

Course Syllabus

Physical Ceramics I

EMA 4144 Class # 28686

Class Periods: T, Period 8,9 (3:00PM - 4:55PM); R- 9 (4:05 - 4:55PM)

Location: Williamson Hall 202

Academic Term: Fall 2022

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Instructor:

John J. Mecholsky < Jr. , Ph.D.

jmech@mse.ufl.edu

(352)-846-3306

Office Hours: T-W-R 11:00-11:40 AM

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Course Description

3 credit hours: Structure of complex ceramic compounds and glasses. Influence of structural imperfections and stoichiometry on physical characteristics, surface and interfacial phenomena, diffusion and phase transformations in ceramic systems.

Course Pre-Requisites / Co-Requisites

Pre-requisite: EMA 3050 - Introduction to Inorganic Materials.

Course Objectives

In this course the student is introduced to modern ceramic materials, their structure, properties, applications, potential uses and limitations. The specific objectives are to:

- Appreciate the factors that render ceramics unique and different from other materials
- Comprehend the bonding/property relationships in ceramics
- Understand the fundamental role of point defects and stoichiometry on the electric, dielectric, and diffusional properties of ceramics

- Gain knowledge of optical, magnetic and dielectric properties of ceramics
- Discover the critical role of flaws, surfaces and interfaces on mechanical properties

Materials and Supply Fees

None

Relation to Program Outcomes (ABET):

| Outcome | Coverage* |
|---|------------------|
| 1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics | Medium |
| 2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors | |
| 3. An ability to communicate effectively with a range of audiences | |
| 4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts | Low |
| 5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives | |

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| 6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions | |
| 7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies | |

* Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.

Required Textbooks and Software

- Ceramic Materials: Science and Engineering
- Barry Carter and M. Grant Norton
- 2013, Second Edition
- Hardcover ISBN: 978-1-4614-3522-8
- eBook ISBN: 978-1-4614-3523-5
 - Available online for UF students at <https://link.springer.com/book/10.1007/978-1-4614-3523-5> ([Links to an external site.](#)) (must log in on campus or using VPN).

Course Schedule

| Week (Dates) | Topic Area | Assignment | Book Section |
|---------------------|---|-------------------|-----------------------|
| Week 1 | <i>Aerospace (Engines) - Materials</i> | | 6.3, 6.13, 7.17 |
| Week 2 | Thermal Properties | Homework | 34 |
| Week 3 | Mechanical Properties | Quiz | 18.7, 17.7-17.12 |
| Week 4 | Solid Oxide Fuel Cells/Batteries | Paper Topic | 30.15-16, 37.3,37.6-7 |

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|-----------------------|--|-------------|-------------|
| Week 5 | Defect Chemistry | Homework | 11 |
| Week 6 | Conductivity | Quiz | 30.13-30.14 |
| Week 7 | Solar Cells – <i>Materials</i> | | 37.4-37.5 |
| Week 8 | Semi-conductors | Homework | 30.1-30.9 |
| Week 9 | Optics | Quiz | 32.1-32.4 |
| Week 10 | Computers (Data Storage) – <i>Materials</i> | | 7.3 |
| Week 11 | Dielectrics /Ferroelectrics | Paper Draft | 31 |
| Week 12 | Magnets | Quiz | 33 |
| Week 13 | Bio-Ceramics – <i>Materials</i> | | 35 |
| Week 14 | Glass | Homework | 7.20-7.21 |
| Week 15 | Bioactivity/Surfaces | Quiz | 13.2-13.8 |
| Week 16: (12/6-12/8*) | Finish up | Final Paper | |

Homework and quizzes due dates will be announced on Canvas and in class at least one week in advance.

Paper topic and paper draft count towards homework grade. See Class Expectations.

Attendance Policy, Class Expectations, and Make-Up Policy

Excused absences must be consistent with university policies in the undergraduate catalog (<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx> (Links to an external site.)) and require appropriate documentation.

Class Participation: Attendance is expected and all class notes are the responsibility of the student. Participation will be awarded for in-class group activities held at least once a week. Must participate in 80% of activities to receive full participation credit.

Homework Assignments: Homework is due at 5pm on the due date. Homework turned in within 24 hours after the due date will receive a reduction in grade by 10 percent. No late homework will be accepted for credit after 24 hours on the day following the due date unless given prior approval by the instructor in agreement with university policies for excused absences. Note that the two assignments Paper Topic and Paper Draft count towards the homework assignment portion of the final grade and are equal value as other homework assignments.

Semester Paper: Papers will be due on December 13th. All papers will be evaluated for plagiarism and violations will be reported to the university according to UF policies.

Quizzes: Quizzes must be conducted individually without external help from peers or internet resources in agreement with the honor code. Quizzes will be announced ahead of time and will be exclusively held during class times. If a student is late for a quiz, the student will have less time to complete the assignment.

Evaluation of Grades

| Assignment | Total Points | Percentage of Final Grade |
|----------------|--------------|---------------------------|
| Homework (6) | 5 each | 20% |
| Quizzes (5) | 10 each | 50% |
| Participation | 10 | 10% |
| Semester Paper | 100 | 20% |
| | | 100% |

Grading Policy

| Percent | Grade | Grade Points |
|----------------|--------------|---------------------|
| 93.4 - 100 | A | 4.00 |
| 90.0 - 93.3 | A- | 3.67 |
| 86.7 - 89.9 | B+ | 3.33 |
| 83.4 - 86.6 | B | 3.00 |
| 80.0 - 83.3 | B- | 2.67 |
| 76.7 - 79.9 | C+ | 2.33 |
| 73.4 - 76.6 | C | 2.00 |
| 70.0 - 73.3 | C- | 1.67 |
| 66.7 - 69.9 | D+ | 1.33 |
| 63.4 - 66.6 | D | 1.00 |
| 60.0 - 63.3 | D- | 0.67 |
| 0 - 59.9 | E | 0.00 |

More information on UF grading policy may be found at: <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx> (Links to an external site.)

Syllabus Changes: I reserve the right to make changes in the syllabus and class schedule as needed. Any changes will be announced clearly on canvas and in class.

Students Requiring Accommodations

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/> (Links to an external site.). It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

Course Evaluation

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/> (Links to an external site.). Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/> (Links to an external site.). Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/> (Links to an external site.).

In-Class Recording

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of

format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

Online Course Recording

Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

University Honesty Policy

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (<https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/> ([Links to an external site.](#))) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Commitment to a Safe and Inclusive Learning Environment

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

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.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html> (Links to an external site.)

Campus Resources:

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Health and Wellness

U Matter, We Care:

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 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.

Counseling and Wellness Center: <http://www.counseling.ufl.edu/cwc> (Links to an external site.), and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the [Office of Title IX Compliance \(Links to an external site.\)](#), located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

Sexual Assault Recovery Services (SARS)

Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/> (Links to an external site.).

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. <https://lss.at.ufl.edu/help.shtml> (Links to an external site.).

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/> (Links to an external site.).

Library Support, <http://cms.uflib.ufl.edu/ask> (Links to an external site.). Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. <https://teachingcenter.ufl.edu/> (Links to an external site.).

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers. <https://writing.ufl.edu/writing-studio/> (Links to an external site.).

Student Complaints Campus: <https://care.dso.ufl.edu> (Links to an external site.).

On-Line Students Complaints: <http://www.distance.ufl.edu/student-complaint-process> (Links to an external site.).