

**Properties of Functional Materials**  
**EMA 6114**  
**Sections: 13586 (Campus); 13588, 13589 (EDGE)**  
**Location: N/A (asynchronous)**  
**Spring 2021**

*This course is one of the four key technical courses foundational to the MSE graduate program: Materials Thermodynamics (EMA 6316), Diffusion, Kinetics and Transport in Materials (EMA 6136), Structure and Mechanical Properties of Materials (EMA 6313), and Properties of Functional Materials, (EMA 6114). As a core course, this class covers a significant amount of graduate-level material and it is designed to challenge you to advance your knowledge and skills. Success will require a considerable investment in preparing for lectures by using textbooks and other sources that you seek out, solving problems, and studying for exams. It is expected that you will have to exhibit significantly more independence, initiative, and ownership of the learning process than was required for success at the undergraduate level.*

1. *Instructor* – Prof. Brij M. Moudgil  
E-mail address: [moudgil@ufl.edu](mailto:moudgil@ufl.edu)  
Phone number: 352-328-7292 (M)  
Office location: 205 E Particle Technology Building  
Office hours: for on and off campus students- a one hour Zoom meeting will be scheduled every week for discussion of questions, review of concepts etc. These sessions will be recorded and posted on Canvas. Questions may be asked live or prior to the meeting via email to the instructor and TA.  
  
Use of the Discussion feature on Canvas is encouraged to work out technical questions and ask for/provide clarifications from and to the instructor, TA and peers.
2. *Teaching Assistant* – Mr. Seaton Ullberg  
Email address: [sullberg@ufl.edu](mailto:sullberg@ufl.edu)  
Office hours: TBD
3. *Course Outline* – This course will be taught within the context of nanoparticles, nanomaterials and interfaces. General topics are physicochemical & nano/bio interfaces, electronic, magnetic, and optical properties, materials processing and selection. List of specific topics covered in lectures will be provided. Guest lectures will be presented to supplement the course topics.
4. *Pre-requisites and Co-requisites* – EMA 6313
5. *Course Objectives* - To gain an understanding of the principles underlying the properties of functional materials. The specific objectives for the course include understanding the electrical, thermal, magnetic, and optical properties of materials.
6. *Material and Supply Fees* – None
7. *Textbooks and Software Required:*

**N/A,**

This course will use Canvas system. All class handouts, reading assignments, homework problem sets, homework solutions, exam solutions, and grades will be available throughout the semester. Course lecture videos, notes developed by the instructor along with any additional reading material assigned will be posted on Canvas.

**8. Recommended Reading:**

- a) *An Introduction to Materials Engineering and Science for Chemical and Materials Engineers*
  - a. By Brian S. Mitchell, 2004  
Publisher: John Wiley & Sons, Inc.  
ISBN-13: 978-0471436232
  - b. Materials Science and Engineering: An Introduction, William D. Callister, Wiley (Note that there are several versions and editions available – any will suffice)
  - c. Principles of Electronic Materials and Devices, 3<sup>rd</sup> Edition, S. O. Kasap, McGraw-Hill, 2006
  - d. The Physics and Chemistry of Interfaces, by Hans-Jurgen Butt, Karlheinz Graf, 3<sup>rd</sup> edition, Wiley-VCH, 2012. ISBN-978-3-527-41216-7

**9. Course Schedule**

(Tentative, details to be provided later)

Week 1-3: Surface energy/surface tension, interaction forces relevant to nanoparticles and nanomaterials systems.

Week 3-11: Physicochemical & nano/bio interfaces, electronic, magnetic, and optical properties,

Week 11-15: Thin Film deposition processes.

**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.

**Attendance Policy, Class Expectations, and Make-Up Policy**

Attendance N/A (asynchronous)

Any excused absences from exams etc., must be consistent with university policies in the graduate catalog (<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#attendance>) and require appropriate documentation.

Homework will be assigned and is due on the dates indicated on the assignment; no late homework will be accepted. Assignments submitted after the solutions are posted will receive a zero grade. Learning from and teaching others is encouraged, but all turned in problem solutions must be your own work. All homework problems and solutions may be downloaded from the Canvas site. In order to enhance the ability to acquire and apply new knowledge using appropriate learning strategies, a team topic review project will be assigned. Details of team project will be provided in class and posted on Canvas.

Exams: will closely follow the material covered in lecture videos, in your assigned reading and in homework problems. These will be open book and notes and will be given at prescheduled time intervals. Requests for re-grading of exams must be made within one week after a graded exam/assignment has been returned.

Exact dates for exams will be announced in the class and posted on the Canvas system, a tentative schedule is as follows: Exam 1 – week of Feb. 8; Exam 2 – week of March 15; Exam 3 – week of April 12.

Final Exam: There will be no final exam.

Make-up Exam Policy: If you miss an exam through documented illness or for an excused absence, you may take a make-up exam. If you miss an exam for any other reason, you will receive zero points on that exam.

### ***Evaluation of Grades***

Assignment	Total Points	Percentage of Final Grade
Homework Sets (6-7)	50 each	10%
Exams (3)	100 each	(30% of best of three; other two at 20% each) 70%
Team topic review	100	20%
TOTAL	-	100%

### ***Grading Policy***

The following is given as an example only.

Percent	Grade	Grade Points
90.0 - 100.0	A	4.00
87.0 - 89.9	A-	3.67
84.0 - 86.9	B+	3.33
81.0 – 83.9	B	3.00
78.0 - 80.9	B-	2.67
75.0 - 79.9	C+	2.33
72.0 – 74.9	C	2.00
69.0 - 71.9	C-	1.67
66.0 - 68.9	D+	1.33

63.0 - 65.9	D	1.00
60.0 - 62.9	D-	0.67
0 - 59.9	E	0.00

More information on UF grading policy may be found at:

<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades>

### ***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/>. 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/>. 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.bluer.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

### ***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/>) 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](mailto:rbielling@eng.ufl.edu)

- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, [taylor@eng.ufl.edu](mailto:taylor@eng.ufl.edu)
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, [nishida@eng.ufl.edu](mailto: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>

### ***Campus Resources:***

#### ***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](mailto: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>, 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](#), located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, [title-ix@ufl.edu](mailto: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/>.

#### ***Academic Resources***

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

**Career Resource Center**, Reitz Union, 392-1601. Career assistance and counseling.  
<https://www.crc.ufl.edu/>.

**Library Support**, <http://cms.uflib.ufl.edu/ask>. 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/>.

**Writing Studio, 302 Tigert Hall**, 846-1138. Help brainstorming, formatting, and writing papers.  
<https://writing.ufl.edu/writing-studio/>.

**Student Complaints Campus**: <https://care.dso.ufl.edu>.

**On-Line Students Complaints**: <http://www.distance.ufl.edu/student-complaint-process>.