

**EMA 6114: Properties of Functional Materials**  
**(Advanced Materials Principles 2)**  
**Syllabus, Spring 2019**

**Sections: 14174 (Campus); 14175, 14176, 14177 (EDGE)**

*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.*

2. Pre-requisites and Co-requisites – EMA 6313

3. Course Objectives

To gain an understanding of the principles underlying the properties of functional of materials. The specific objectives for the course include understanding the electronic, magnetic, and optical properties of materials.

4. Instructor – Prof. Simon R. Phillpot

a. Office location: 164 Rhines Hall

c. E-mail address: [sphil@mse.ufl.edu](mailto:sphil@mse.ufl.edu)

d. Class Web site: login to e-Learning at <https://lss.at.ufl.edu/>

e. Office hours:

On campus students (Sec. 4785): M 12:50 – 1:40, R 10:40 – 12:30

Off campus students: e-mail (expect up to 24 hrs. for response). Phone/Skype by arrangement

5. Teaching Assistants – Brittani Maskley ([bmaskley93@ufl.edu](mailto:bmaskley93@ufl.edu))

On campus students (Sec. 4792): Office Hours: Rhines 125 Library

M 9:00 -10:00

R 1:30 – 2:30

Off campus students: e-mail (expect up to 24 hrs. for response); Phone/Skype by arrangement

6. Meeting Times – Lecture: M, W, F period 2 (8:30 – 9: 20m)

7. Class/laboratory schedule – Three 50-minute lecture periods per week.

8. Meeting Location – 100 NEB

9. Material and Supply Fees – None

10. Textbooks and Software Recommended:

- Principles of Electronic Materials and Devices, S.O. Kasap, 4th Edition, McGraw-Hill 2018, ISBN: 0072957913

*The 3<sup>rd</sup> edition is also OK, but the student responsible for any differences between the editions. First and second editions are not acceptable substitutes.*

11. Recommended Reading:

- Introduction to Solid State Physics, C. Kittel.  
*This is a classical solid-state physics book, now in its 8<sup>th</sup> edition since ~1953. Essentially any edition of this will be a useful supplemental text. Many are available cheaply online.*
- Electrical Properties of Materials, L. Solymar and D. Walsh, Oxford University Press  
*This book is in its 9<sup>th</sup> edition. I have 7<sup>th</sup> Edition which is a good text; I assume other editions are useful also.*

12. Course Outline - General topics are electronic, magnetic, and optical properties, materials processing, and materials selection. List of specific topics covered in lectures will be provided.

The following is an approximate outline of the 43-class schedule. This may be subject to change:

1. Introductions (1 class)
2. Classical electronic and thermal properties; successes and failures of classical physics (3 classes)
3. Quantum theory (6 classes)
4. Electronic Properties of Semiconductors: Basics (4 classes)
5. Electronic Properties of Semiconductors: Devices (4 classes)
6. Electrical Properties of Organic and Biological Systems (2 classes)
7. Optical Properties (5 classes)
8. Vibrations, Phonons and Thermal Conductivity (4 classes)
9. Magnetic, Dielectric, Ferroic Properties (6 classes)
10. Functional Materials: Surfaces, Interfaces, Growth and Nanostructures (4 classes)  
In-class exams (4 classes)

Exam #1 – Parts 1, 2, 3 (10 classes)

Exam #2 – Parts 4, 5 and 6 (10 classes)

Exam #3 – Parts 7 and 8 (9 classes)

Exam #4 – Parts 9 and 10 (10 classes)

13. Attendance and Expectations - Attendance in lecture is not part of the course grade; however, all on-campus (Sec. 4785) students are expected to attend class. Cell phones should be turned off in class. Reading of newspapers, work on assignments for this or other classes, or other activities that are not part of the class are not allowed during class time.

14. Grading –

Four in-class exams - 20% each

Homework - 20%

Homework deadlines will be provided during the semester. Homework assignments are posted on the website. For on-campus students, all HW must be handed in in-person to the Instructor in class by the date and time designated. For off-campus students, all homework must be submitted as a PDF file through the website by the 11:59pm on date designated.

There are four in-class exams. Unexcused absence from any exam will result in a zero on the test. Exams will be held in class, tentative exam dates will be announced, and posted on the course website. There will be no final exam.

15. Grading Scale - The grading scale is indicated below. Grades are not curved.

Percentage	≥92	≥88	≥84	≥80	≥76	≥72	≥68	≥65	≥62	≥59	≥56	<56
Letter Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E

More information on UF grading policy may be found at:

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

### ***Students Requiring Accommodations***

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc>) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

### ***Course Evaluation***

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu/evals>. 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/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://www.dso.ufl.edu/sccr/process/student-conduct-honor-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.

### ***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:

<http://registrar.ufl.edu/catalog0910/policies/regulationferpa.html>

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

#### *Health and Wellness*

##### **U Matter, We Care:**

If you or a friend is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu) or 352 392-1575 so that a team member can reach out to the student.

**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 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://www.dso.ufl.edu/documents/UF\\_Complaints\\_policy.pdf](https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf).

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