

Energetics & Kinetics
EMA 4314 Section 8797
Class Periods: T 7, R 7 & 8
Location: TUR L005
Academic Term: Fall 2019

Instructor:

Name: Brij M. Moudgil

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Office Hours: TBD, Particle Science & Technology Building room 205E (for appointment, contact Ms. Hollie Starr, Administrative Support Assistant at hstarr@ufl.edu; Ph: 352-846-1194).

Teaching Assistants:

Please contact through the Canvas website

- TBD, office location, office hours TBD

Course Description

Foundations of energetics and kinetic theory with applications to processes in materials science (3 credits)

Course Pre-Requisites / Co-Requisites

Prerequisites: EMA 3010

Corequisites: None

Course Objectives

The objective of this course is to develop and understand the foundations of thermodynamics and kinetics of materials, including both the underlying physical principles and problem solving for materials problems.

Materials and Supply Fees

None

Professional Component (ABET):

2 credits associated with mathematics or basic science, 1 credit associated with engineering. Course does not contain a significant design component.

Relation to Program Outcomes (ABET):

Outcome	Coverage*
1. An ability to identify, formulate, and solve engineering problems by applying principles of engineering, science, and mathematics.	High
2. An ability to apply both analysis and synthesis in the engineering design process, resulting in designs that meet desired needs.	
3. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.	
4. An ability to communicate effectively with a range of audiences	
5. 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.	
6. An ability to recognize the ongoing need for additional knowledge and locate, evaluate, integrate, and apply this knowledge appropriately.	
7. An ability to function effectively on teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainty	

*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.

Required Textbooks and Software

- Physical Chemistry
- P.W. Atkins and J. de Paula
- Oxford, Part I, 9th Edition
- ISBN #1-4292-3127-0

(if any course notes derived from published sources are used, information will be provide for each source)

Course Schedule

(Note: Topics are tentative. Section selection may change; some sections may be emphasized more than others)

Week 1- 2

Class# 1-5

Topics:

Class overview, perfect gas laws, kinetic model, mixtures,
Van der Waals and law of corresponding states
(Sections:1.1-1.4)

Week 2 - 3

Class# 6-11

Topics:

Work, heat energy and internal energy
Expansion work, heat transactions, Enthalpy, Adiabatic processes
Standard enthalpy changes, Standard enthalpies of formation;
T dependence
(Sections: 2.1 – 2.11)

Week 4 - 6

Class# 12-20

Topics:

Dispersal of Energy, entropy
Entropy changes, Third Law, Gibbs and Helmholtz energies
Standard molar Gibbs free energies
Combined 1st and 2nd Laws, Properties of Gibbs Free energy
(Sections: 3.1 – 3.9)

Week 7 - 10

Class# 21- 30

Topics:

Phase diagrams, phase boundaries, phase rule, representative unary
phase diagrams, phase stability, Phase boundaries, Ehrenfest classification.
(Sections: 4.1 – 4.6)

Mixtures: partial molar quantities, thermodynamics of mixing, chemical potentials

Liquid mixtures; Phase diagrams, Activity, Chemical equilibrium (Sections: 5.1 – 5.13)

Week 11 - 16 Class# 31-44
Gibbs free energy, Temperature and pressure effects
Electrochemistry: half reactions and cells;
cell potential, standard electrodes, Applications of cells
(Sections: 6.1-6.9)

Diffusion: (Sections: 20.8-20.10)

Homework problem sets and solutions will be posted.

Tentative Midterm Exam schedule is as follows: Exam 1 – Week of Sept. 23; Exam 2 – Week of Oct. 28. Exam 3 – Week of Dec. 2.

Attendance Policy, Class Expectations, and Make-Up Policy

Attendance in class is important. Material covered in class will follow the book closely in some areas and will deviate from it in others; in a few cases class notes will be used exclusively. In addition, there may be assignments to be completed in class that will count towards your grade. Those students not in class for any reason are responsible for the material covered in class, and the homework assigned.

Correct behavior in class is always important. Making noise, talking, reading the paper, leaving your cell phone on, leaving early or arriving late can be very distracting. Occasionally, your schedule will demand that you arrive late or leave early - in these cases please minimize class disruption.

Homework problem sets and solutions will be posted, and will form the basis of a number of Exam questions.

Exams: will closely follow the material covered in class, in your assigned reading and in homework problems. These will be closed book and without notes and will be given during a regular class period. A double sided one page (8.5X11 inch) sheet listing only equations/formulae etc. will be allowed. Requests for re-grading of tests and exams must be made within one week after an exam or test has been returned. Only exams or tests completed in pen will be considered for re-grading.

Final Exam: There will be no final exam.

On the Web: This course will use Canvas (<https://lss.at.ufl.edu>). All class handouts, homework problem sets, homework solutions, exam solutions, and grades will be available throughout the semester.

This statement is required: Excused absences must be consistent with university policies in the undergraduate catalog (<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>) and require appropriate documentation.

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Homework Sets (8)	100 each	5%
Midterm Exam (best of 3)	100 each	45%
Next 2 Midterm Exams	100 each	25% each
Final Exam	N/A	N/A
Review Paper	N/A	N/A

Grading Policy

The following is given as an example only.

Percent	Grade	Grade Points
92 - 100	A	4.00
88 - 91	A-	3.67
84 - 87	B+	3.33
80 - 83	B	3.00
76 - 79	B-	2.67
72 - 75	C+	2.33
68 - 71	C	2.00
67 - 65	C-	1.67
62 - 64	D+	1.33
59 - 61	D	1.00
56 - 58	D-	0.67
< 56E	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 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.

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
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.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: <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

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://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.

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