep, high temp furnace, XRD, grain size determination	* Student notebook * Student weekly report * Student ceramic product
4	Colloidal Processing – making a ceramic foam (2 -3 Weeks) Student independent experiment	Science of Colloidal Processing (Chapter 4, pages 141-189) Particle mechanics and particle rheology.	Particle rheology	* Student notebook * Student weekly report * Student ceramic product
5	Sol-gel processing – Modified oxide sol-gel (MOSG) synthesis of borophosphosilicate glasses and glass-ceramics Student independent experiment	Sol-Gel Processing (Chapter 5, pages 193-249) Acid/base catalysis; controlled drying agents; powders; fibers; monoliths, aerogels.	Sol-gel processing, dielectric measurements using LCR meter	* Student notebook * Student weekly report * Student ceramic product

6	Packing and making toroid and cylindrical pellets Student independent experiment	Mixing and Packing of Powders (Chapter 6, pages 253-276) Beneficiation and processing additives, comminution, batching, mixing, and granulation.	Die press, designing and making pellet die, SolidWorks	* Student notebook * Student weekly report * Student ceramic product
7	Forming – Slip, and tape casting of ceramics Student independent experiment	Forming of Ceramics (Chapter 7, pages 279-333) Powder consolidation and forming of ceramics, colloidal forming methods: drained techniques, direct casting and solid freeform fabrication. Pressing, extrusion, injection molding.	extrusion, slip casting, pressing, tape casting and injection molding,	* Student notebook * Student weekly report * Student ceramic product
8	Packing and making toroid and cylindrical pellets	Drying, Debinding and Microstructural Characterization of Green Bodies (Chapter 8, pages 337-362)	SEM, sample prep, high temp furnace, XRD	* Student notebook * Student weekly report * Student ceramic product
9	Student independent experiment	Sintering and Microstructure Development (Chapter 9, p. 365-446) Classification of sintering; importance of sintering; sintering property relationship; driving forces for sintering; diffusion; defects and defect chemistry. Mechanisms of sintering; models and sintering equations; densification; grain growth. Effects of heterogeneities; anisotropic densification; sintering; liquid-phase sintering; hot pressing; hot isostatic pressing.	SEM, sample prep, high temp furnace, XRD, modeling of ceramic sintering using equations, hot isostatic pressing, dielectric measurements	* Student notebook * Student weekly report * Student ceramic product
10	n/a	Societal needs, impacts from global community on ceramic markets. Job market, outlook on ceramics in the future.	Professional competencies	Student final report

Students will be graded according to the following:

Student daily notebook	45% of final grade
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Student products	45% of final grade
Student informal and formal assessments (pre-labs, in class quizzes, surveys, exit tickets, quick writes, etc...)	10% of final grade

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

Grade	Earned percentiles total
A	92
A-	88
B+	84
B	80
B-	76
C+	72
C	68
C-	65
D+	62
D	59
D-	56
E	50

This statement must be included in every grade scale for undergraduate level 1000-5000 syllabi:

“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>

18. Make-up Exam Policy – Make up exams will be provided only with the **prior approval of the instructor in accordance with university policies**. In general, acceptable reasons for excused absence 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. To be clear, Make-up exams will only be allowed in exceptional cases, with prior instructor approval, sufficient documentation, and in accordance of university policies. 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.

19. 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.

20. 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.

21. 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.

22. 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.