

EMA 6136 – Diffusion, Kinetics, and Transport Phenomena

Course Syllabus – Spring 2019

	Office	E-Mail	Office hours
Prof: Richard G. Hennig	154 Rhines Hall	rhennig@ufl.edu	Tue 2-3 pm
TAs: TBA			

Course Description (3 credit hours)

Physical basis, equation, and theories of diffusion, tracer, chemical, multicomponent, and multiphase diffusion in general force fields.

Prerequisites:

EMA 4125 or equivalent.

Course Objectives

To become familiar with the fundamental concepts of diffusion and phase transformations in alloys, semiconductors, ceramics, and polymers. The atomistic and phenomenological treatment of diffusion will be introduced and applied to atomic transport under concentration, temperature, electric field and pressure gradients in a variety of technological materials. The kinetics of diffusive and martensitic phase transformations will be developed and applied to nucleation and growth of phases in vapors, liquids and solids. The course will enable students to apply theoretical concepts of diffusion and phase transformations to practical applications of evolution of materials.

Class Time

Tuesday, Thursday Period X XX:YY-ZZ:ZZ NEB 201

Text books: (required)

Title: Diffusion in Solids
Author: Paul Shewmon
ISBN: 978-3-319-48206-4 or 978-0873391054

Title: Phase Transformations in Metals and Alloys, Third Edition
Author: D. A. Porter, K. E. Easterling, and M. Y. Sherif
ISBN: 1420062107

Textbooks are available for purchase at the Reitz Union Bookstore and on-line sources. Supplementary reading and links to various other resources/websites are provided and updated throughout the semester.

Course Website

The course website is on the Canvas system <https://ufl.instructure.com>, where you can find the syllabus, lecture notes, homework problems, announcements, and your grades. Please check it frequently.

Lectures

Lectures are critical to success in this MS&E course. Past experience has shown that you will be able to get a better grade when regularly attending class. However, I will not require attendance. Questions are highly encouraged. It will make the class more interesting, wake up

your fellow students and give me a chance to explain things better. If you do not understand something, chances are that most of the class missed that point too. If you do not ask enough questions, I may start asking you. You are responsible for material presented in lectures, reading assignments, homework, and distributed notes.

Homework

Four homework exercises will be assigned. These homework questions are essential to your study and prepare you for the exams. Some exam questions will be adapted from homework. Homework is usually due back 10 days before the corresponding exam. The approximate homework due dates are 1/25, 2/22, 3/22, 4/12. The exact submission dates are in the e-learning assignment. The purpose of homework is to give students an opportunity to evaluate and apply their knowledge. Students may collaborate on homework; however, the actual submitted assignment must represent their own work and preparation. Please see me or the TAs during their office hours to discuss homework problems.

Homework in its entirety must be word processed. For some problems you will require a suitable math package with graphing capability, e.g., Excel, MatLab, Python. Files have to pdf, doc, docx, or pptx. Picture files (jpg, etc.) are not accepted.

Homework needs to be submitted online on e-learning. Email is not acceptable for submission of homework. Hard copies are also not accepted.

Homework will be evaluated on the following basis:

- Excellent work: 100
- Assignment acceptable: 85
- Homework submitted (showing effort): 70
- Homework submitted no or small effort: 0
- **No late homework assignments will be accepted.**

Quizzes and Interactive Learning

We will have online quizzes covering current and recent lecture material. The quizzes will typically consist of about 4 questions that should take about 10 minutes to answer. The quizzes serve as feedback both for you and me.

In addition, we will use Kahoot in class to provide instant feedback about important concepts. You will need an online electronic device (smartphone, tablet, computer) for the lectures running the website tool Kahoot.

Exams

We will have four in-class exams. The exams usually consist of concept questions to evaluate your familiarity with the course content and some numerical problems designed to test your ability to apply concepts to new situations, i.e. to promote critical thinking. Unless otherwise informed, one sheet of prepared personal notes may be used to assist you in completing examinations. In class exams use randomized seating assignment. Exam work must be individual and collaboration is never allowed. Observations of cheating will be promptly reported by the exam proctor. Please see UF's statement on academic honesty: <https://www.dso.ufl.edu/%20sccr/process/student-conduct-honor-code>.

There is no final exam in this class. Exam dates are scheduled (changes are possible) for February 1, March 1, March 29, and April 24.

EDGE Student Submission Policy

EDGE students must submit all homework assignments electronically by the given deadlines. Exams must be received no more than four days after the in-class exam date. Please scan documents as a pdf and submit them electronically or via fax. We will use the department established proctoring for taking exams. You must follow-up and verify that exams are received in their entirety by the instructor. If problems occur, they must be reported early. No credit will be given for late submissions.

Exam Conflicts with other course exams

The official UF policy on exam conflict resolution states that when two exams conflict, the course with the higher number will take priority. There will be no exceptions to this rule.

Make-up exams

You only need 3 out of 4 exams. If you take all 4 exams then your lowest exam score will be dropped. You do not have to take the 4th exam if you are satisfied with the scores of the first three exams. There is no disadvantage or penalty for not taking one exam.

Make up exams will be provided only with the *prior approval of the instructor in accordance with university policies* (<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>). In general, acceptable reasons for excused absence from an exam include illness, serious family emergencies, special curricular requirements, military obligation, court-imposed legal obligations, and religious holidays. In all cases, you will be required to provide written documentation, and obtain prior instructor approval. You will not be excused from any exam without following the policy above, with no exceptions. Students not in attendance for the scheduled exam will receive a score of zero. **You must notify the instructor no less than 1 week of the scheduled exam of your intent and justification for missing the exam.** Make-up exams for excused absences as well as exam conflicts must occur within 1 week of the missed exam, and may occur before the missed exam.

Grading

Homework	15%
Online quizzes	10%
Best 3 out of 4 exams	75% (25% each)

You have two weeks after the test results are posted to resolve any questions about scores and grades. No changes to your exam grade will be made after that time.

Grading Scale

This course follows current UF grading policies for assigning grade points

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
Grade Points	4.0	3.67	3.33	3.0	2.67	2.33	2.0	1.67	1.33	1.0	0.67	0

In order to graduate, graduate students must have an overall GPA and an upper-division GPA of 3.0 or better (B or better). Note: a B- average is equivalent to a GPA of 2.67, and therefore, it does not satisfy this graduation requirement. For more information on grades and grading policies, please visit:

<http://gradcatalog.ufl.edu/content.php?catoid=5&navoid=1054#grades>.

Office Hours

Office hours are Tuesday afternoons 2:00-3:30 p.m. TA office hours are tentatively scheduled for Thursday afternoons from 1 to 5 pm. If you have any questions about the class or homework, please come to office hours or email me and the TA's. We will try to respond to e-mail questions as fast as possible. Important e-mail questions (minus identifying information) and answers may be posted to the class either by e-mail or on the course website for the benefit of other students.

Honesty Policy

All students admitted to the University of Florida have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a UF student and to be honest in all work submitted and exams taken in this course and all others.

Note that failure to comply with this commitment will result in disciplinary action compliant with the UF Student Honor Code Procedures.

See general regulations in the 2017-2018 graduate catalog section on academic integrity <http://gradcatalog.ufl.edu/content.php?catoid=11&navoid=2486>

Accommodation for Students with Disabilities

Students Requesting classroom accommodation must first register with the Dean of Students Office. That office will provide the student with documentation that he/she must provide to the course instructor when requesting accommodation.

UF Counseling Services

Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:

- UF Counseling & Wellness Center, 3190 Radio Rd, 392-1575, psychological and psychiatric services.
- Career Resource Center, Reitz Union, 392-1601, career and job search services.

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.

Software Use

All faculty, staff and student 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.

Record keeping

All materials from this class that students did not pick up (graded exams, etc.) within 1 year of the end of class will be shredded on or after December 31, 2018.

Syllabus Changes

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