CEE 6390 Air Pollution Formation and Control

Instructor: Da Pan (da.pan@ce.gatech.edu)

Delivery: In-person lectures, T/TH 3:30 - 4:45 pm, Clough 323

Office Hours: Tuesday 2:15 - 3:15 pm or by appointment, ES&T 3222

Description

Analysis of air pollutant formation and control through study of radical reaction pathways, combustion chemistry, and removal of particles and gaseous pollutants from gas streams.

Course Learning Objectives

CEE 6390 is designed to help you develop skills to ***analyze air pollution formation pathways and evaluate pollution control methods***. These skills will enable you to identify sources and factors responsible for air pollution and devise control strategies. You will learn:

- ***Ozone and particulate matter formation and emerging pollutants (e.g., HAPs and microplastics)***
- ***Combustion and evaporative processes and emissions***
- ***Source identification and impact assessment***
- ***Design of emission control devices***

Materials

Textbooks are not required, but you might find the following helpful:

Sources and Control of Air Pollution by R.J. Heinsohn and R.L. Kabel

Air Pollution Control: A Design Approach by C.D. Cooper and F.C. Alley

Grading

- Preview Quizzes (4) 20%
- Problem Sets (3): 30%
- Paper and Presentation: 30%
- Exams (1): 20%
- Grading Scale: A: ≥ 85%, B: 75 - 84%, C: 65 - 74%, D: 50 - 64%

Preview Quizzes: Four short quizzes will be administered at the beginning of each module with accompanying video materials. These are designed to ensure you are familiar with the upcoming topics.

Problem Sets: Designed to build and test deeper understanding, ***problem sets are more detailed than the exams***. You may work alone or in groups, but individual solutions are required. If you work in groups, provide group member names.

Paper and Presentation: A three-page paper and a 12-minutes presentation as an end-of-semester project. ***You will select a state/country and a pollutant of interest and apply the skills learned.***

Exams: Exams are in-person and closed-note/book/internet/phone.

Late Assignments and Rescheduled/Missed Exams

Late work is not accepted to allow timely posting of solution sets. However, each student is allowed one "late" pass: you may submit one problem set up to 48 hours late with no penalty. Do not email me to use your late pass—no explanation or accounting is needed.

For further extensions or multiple assignment extensions due to exceptional circumstances, contact the Office of Student Life. Medical information should not be emailed directly to the professor.

Alternative exam times can be scheduled with the instructor as necessary.

Participation

Participation is crucial to your learning. There will be ample opportunities for discussion and questions. Additionally, there are ***dedicated class periods*** where you will work with peers or me on shorter, ***exam-type practice problems*** to ensure you are keeping up with the material.

Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. For more information on Georgia Tech's Academic Honor Code, please visit Georgia Tech Academic Honor Code or Student Code of Conduct.

Students are expected to abide by the Georgia Tech Honor Code and avoid academic misconduct, including but not limited to (a) distributing course materials to individuals not in the class, (b) possessing, using, or exchanging improperly acquired information in the preparation of problem sets and exams, and (c) using material created or written by another individual (including AI) without reference. Any student suspected of misconduct will be reported to the Office of Student Integrity.

Accommodations for Students with Disabilities

If you have learning needs that require special accommodation, contact the Office of Disability Services at (404) 894-2563 or disabilityservices.gatech.edu as soon as possible to make an appointment to discuss your needs and obtain an accommodations letter. Please also email me to set up a time to discuss your learning needs.

Student-Faculty Expectations Agreement

At Georgia Tech, we strive for an atmosphere of mutual respect, acknowledgment, and responsibility between faculty members and students. See the Student-Faculty Expectations Agreement for basic expectations. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. I encourage you to remain committed to the ideals of Georgia Tech while in this class.

Class Schedule

Module 1: Pollution Formation	Wk1-T	19-Aug	Air Pollution: Health & Policy	CO_2 Sensor Demo
	Wk1-TH	21-Aug	Radical Reactions	Preview Quiz 1
	Wk2-T	26-Aug	Thermochemistry	
	Wk2-TH	28-Aug	O_3 Formation & Modeling	
	Wk3-T	2-Sep	Practice Problems 1	F0AM Demo
	WK3-TH	4-Sep	PM Size & Composition	
	Wk4-T	9-Sep	Secondary PM Formation & Modeling	ISORROPIA Demo
Module2: Emission Processes	Wk4-TH	11-Sep	Combustion Processes & Emissions	PS1 Due 12-Sep
	Wk5-T	16-Sep	Engine & Petroleum Industry Emissions	
	Wk5-TH	18-Sep	Evaporative Processes & Emissions	Preview Quiz 2
	Wk6-T	23-Sep	Biogenic, Agricultural, & Wildfire Emissions	
	Wk6-TH	25-Sep	Practice Problems 2	NEI Demo
	Wk7-T	30-Sep	Emerging Pollutants: HAPs & Microplastics	
	Wk7-TH	2-Oct	Review	PS2 Due 3-Oct
	Wk8-T	7-Oct	Fall Break	
	Wk8-TH	9-Oct	Exam	
Module 3: Control Devises	Wk9-T	14-Oct	Condensation & Sorption	
	Wk9-TH	16-Oct	Thermal & Catalytic Oxidation	Preview Quiz 3
	Wk10-T	21-Oct	PM Motion & Settling	
	Wk10-TH	23-Oct	Primary PM Controls	
	Wk11-T	28-Oct	Practice Problems 3	
	Wk11-TH	30-Oct	Emerging Control Technologies	PS3 Due 31-Oct
Module 4: Control Strategies	Wk12-T	4-Nov	Regulations & Control Strategies	
	Wk12-TH	6-Nov	Pollutant Transport & Dispersion	Preview Quiz 4
	Wk13-T	11-Nov	Source Identification & PMF Model	
	Wk13-TH	13-Nov	Practice Problems 4	PMF Demo
	Wk14-T	18-Nov	Advanced Monitoring & Modeling	
	Wk14-TH	20-Nov	Regulatory Debate	
	Wk15-T	25-Nov	Project Work Session	
	Wk15-TH	27-Nov	Thanksgiving Break	
	Wk16-T	2-Dec	Project Presentations	Paper Due 5-Dec