CEE 4330 – AIR POLLUTION ENGINEERING
FALL 2019 SYLLABUS

Instructor: Jennifer Kaiser
3224 ES&T
jennifer.kaiser@ce.gatech.edu

Lecture: TR 1:30-2:45; Skiles 154

Office Hours: MF 11:00-12:00, or by appointment

Prerequisites: CHEM 1310, PHYS 2211

Textbook: *Air Pollution Control: A Design Approach 4th Edition;* C. David Cooper and F. C. Alley. Additional readings and assignments from *Introduction to Atmospheric Chemistry*; D. J. Jacob, available for free online at http://acmg.seas.harvard.edu/people/faculty/djj/book/.

Description: Introduction to the physical and chemical processes affecting the dynamics and fate of air pollutants at the local, regional, and global scales. Particular emphasis is on tropospheric pollutant chemistry and transport.

Educational Objectives: The course is designed to introduce students to fundamental principles needed to address air pollution engineering. Upon completion of this course, the student should have knowledge of the air pollutants of most concern, their source and control, their atmospheric transport and fate, and policies developed to help manage the problem.

Grading:		
	Homeworks (5)	25%
	EPA EmPOWER challenge	10%
	Participation Quizzes	3%
	Exams (2 midterms; optional final)	62%

Scale:		
	A	≥85%
	B	70-85%
	C	60-70%
	D	50-60%
	F	<50%

Homework: It is anticipated that five homework sets will be assigned during the semester. You may work alone or in groups to complete the homework assignments, but you should solve each problem yourself. If you do work in groups, write group member names at the top of your solution. Homework will be collected at the start of class on the day that it is due. No homework assignments will be accepted late unless a prior arrangement has been made with the instructor.

EPA EmPOWER challenge: Students will work with real data from the EPA to produce an online report documenting the emissions trends and control strategies for a single power plant. While this project involves group-work, students are graded on an individual basis and class time will be dedicated for group meetings.

Participation/attendance is expected as we will discuss current events and recent advances in air pollution science/engineering of air pollution. This material is not covered on homeworks or graded on exams, but composes an important part of a complete education. Attendence is therefore graded through random 'participation quizzes'. Submitted quizzes receive a grade of 100%.

Exams: Two midterm exams and a final exam will be given during the semester. Exams are closed book and closed notes, equations will be provided by the instructor, and you will need a calculator.

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Academic Integrity: Students in this class are expected to abide by the Georgia Tech Honor Code (http://www.honor.gatech.edu/) and to avoid any instances of academic misconduct, including but not limited to:

1 Possessing, using, or exchanging improperly acquired written or oral information in the preparation of homework, class project, and exams.
2 Use of material that is wholly or substantially identical to that created or written by another individual or group.
3 False claims of performance or work that have been submitted by a student.

Any student suspected of cheating or plagiarizing on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Accommodations for Students with Disabilities: If you are a student with learning needs that require special accommodation, contact the Office of Disability Services at (404)894-2563 or http://disabilityservices.gatech.edu/, as soon as possible, to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

This course is part of Georgia Tech's **Serve-Learn-Sustain (SLS)** initiative, which provides students with opportunities to combine their academic and career interests with their desire to make worthwhile contributions to the world and build sustainable communities where people and nature thrive, in Georgia, the United States, and around the globe. More information about SLS can be found at www.serve-learn-sustain.gatech.edu. Visit the website to sign up for the SLS Email List, view the full list of affiliated courses and projects, and find links to Facebook, Instagram and Twitter.

SLS Student Learning Outcomes:

1. Students will be able to identify relationships among ecological, social, and economic systems
2. Students will be able to demonstrate skills needed to work effectively in different types of communities.
3. Students will be able to evaluate how decisions impact the sustainability of communities.
4. Students will be able to describe how they can use their discipline to make communities more sustainable.

Tips for success:

1.) **Read** the assigned textbook material before class.
2.) **Homework** should not be attempted in a single sustained effort. Start working on it when it is posted.
3.) **Exams** include short answer and quantitative questions (~30/70 breakdown). In general, study to understand both the *context* and the *methods* of the quantitative problems worked in class and on the homework. Previous exams will be made available, though the material covered may vary substantially from previous years.
4.) **Communicate** any questions or concerns early, by email or in person.

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date	topic		text*	online**	Due
20-Aug		Introduction to air pollution	Ch 1.1,2,4,8,9		
22-Aug	Particle Control	Atmospheric composition units, PM formation/properties	Ch 1.5-6; Ch 3.1-2	Ch 1,8	
27-Aug		Particle motion and gravitational settlers	Ch 3.3-4		HW 1
29-Aug		Particle Control: cylones, ESPs, filters, scrubbers	Ch 4-7, sections 1-3		
3-Sep		Practice problems: Particle control			
5-Sep	Gas Control	Properties of gases and vapors	Ch10	Ch 9	HW 2
10-Sep		VOCs, Incinerators	Ch 11		
12-Sep		Adsorption/absorption	Ch 12,13		
17-Sep		SO2 control	Ch 15		
19-Sep		NOx stationary controls	Ch 16		
24-Sep		Mobile sources	Ch 18		
26-Sep		Practice problems: Gas control			HW 3
1-Oct		Exam 1			
3-Oct	Working with real data	Return exam, EmPower project intro			
8-Oct		EmPower guest lecture and class time			
10-Oct		EmPower class time			
15-Oct		Fall break			
17-Oct	Ambient Air Quality	Measuring emissions and air quality			EmPower plans
22-Oct		Ozone chemistry	Ch 19, section 5	Ch 11,12	
24-Oct		Meteorology	Ch 19, sections 1-4; 6	Ch 4	
29-Oct		Box models		Ch 3	
31-Oct		Dispersion models	Ch 20		
5-Nov		Practice problems: Ambient AQ			
7-Nov	Topics in global air pollution	Global AQ Topics: Biomass burning, Cookstoves, the ozone hole, etc		Ch 10	HW 4
12-Nov		Climate change: Radiative forcing, AQ feedbacks		Ch 7	EmPower due to reviewers
14-Nov		Climate change: Engineering approaches	Ch 22		
19-Nov		Practice problems: Global pollution (in class homework 5)			HW 5; EmPower feedback
21-Nov		EmPower class time; Exam 2 review			
26-Nov		Exam 2			EmPower finalized
28-Nov		Thanksgiving holiday			
3-Dec		Return exam, course grades			
12-Dec		Final exam (optional)	Monday, 2:40-5:30		

*Cooper and Alley **Jacob, http://acmg.seas.harvard.edu/people/faculty/djj/book