

Kinetics of Materials
EMA 4125 Section TPM2
Class Periods: MWF Period 4, 10:40a – 11:30a
Location: LIT0237
Academic Term: Spring 2025

Instructor:

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Office Hours: 221 MAE, date and time TBD

Teaching Assistant/Peer Mentor/Supervised Teaching Student:

Please contact through the Canvas website

- Mary Severt, marysevert@ufl.edu, office hours TBD

Course Description

Science and application of diffusion and phase transformations in alloys, semiconductors, ceramics, and polymers, phenomenological description and atomic theory, analytical and numerical solutions, solidification and solid-state transformations, including nucleation, growth, and coarsening.
3 credits

Course Pre-Requisites / Co-Requisites

EMA 4314.

Course Objectives

Students completing this course should know the fundamental mechanisms defining diffusion, heat transport, and phase transformation in solids. They should also be able to predict these behaviors using both analytical solutions and numerical finite difference solutions using MATLAB.

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	
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	Medium
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	

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	

Required Textbooks and Software

Octave or MATLAB. You can access them in one of four ways:

1. **Use the open source code Octave (<https://www.gnu.org/software/octave/>)** . Octave is an open source code that is very similar to MATLAB but is free. Historically, all work in this course can be done using Octave; however, Dr. Miller has no experience with Octave and will be less able to help troubleshoot. When you download and install it, make sure you have the graphic user interface.
2. MATLAB from **UF Apps (<https://info.apps.ufl.edu/>)**. Also free, and much better than the “old” UFApps.
3. MATLAB in On Campus Computer Labs
4. **Purchase a student license of MATLAB (<https://www.mathworks.com/products/matlab/student.html>)** . Most convenient, but costs. It will be useful throughout your time as a student.

Recommended Materials

Transport Phenomena in Materials Processing

Author: William D. R. Poirier and G. H. Geiger

Publisher: TMS Publications, Warrendale PA , 1994

Fundamentals of Momentum, Heat and Mass Transfer

Author: James Welty, Charles Wicks, Robert Wilson and Gregory Rorrer

Publisher: 4th edition NY, John Wiley and Sons. 2001

Introduction to Heat and Mass Transfer

Author: Frank Incropera and David Dewitt

Publisher: NY John Wiley and Sons, 2000

Required Computer

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

Course Schedule

The course schedule is subject to change and will be kept up to date in OneNote.

- Week 1: Introduction & Diffusion: Theory
- Week 2: Diffusion: Theory
- Week 3: Diffusion: Analytical
- Week 4: Diffusion: Numerical
- Week 5: Diffusion: Review
- Week 6: Heat Transport: Theory
- Week 7: Heat Transport: Analytical
- Week 8: Heat Transport: Numerical
- Week 9: Heat Transport: Review
- Week 10: Phase Transformations: Thermodynamics
- Week 11: Phase Transformations: Solidification
- Week 12: Phase Transformations: Solid state phase transformations
- Week 13: Phase Transformations: Review
- Week 14: Phase Transformations: Review
- Week 15: Course wrap up

Important Dates

Exam dates are tentative and may shift. Your exams in other classes will be taken into consideration as dates are finalized.

2/10/25	Exam 1 in class
3/26/25	Exam 2 in class
4/13/25	Exam 3 in class

Attendance Policy, Class Expectations, and Make-Up Policy

- Canvas discussions
 - This term we will be using a Canvas discussions. Rather than emailing questions about the course content to me or the TA, please post your questions in Canvas Discussions.
 - All questions about course content/logistics and other non-private information should be in the Canvas Discussions.
 - Extra credit may be given to students who are helpful to others in the Canvas Discussion platform.
- Homework
 - Homework is used to help you learn the material by actively applying the concepts taught in the lecture. The focus is learning not assessment. Homework problems will be assigned for each module in the course. The assignments will be posted in Canvas and will be turned in electronically.
 - Your homework will be graded by the TA. If you feel there is a problem with a homework grade, contact the TA. For questions on exams, also contact Dr. Tonks. After two weeks have passed since the due date, no grades will be changed.
 - Late homework (and other assignments) will be accepted until the solutions are posted with 10% of the total points deducted for each day (or part thereof) late. Exceptions to this late policy (e.g., exams) will be announced in class and recorded in OneNote.
- Attendance and Absences
 - Attending lectures or watching their recordings is the best way to get course content. A small portion grades are based on in class exercises.
 - If you are sick (with covid or mental health stuff or anything else) please let me know! I can work with you if I know, but I'm not psychic.
 - Verification of an absence may be required in extreme circumstances, e.g. missing a midterm exam with no notice. Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies. Click here to read the university attendance policies: <https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>
- In-class exercises
 - In-class exercises will be taken during class. They will only be graded for completion, not correctness. I will drop the lowest 2 scores.
- Quizzes
 - Quizzes are used to help you review the material covered in the lectures. Their focus is learning not assessment. Quizzes will be given through Canvas, one in each module. You will have 15 minutes to take each quiz, and they will be open book, open note, and open internet. However, you must take them alone.
- Exams
 - Exams are used to assess how well you have learned the material. You will be given three exams throughout the semester. Each exam is weighted equally. You will take the exams in person during the normal class time. The exam will be taken using Canvas, so bring an electronic device with internet access to the exam.
 - 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. If you get a grade below a 70% on any of the exams, you can submit a corrected version of the exam to raise your grade to a 70. For each of the multiple-choice questions that you missed, give a short summary explaining the correct answer. For each of the workout

questions, correct your answer. Send your corrected version to Dr. Miller **before 2 weeks after the exam date.**

- Extra Credit
 - Students that make a useful demo that I can use in class will receive up to five extra credit points (based on demo quality) to be assigned to the lowest homework grade. "Standard" projects will receive 3 points, with additional points awarded for exceptional work and points detracted for sub-par work. In order to receive credit, student must provide a typed description of the class concept being demonstrated (minimum of a half page single spaced). Within reason, there is no maximum number of demos a student can submit. Extra credit will be accepted until the last day of classes. A maximum of one demo per week per student will be accepted.
 - Students giving helpful advice in the group chat (not just giving the answers, but actually helping) will also be awarded bonus points.
 - Additional opportunities for extra credit may be announced during lecture.
- Be Nice!
 - Incivility toward students, staff, or faculty will not be tolerated.
 - If you'd like me to call you by a different name, different pronouns, etc. just let me know!

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
In class exercises		5%
Homework		20%
Quizzes		5%
Exams (3)	100 each	50%
Final Project	100	20%
		100%

Grading Policy

Percent	Grade	Grade Points
93.0 - 100	A	4.00
90.0 - 92.9	A-	3.67
87.0 - 89.9	B+	3.33
83.0 - 86.9	B	3.00
80.0 - 82.9	B-	2.67
77.0 - 79.9	C+	2.33
73.0 - 76.9	C	2.00
70.0 - 72.9	C-	1.67
67.0 - 69.9	D+	1.33
63.0 - 66.9	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:

<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.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/>.

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>.