

Fundamental Principles of Materials
EMA 3011 Section 11858
Class Periods: T Period 2 - 3 8:30am-10:25am
R 3 9:35am-10:25am
Location: CSE E119
Academic Term: Spring 2025

Instructor:

Name **Dr. Wolfgang Sigmund (he/him/his)**

E-mail address: sigmund@ufl.edu

Office hours: R **10:35am – 12:00pm** Rhines 225

Office location:

Teaching Assistant:

Name: **TBA**

E-mail address:

Office hours:

Office location: Rhines 123 (Rhines Library)

Course Description: The fundamental principles of structure, reactivity and energies describing materials systems will be covered, directly relating individual principles to specific materials properties or functions. (3 credit hours)

Prerequisites: EMA 3010, CHM 2046 or CHM 2096

Course Objectives: In this course the student is exposed to the materials' tetrahedron and its relation to the fundamental properties of materials. The student is exposed to materials selection and design.

Specific Objectives:

- Become familiar with the fundamentals of materials science and to be able to apply them to metals, ceramics, and polymers
- Learn the fundamentals of materials design and selection

Professional Component (ABET): This is a 3-credit course. It provides 3 credits toward engineering topics.

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.	High
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	Medium

Required Textbooks

Title: *Fundamentals of Materials Science and Engineering: An Integrated Approach*

Author: **William D. Callister and David G. Rethwisch**

Edition: **5th**

ISBN: **9781119175483**

Title: *Materials: engineering, science, processing, design*

Author: **Michael Ashby, Hugh Shercliff, David Cebon**

Edition: **4th**

ISBN: **9780081023761**

Required Computer

UF student computing requirement: <https://news.it.ufl.edu/education/student-computing-requirements-for-uf/>

On the Web: This course will use Canvas 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 Canvas entry link: <https://elearning.ufl.edu/>. Pertinent course information may also be announced via UFL e-mail address in addition to over Canvas.

Course Outline: Below is the tentative schedule of topics, activities, reading assignments, and exams.

Week of	Topic	Reading (Ashby)	Reading (Callister)
1	Introduction to Materials Selection and Design	Ch.2-3	
2	Introduction to Design, Crystal Structures	Ch. 3	Ch. 3
3	Materials Tetrahedron and Materials Design via Elasticity and Plasticity	Ch. 4	Ch. 7
4	Electronic Properties	Ch. 15	Ch. 12
5	Thermal Properties, Magnetic Properties	Ch. 12, 16	Ch. 17-18
6	Magnetic Properties	Ch. 16	Ch. 18
7	Corrosion		Ch. 16
8	Materials Design via Elasticity and Plasticity	Ch. 5	
9	<i>Spring Break (No Class)</i>		
10	Materials Design via Elasticity and Plasticity	Ch. 6-7	
11	Materials Design via Service Condition	Ch. 8-9	
12	Materials Design via Electronic, Optical, and Thermal Properties	Ch. 12-14	
13	Materials Design via Electronic, Optical, and Thermal Properties	Ch. 12-14	
14/15	Projects and Wrap-up		

Important Dates

March 4, 2025	Exam 1 (In class)
April 8, 2025	Exam 2 (In class)
April 12, 2025	Project due online

Attendance Policy, Class Expectations, and Make-Up Policy

Proper behavior in class is always important and leads to a relaxed and productive educational environment. Thus, eating, drinking, texting, reading newspapers, working on homework for this or other courses, or other activities that are not part of the class are not allowed. Students who do not comply with these requirements or who behave disorderly or disrespectfully may be asked to leave the classroom. Leaving your cell phone on, leaving early or arriving late can be VERY distracting. All electronic devices (cell phones, etc.) should be turned off or in silent mode. While not directly enforced, attendance is strongly recommended for this course. While attendance does not make up a specific component of the course grade, it will be reflected in homework and exam grades. Excused absences must be in compliance with university policies in the Catalog (<https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>) and require appropriate documentation.

Exams. You will be given 2 exams throughout the semester, the exam content may change but the dates will not. **There will be no final exam.** Each exam is weighted equally and will be worth 25% of your final grade. Requests for re-grading must be made in writing and within one week after the assignment has been returned. **Make-up exams** will be provided only with the **prior approval of the instructor or excused absence**. In general, acceptable reasons for excused absence include illness, serious family emergencies, special curricular requirements, military obligation, court-imposed legal obligations, religious holidays and participation in official university activities such as music performances, athletic competition or debate.

Final Design Project: You will have a final design project which will involve materials selection for a given application and/or type of material. This project will include a written report.

Homework. Homework problems will be assigned, together with due dates, through e-Learning (Canvas). These homework questions are **essential** to your study and some exam questions will be adapted from them. Assignments are due **online through Canvas in pdf. format** on the due date, unless otherwise stated. **Late homework assignments will not be accepted and will receive a grade of zero.** The lowest homework score will be dropped.

Evaluation of Grades

Your final grade will be allocated based on the following distribution:

Homework:	25%
Two In-Class Exams:	25% each
Final Design Project:	25%

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

The instructor reserves the right to adjust the grade distributions, however grades **will not** be adjusted for individuals.

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 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.ua.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.ua.ufl.edu/public-results/>.

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.

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/process/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 varied perspectives and lived experiences within our community and is committed to supporting the University's core values, including the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of race, creed, color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national origin, political opinions or affiliations, genetic information, and veteran status.

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 Undergraduate Coordinator
- HWCOE Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
- Pam Dickrell, Associate Dean of Student Affairs, 352-392-2177, pld@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>

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 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: <https://counseling.ufl.edu>, 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

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. <https://elearning.ufl.edu/>.

Career Connections Center, Reitz Union, 392-1601. Career assistance and counseling; <https://career.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://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>; <https://care.dso.ufl.edu>.

On-Line Students Complaints: <https://distance.ufl.edu/getting-help/>; <https://distance.ufl.edu/state-authorization-status/#student-complaint>.