

CEE 8813: Remote Sensing of Atmospheric Composition Spring 2021 Syllabus

Class meets: Mondays and Wednesdays, 11:00-12:15, ES&T 1175 | <https://bluejeans.com/8469846087>

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Description: This course is designed to introduce students to the fundamentals of remote sensing of atmospheric composition and recent advances in earth science products. Students will complete a series of projects using satellite data to explore the response of atmospheric composition to specific events and general trends in the earth system.

Educational Objectives: Upon completion of this class, students will have:

- gained a basic understanding of remote sensing strategies
- developed programming and data manipulation skills needed for visualizing satellite-based observations
- acquired analytical skills for interpreting these measurements in the context of their uncertainty
- gained experience applying the datasets to explore short-term and long-term changes in atmospheric composition

Prerequisites: Students are expected to have a basic understanding of atmospheric composition and air pollution. Students may use any programming language of their choice (python, MATLAB, IDL, etc.), but the instructor will present all examples in MATLAB, and only assist with MATLAB troubleshooting.

Textbook: No textbook is required for this course.

Course Structure: This course will be offered in a hybrid format, with 3 modes of instruction, as specified below.

- *Lectures:* All lectures will be recorded and can be viewed asynchronously or in real time.
- *Discussion:* Participation in discussions, either in-person or remote, is mandatory. You should read the assigned journal article before attending the discussion. You should expect to voluntarily participate in the discussion. Nonparticipation in discussions will be noted and will impact project grades.
- *Project lab:* The instructor will be present in the classroom and on bluejeans during lab sessions to offer trouble-shooting help. In-person attendance is not mandatory and may be limited by classroom capacity.

Grading: 90+ = A; 80+ = B; 70+ = C; 60+ = D.

- *Labs 1-5:* 10% each, totaling 50%
- *Final lab:* 50%

Late Work: A 10% penalty will be applied for each day an assignment is late, topping out at a 50% deduction after 5 days. Please communicate with me 48h in advance if there are valid reasons your work may be delayed.

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/> to make an appointment to discuss your needs and 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.

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) Use of material that is substantially identical to that created or written by another individual (2) False claims of performance or work that have been submitted by a student. Any student suspected of academic misconduct will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Course Schedule:

	Date	Topic	Lecture	Discussion	Lab
Intro	20-Jan	Introduction: Course expectations and objectives		x	
	25-Jan	Introduction: Earth-viewing strategies; Making good figures	x		
Project 1	27-Jan	UV/Vis DOAS fundamentals	x		
	1-Feb	UV/Vis DOAS: NO ₂ recent literature/advances		x	
	3-Feb	Project lab: TROPOMI NO ₂ data			x
	8-Feb	Project lab: TROPOMI NO ₂ data			x due
Project 2	10-Feb	Thermal IR fundamentals	x		
	15-Feb	TIR: NH ₃ recent literature/advances		x	
	17-Feb	Project lab: CrIS NH ₃ data			x
	22-Feb	Project lab: CrIS NH ₃ data			x due
Project 3	24-Feb	Imaging fundamentals	x		
	1-Mar	Imaging: AOD recent literature and advances		x	
	3-Mar	Project lab: MODIS AOD/fire product			x
	8-Mar	Project lab: MODIS AOD/fire product			x due
Project 4	10-Mar	LIDAR fundamentals			
	15-Mar	LIDAR: Aerosol extinction literature and advances	x		
	17-Mar	Project lab: CALIPSO Aerosol extinction data		x	x
	22-Mar	Project lab: CALIPSO Aerosol extinction data			x due
	24-Mar	--Instructional break: No classes, assignments, or assessments--			
Project 5	29-Mar	Combining orbital and suborbital observations	x		
	31-Mar	Recent large-scale validation/calibration efforts		x	
	5-Apr	Project lab: satellite validation/calibration			x
	7-Apr	Project lab: satellite validation/calibration			x due
Final Project	12-Apr	Project scoping: Pairing science questions & analysis techniques		x	
	14-Apr	Final project lab: Project scoping			x due
	19-Apr	Final project lab: One-on-one project scoping meetings			x
	21-Apr	Final project lab			x
	26-Apr	Final project lab: 8 minute talks		x due	

Tips for success:

- 1.) Take notes during the lecture. While there are no quizzes/exams, the information will be useful in the projects (and hopefully in your post-class future!)
- 2.) Prepare for the discussion at least 24 h in advance. Ask yourself:
 - What is the main point of this article?
 - How does this article build on previously published literature (as summarized in the introduction)?
 - Do I understand the methods? What are the limitations to the methods?
 - Are the conclusions supported by their analysis?
 - What would be the next steps?
 - Where else could this method be applied?
- 3.) Do not expect to finish the project labs in a single effort. You will need class time and then some. Use class time to ask for help from me and others.
- 4.) Keep track of your code. You will be able to reuse snippets you wrote from one lab for the next lab. You're building a toolbox throughout the semester. This also means that if you fall behind, it will be hard to catch up.

Resources for Students

In your time at Georgia Tech, you may find yourself in need of support. Below you will find some resources to support you both as a student and as a person.

Academic support

- Center for Academic Success <http://success.gatech.edu>
 - 1-to-1 tutoring <http://success.gatech.edu/1-1-tutoring>
 - Peer-Led Undergraduate Study (PLUS) <http://success.gatech.edu/tutoring/plus>
- OMED: Educational Services (<http://omed.gatech.edu/programs/academic-support>)
 - Group study sessions and tutoring programs
- Communication Center (<http://www.communicationcenter.gatech.edu>)
 - Individualized help with writing and multimedia projects
- Advising and Transition (<https://advising.gatech.edu>)
 - Study Strategies Seminar course <https://advising.gatech.edu/gt2801-study-strategies-seminar>
 - Academic coaching <https://advising.gatech.edu/academic-coaching>
 - Advising in your major <http://advising.gatech.edu/>

Personal Support

Georgia Tech Resources

- The Office of the Dean of Students: <https://studentlife.gatech.edu/content/get-help-now>; **404-894-6367**;
Smithgall Student Services Building 2nd floor
 - You also may request assistance at https://gatech-advocate.symplicity.com/care_report/index.php/pid383662?
- Center for Assessment, Referral and Education (CARE) **404-894-3498**; <https://care.gatech.edu/>
 - Smithgall Student Services Building 1st floor
 - Students seeking assistance from the Counseling Center or Stamps Psychiatry need to visit CARE first for a primary assessment and referral to on and off campus mental health and well-being resources.
 - *Students in crisis may walk in during business hours (8am-4pm, Monday through Friday) or contact the counselor on call after hours at 404-894-2575 or 404-894-3498. Other crisis resources: <https://counseling.gatech.edu/content/students-crisis>*
- Students' Temporary Assistance and Resources (STAR): <https://studentlife.gatech.edu/content/star-services>
 - Can assist with interview clothing, food, and housing needs.
- Stamps Health Services: <https://health.gatech.edu>; **404-894-1420**
 - Primary care, pharmacy, women's health, psychiatry, immunization and allergy, health promotion, and nutrition
- OMED: Educational Services: <http://www.omed.gatech.edu>
- **Women's Resource Center: <http://www.womenscenter.gatech.edu>; 404-385-0230**
- **LGBTQIA Resource Center: <http://lgbtqia.gatech.edu/>; 404-385-2679**
- **Veteran's Resource Center: <http://veterans.gatech.edu/>; 404-385-2067**
- **Georgia Tech Police: 404-894-2500; <http://www.police.gatech.edu>**

National Resources

- The National Suicide Prevention Lifeline | 1-800-273-8255
 - Free and confidential support 24/7 to those in suicidal or emotional distress
- The Trevor Project
 - Crisis intervention and suicide prevention support to members of the LGBTQ+ community and their friends
 - Telephone | **1-866-488-7386** | 24 hours a day, 7 days a week
 - Online chat | 24 hours a day, 7 days a week
 - Text message | Text "START" to **687687** | 24hrs day, 7 days a week