

EMA 5646/4990 CERAMIC PROCESSING (online)
2022 Fall (TENTATIVE)

Basic Information

Instructor: Dr. Zhe Cheng Phone: 305-348-1973 Email: zhcheng@fiu.edu
Office: MMC VH150B Office Hours: **Thur 10-11:30 & 20-21:30 on ZOOM**
Class Hours: N/A - fully online
Prerequisite: N/A

Course Description

Introduction to the science and engineering of ceramic processing, with emphasis on theoretical fundamentals and current state-of-the-art processing.

Course Objective

The main objective of EMA5646 Ceramic Processing is to introduce principles and engineering practices of conventional as well as new, unconventional processing techniques for ceramics, especially advanced technical ceramics and glass materials.

Learning Outcomes

Through this course, students will be able to understand the state-of-the-art knowledge about processing of ceramic materials. In particular, students will be able to understand the principles behind the processing/characterization techniques and the impacts of processing variables on the microstructure and the resulting properties of ceramic materials.

Contents Covered

- Powder synthesis
- Post synthesis processing and characterization of ceramic powders
- Green body formation and characterization including additives
- Thermal processing of ceramics
- Post firing processing of ceramics (if time allows)
- Processing of glass (if time allows)

Textbook & Other Course Materials

- Textbook: **Ceramic Processing and Sintering**, M. N. Rahaman, CRC Press (2003), ISBN 0-8247-0988-8
- Principles of Ceramic Processing, James S. Reed, 2nd edition, Wiley (1995), ISBN 0-471-59721-X.
- Class notes

Grading for *EMA5646*

- Quiz (20%)
- Homework (30%)
- Mini research proposal (50%)
- Final grades: A: >=90; A-: 87-89.9; B+: 84-86.9; B: 80-83.9; B-: 77-79.9; C+: 74-76.9; C: 70-73.9; C-: <67-69.9; D: 60-66.9; F: <60

Grading for EMA4990

- Quiz (20%)
- Homework (30%)
- Mini term paper (20%)
- Final project (30%)
- Final grades: A: ≥ 90 ; A-: 87-89.9; B+: 84-86.9; B: 80-83.9; B-: 77-79.9; C+: 74-76.9; C: 70-73.9; C-: $< 67-69.9$; D: 60-66.9; F: < 60

Course Policy

- Students can discuss homework problems, but must independently finish it
- Grade discrepancies – resolve in the same day
- Homework will be collected
- Accommodate “make-up” quiz, tests, or delayed term paper if proven medical necessity
- Accommodate disability (<http://drc.fiu.edu/>) and religious holidays
- NO cheating or plagiarizing in ANY form (Check with me if questions)
 - No excuses will be accepted
 - Will be reported and handled according to FIU policy

Topics and TENTATIVE Schedule

1. Introduction (week 1)
2. Powder synthesis and processing (week 2-3)
3. Ceramic (powder) characterization (week 4-6)
4. Additives in ceramic processing (week 7)
5. Colloidal processing fundamentals (week 8-10)
6. Other green body formation technology (week 11-12)
7. Heat treatment for ceramics (week 13-14)
8. Post firing processing and other ceramic/glass processing (if time allows)

Related MME Program Outcomes

- (a) Ability to apply knowledge of mathematics, science, and engineering
- (e) Ability to identify, formulate, and solve engineering problems
- (g) Ability to communicate effectively
- (i) Recognition of the need for, and an ability to engage in life-long learning
- (k) Ability to use the techniques, skills and modern engineering science necessary for engineering

Guidance about “Mini Research Proposal” for EMA5646

- Description
 - Identify a particular ceramic material, or a ceramic-based composite, or ceramic-based simple device of your (research) interest, do some research, and write a mini research proposal about that material/device with particular focus on:
 1. Why that material/device is of interest to you,
 2. How it is typically processed including common features and variations,
 3. What is one unanswered question and/or remaining challenge concerning its processing that interest you or of particular importance,

4. What are your hypothesized solutions and your experimental plan to prove/disprove your solution;
 5. Literature search results (if available) to show your plan/solution is feasible
- Will go through **peer review** and rating, with each proposal subject to at least 1 “peer reviews” by peer graduate students in the course as well as instructor (ZC) as the “editor”
 - Grading based on criteria for publication quality
 - Format: **1 page** (excluding references), single space, Times New Roman 10 point font
 - Grading
 - Totally 50 points towards overall grade
 - 1st draft for 5 points
 - 2nd draft for 10 points
 - Final version for 25 points
 - Response/rebuttal to peer review feedbacks for 5 points
 - Review feedbacks to peer students’ mini-proposal for 5 points

Guidance about “mini term paper” for EMA4990

- Description

Identify a particular ceramic material, or a ceramic-based composite, or a ceramic-based device of your interest, do some research/literature review, and write a **half-page** (≤ 250 words) term paper about that material/device with particular focuses on:

 1. Why that material/composite/device is of particular interest to you,
 2. How it is typically processed including common features and important processing parameters,
 3. What is one unanswered question and/or remaining challenges concerning its processing that interest you or need to be resolved
- Format: half page (up to 250 words, excluding references), single space, Times New Roman 10 point font
- Topic must be approved by Dr. Cheng before submission.

Guidance about “final project” for EMA4990 will be given later

NO plagiarism in any form

- FIU plagiarism guide**
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- Ask if any questions**
- NO excuses accepted**