

Atmospheric Chemistry and Physics
ENV6932 Section 3C87
Class Periods: MWF, 8:30-9:20 AM (2 period)
Location: Web
Academic Term: Fall 2020

Instructor:

Name: Myoseon Jang

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Office Phone Number: 352-846-1744

Office Hours: 9:35-10:40 AM

Teaching Assistant/Peer Mentor/Supervised Teaching Student: No official TA.

Dr. Zechen (Yu, zchenyu@ufl.edu, BLK404) is willing to assist students by appointment.

Course Description

This class provides students a platform to estimate the chemical and physical properties of atmospheric aerosol and airborne particulate matter. The class covers techniques to predict the multiphase partitioning process of atmospheric compounds; physicochemical parameters of organics related to thermodynamic and photochemical properties; group contributions, inorganic thermodynamic models; multiphase kinetic processes of air pollutants; nucleation in gas phase; aerosol coagulation; and aerosol hygroscopicity.

Course Pre-Requisites / Co-Requisites: None

Course Objectives

- Diffusion of atmospheric compounds and mass transport between the gas and the particle
- Composition of atmospheric particulate matter
- Photochemical reactions of atmospheric organic species (PAHs, oxy-PAHs, etc)
- Vapor pressure of atmospheric organic compounds
- Absorptive partitioning of organic compounds between the gas and the aerosol phases
- Activity coefficient of organic compounds in aerosol
- Adsorptive partitioning
- Gas/Particle sampling
- Application of physicochemical parameters,
- Condensation and evaporation of organic compounds
- Particle heterogeneous chemistry;
- Aerosol growth,
- Nucleation;
- Particle coagulation
- Inorganic thermodynamics;

Materials and Supply Fees: none

Recommended Materials

Seinfeld and Pandis, Atmospheric Chemistry and Physics

Chemistry of the Upper and Lower Atmosphere, Finlayson-Pitts and Pitts Jr., Academic Press, 1999

Atkins, Physical chemistry

Carey, Advanced organic chemistry

Sandler, Models for thermodynamics and phase equilibria calculation

Schwarzenbach, Environmental Organic Chemistry

Allen Barton, CRC Handbook of solubility parameters and other cohesion parameters

Murov, Carmichael, and Hug, Handbook of photochemistry

Course Schedule

Wk	Mo	Date	Topics	HW and Exam	Comments
1	Aug.	31	Background. Kinetics: order, unit, oxidants	HW 1	HW1
	Sep	2	Gas-Particle Partitioning: experimental methods		
		4	type of reactions, characteristic time		
2		7	Labor day (no class)		
		9	Solving questions		HW 1 due
		11	Multiphase reaction of air pollutants	HW 2	
3		14	Multiphase reaction of air pollutants		
		16	Solving question		HW 2 due
		18	PM Compositions	HW 3	
4		21	PM Compositions		
		23	Photochemical reactions in particle phase		
		25	Photochemical reactions in particle phase		
5		28	Solving Question		HW 3 due
		30	Source Apportionment		Exam 1
	Oct.	2	No class (Home coming day)		
6		5	No class (conference)		
		7	No class (conference)		
		9	Source Apportionment		
7		12	Thermodynamics, Vapor pressure	HW4	
		14	Thermodynamics, Vapor pressure		
		16	application of VP to Kp, PAHs		HW 4 due
8		19	Solving Question		
		21	Activity coefficient of organics in particles	HW5	
		23	Activity coefficient of organics in particles		
9		26	Exam 1		
		28	Activity coefficient of organics in particle: Hansen method		HW5 due
		30	Activity coefficient of organics in particle: UNIFAC		Project title and abstract
10	Nov.	2	Activity coefficient of organics in particle: UNIFAC	HW 6	
		4	Adsorption and absorption partitioning		
		6	Adsorption and absorption partitioning		HW 6 due
11		9	pK _a and pK _{BH+} of organic and inorganic compounds Acidity of particle	HW 7	
		11	No class (Veterans day)		
		13	pK _a and pK _{BH+} of organic compounds, aerosol acidity		
12		16	pK _a and pK _{BH+} of organic compounds, aerosol acidity		
		18	Heterogeneous reactions of organics in particles. reaction time scale, mass transfer, aerosol growth		
		20	Kelvin effect		
13		23	Solving Question		HW 7 due
		25	Thanks Giving		
		27	Thanks Giving		
14		30	Inorganic thermodynamics		
	Dec.	2	Inorganic thermodynamics		
		4	Exam II		
15		7	Project presentation		
		9	Project presentation		
		11			Project report

Online Course Recording

Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

Attendance Policy, Class Expectations, and Make-Up Policy

The attendance is required. During the class, turnoff cellphone. You will participate on solving question in class. Excused absences must be in compliance with university policies in the Graduate Catalog (<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#attendance>) and require appropriate documentation.

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Homework Sets (7)	100 each	30%
Two Exam	100	40%
Project	100	30%
		100%

Homework: Please see the class schedule for homework assignments. In Class, Dr. Jang will ask a student to demonstrate how to solve homework questions. Students will use excel for homework submission.

Exam Policy: Take home. The example will begin at 8:30AM and the students will submit their answer to the e-learning system by 8PM in the same day.

Presentation: Each student will present their project to the class at the end of the semester. A **2-Page Proposal** should be submitted to Dr. Jang by **October 30, 2020**. A technical report (no more than 15 pages including reference, Figures and Tables, 1.5 lines spacing, 12 point in Times New Romans, 1 inch margin on each side) should be submitted by the due data (see schedule). Your power point materials should be submitted before the presentation (at least 24 hrs earlier than your presentation).

Grading Policy

Percent	Grade	Grade Points
90	A	4.00
87.0 - 89.9	A-	3.67
84.0 - 86.9	B+	3.33
80.0 - 83.9	B	3.00
77.0 - 79.9	B-	2.67
74.0 - 76.9	C+	2.33
70.0 - 73.9	C	2.00
67.0 - 69.9	C-	1.67
64.0 - 66.9	D+	1.33
60.0 - 63.9	D	1.00
57.0 - 59.9	D-	0.67
0 - 56.9	E	0.00

More information on UF grading policy may be found at:

<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades>

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.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-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://sccr.dso.ufl.edu/policies/student-honor-code-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 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:

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://care.dso.ufl.edu>.

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