EAS 6145: Remote Sensing of the Atmosphere and Oceans

Instructor
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Office Hours
M 3-4pm, W 3-5 pm

Lecture
MWF 1:55-2:45 pm,
ES&T 1116

Course Overview

This course provides a foundation for understanding the physical principles of remote sensing of the atmosphere and oceans. The main goal of the course is to build a broad conceptual framework for physical understanding the methodology and various applications of remote sensing in studying the atmosphere and oceans.

Required Texts

Remote Sensing of the Lower Atmosphere: An Introduction
Stephens G. Oxford Univ. Press 1994.

Supplementary Text

A First Course in Atmospheric Radiation.
Petty G.W., Sundog Publishing. Second Edition.

Further Reading

An introduction to atmospheric radiation.
Liou, K.N., Academic Press, Second Edition, Chapter 7, 2002.

Satellite meteorology: An Introduction.
Kidder S.Q. and Vonder Haar T.H., Academic Press, 1995.

Physical principles of remote sensing.
Rees W.G., Cambridge Univ. Press, Second Edition, 2001.

Introduction to the physics and techniques of remote sensing.
Elachi, C. New York : Wiley, 1987

Remote sensing: Principles and interpretation.
Sabins, F.F., 1997.

Resources

Class website: Syllabus, course schedule, and lecture notes will be provided here:

http://irina.eas.gatech.edu/EAS6145_Fall2019/Default.aspx

Online Tutorials

Canada Centre for Remote Sensing (CCRS) remote sensing tutorial:
http://www.nrcan.gc.ca/earth-sciences/geomatics/satellite-imagery-air-photos/satellite-imagery-products/educational-resources/9309

NASA remote sensing tutorial:
http://fas.org/irp/imint/docs/rst/
Univ. of Illinois tutorial: remote sensing for meteorology:
http://ww2010.atmos.uiuc.edu/(Gh)/guides/rs/home.rxml

Univ. of Wisconsin tutorial: Satellite Observations in Science Education:
https://www.ssec.wisc.edu/sose/index.html

Course Goals and Learning Outcomes

Upon completion of this course you should be able to:

- Describe how electromagnetic radiation physically interacts with the atmosphere and oceans
- Summarize different passive and active remote sensing techniques
- Identify and interpret remote sensing datasets to support your research goals
- Critique the quality of a dataset based on the remote sensing technique used in the measurement

Components of the Course

Reading: Readings will be assigned from the required text or provided through supplementary text chapters, journals or website links. The readings associated with each lecture are given in the course schedule. These readings should be completed BEFORE each lecture.

Lecture: Lectures are developed to provide the most critical material.
Lecture notes will be posted before the lectures (in PDF format) at the course website.

Computer Modeling Laboratories: Will be posted at the course website and available online. Your written report will be due one week after the in-class lab. Each students two lowest lab grades will be dropped from their final grade.

Exams: A mid-term and final (cumulative) will be given. There will be reviews with example problems given in the lecture prior to the exam date. The dates of the exams can be found on the course schedule.

Research Project: The goal of the research project is gain experience with analysis and interpretation of remote sensing data as means to answer a well-defined research problem.

A research plan must be prepared by students and discussed with and approved by the instructor. Students should select a topic that is as close as possible to their graduate research. Deadline for the project's title and abstract is by the end of the third week of class.

Research projects must be prepared as a research paper and presented orally in class. Presentations will be scheduled for the last full week of class.

General guidelines for preparing your class project:
1) Define a topic of your project by selecting a specific atmospheric or oceanic parameter and remote sensing technique(s) used to retrieve this parameter.
E.g. characterization of ozone from OMI observations.

2) Identify and study at least 3-5 papers dealing with the selected topic.

3) Perform an original analysis of the remote sensing data in a well-defined problem.
E.g. interannual variability of O_3 over North America.

4) Your paper (about 20 – 25 pages) should show:

- the importance of the atmospheric or oceanic parameter selected
- brief description of a remote sensing instrument
- explanation of a retrieval algorithm
- results of your analysis
- validation of retrieved data against independent measurements and/or modeling
- brief summary (e.g., advantages and disadvantages of the retrieval technique, etc.)

Evaluation

Grades will breakdown as follows:

Exams (2)	30%
Computer Modeling Labs (10)	40%
Research Project (1 written, 1 oral)	30%

Your final grade will be assigned as a letter grade according to the following scale:

A	90-100%
B	80-89%
C	70-79%
D	60-69%
F	0-59%

Extensions, Late Assignments, Rescheduled/Missed Exams

Unless other arrangements have been made in advance, the student is expected to submit their assignments when due and sit for all scheduled exams. If an assignment due date or test date is missed due to illness, a doctor's note documenting the illness at the time of the due date or exam is required to reschedule.

Collaboration and Group Work

You may work with classmates to complete the computer modeling labs, but each student must hand in their own lab write-up. Research projects (papers and presentations) are to be completely individually.

Getting Help with the Course

If you feel comfortable, please ask questions about your assignments and exams in class or recitation. There is a good chance that your classmates have similar questions, so it saves time to have a group discussion. Should you need individual help, stop by my office hours (posted at the top of this syllabus) or email me to make an appointment. If you have a quick question that doesn't need to be answered in person, please feel free to email me. There are also various academic support services available through Georgia Tech including: the Library, the Communication Center, OMED: Educational Services. Academic and student health resources can be found here: http://ctl.gatech.edu/sites/default/files/documents/campus_resources_students.pdf

Student-Faculty Expectations Agreement

At Georgia Tech we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. See http://www.catalog.gatech.edu/rules/22/ for an articulation of some basic expectation that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

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.

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 information on Georgia Tech's Academic Honor Code, please visit http://www.catalog.gatech.edu/policies/honor-code/ or http://www.catalog.gatech.edu/rules/18/.

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.