Atmospheric Dynamics Practicum
EAS 4656 (1 Credit Hour)
Fall 2022

Lecture Meeting Times: Fridays from 12:30 – 3:15 PM
Lecture Location: L1118 Ford ES&T

Instructor: Dr. Zachary Handlos
Office: 1251 Ford ES&T Building
Office Hours: 12-2 PM EDT Mondays and Wednesdays or via appointment (in-person or virtual)
Email: zachary.handlos@eas.gatech.edu

TA: Susan Harrison
Office Hours: By appointment
Email: sharrison49@gatech.edu

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*****Statement about Wearing Masks*****

You are **strongly encouraged** to wear a mask within campus buildings **regardless of your vaccination status**.

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*****COVID-19 Statement*****

The best way to protect yourself from COVID-19 is to get vaccinated; more information about vaccination opportunities on campus can be found here: https://health.gatech.edu/coronavirus/vaccine

If you are experiencing a fever (i.e., temperature over 100°F), cold-like symptoms, sore throat, dry cough, flu or any other type of illness, DO NOT COME TO CLASS IN-PERSON. Please inform the course instructor ASAP if you will miss class due to illness.

COVID-19 campus guidelines: http://health.gatech.edu/coronavirus/campus-guidelines

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EAS 4656 Course Prerequisites:

- PHYS 2212 (ask Dr. Handlos about taking this course if you have not finished this course yet)
- MATH 2551
- MATH 2552

Course Description

If you are enrolled within this course, you are already aware of the goals of the course EAS 4655: Atmospheric Dynamics (and are likely enrolled in this course right now). You will quickly learn that the atmospheric dynamics course is highly math and physics intensive. While developing a strong skillset in solving applied math problems within the context of atmospheric science is beneficial to developing your logical skills, often students wonder what the point of doing all this math is for. For example, students,

including your course instructor when he took dynamics as an undergraduate student, wondered how this type of course was about the atmosphere despite a significant deficiency in weather maps, soundings, etc… While the lecture course cannot remedy this completely, this lab course you provide you opportunities to learn how to interpret meteorological data and apply your newly learned dynamical skills to meteorological observations and forecasts.

Course Topics

1) Interpreting weather maps and sounding data
2) Quantifying dynamical quantities within the context of understanding atmospheric science phenomena
3) Learning how to program in Python and/or MATLAB
4) Facilitating weather discussions and helping class learn how to point out key dynamical features in the "real-world"

Earth and Atmospheric Science Core Skill Development

The School of Earth and Atmospheric Sciences at Georgia Tech strives to meet several learning standards for all students within the undergraduate and graduate programs. These standards, and how they will be achieved in this course, are listed below:

1) Demonstrate **quantitative understanding** atmospheric dynamics theory
2) Develop **critical analysis** and **problem-solving skills** through course participation activities and assignments
3) Gain **practical experience** with **analyzing, interpreting and communicating** atmospheric dynamics material
4) Gain appreciation of the **interdisciplinary** nature of fluid dynamics
5) **Increase breadth of knowledge** within meteorology by developing foundational understanding of atmospheric dynamics theory

Grading

Your grade in this course will be based on your performance within the following categories:

- Top 9 of 10 lab assignments – 90% of grade
- WxChallenge – 10% of grade

Labs (90% of Grade)

You will have 10 lab assignments to complete this semester. Your top 9 scores will count towards your final grade (i.e., your lowest lab grade score will be dropped). Labs will provide opportunities to improve your weather analysis and forecasting skills. More details will be discussed with each lab assignment.

For one of the labs, you and 1-2 classmates will lead one weather discussions this semester. The goal of these discussions is to provide you experience with discussing real-time and forecasted weather information, which will require you to apply what you have learned from atmospheric dynamics towards helping the audience understand the "how" and "why" of weather. Being able to effectively communicate scientific information, especially meteorological information, to an audience is vital towards informing people about key weather events (especially when societal decisions depend on weather forecasts!). One person will lead the "observations/past weather" part of the discussion, while the second person will lead the "forecast." The course instructor will provide more information and resources to use for this discussion assignment.

WxChallenge (10% of Grade)
You will participate within the WxChallenge forecasting competition this semester. This is a national forecasting competition, where participants enter maximum/minimum temperature, maximum wind speed and precipitation values for a forecast city over a two-week period. Prizes are awarded for forecasters that receive the least number of error points.

In this course, you will be required to submit forecasts for all forecasting days for all cities during the competition this semester. At the completion of all 5 forecast cities for this semester, you will write a short reflection summarizing how well you did at forecasting, including discussion of your forecast strategies and how well they worked (or did not work).

Grading Scale
The **grading** for the course is as follows:

Grade	Percentage
A	100 – 90
B	89.99 – 80
C	79.99 – 70
D	69.99 – 60
F	<60

Depending on the distribution of student scores at the end of the course, the scores may be curved to reflect the scale described above (**up to the instructor's discretion**).

Late Work Policy
An assignment turned in late will be deducted 20% of its total grade for each day it is late after submitted. This policy will only be waived in extreme circumstances (e.g., serious illness, family emergency, COVID-19). **You must contact me at least 24 hours prior to the due date of any assignment if you anticipate any issues with submitting it on time.**

Course Canvas Page
All relevant materials to this course will be posted on Canvas.

Cheating
Cheating will not be tolerated in this course. Cheating includes the following: 1) copying answers from another student, 2) using unauthorized resources to study for course quizzes and assessments, which includes the use of electronic devices, 3) posting solutions to course quizzes and assessments on the Internet, and/or 4) any other activity that would be considered "academic misconduct".

To summarize, do not cheat; it is not worth jeopardizing your future because you wanted to look good doing something that you need to improve upon.

Academic Honor Code
The instructor and students are expected to abide by Georgia Tech's Academic Honor Code. Plagiarism of any kind (including the reproduction of materials found on the internet) is strictly prohibited and will be reported to the Office of Dean of Students for academic misconduct. The complete text of the Academic Honor Code may be found at:

https://policylibrary.gatech.edu/student-affairs/academic-honor-code

Access and Accommodations

If you anticipate or experience physical or academic barriers based on disability, you are welcome to let me know so that we can discuss options. You are also encouraged to contact the Office of Disability Services to explore reasonable accommodations.

The Office of Disability Services can be contacted by:

Phone: **404-894-2563**
Email: dsinfo@gatech.edu
Website: https://disabilityservices.gatech.edu/

Resources:

Academic Support

- Center for Academic Success
  - 1-to-1 tutoring
  - Peer-Led Undergraduate Study (PLUS)
  - Drop-In Tutoring
- OMED Educational Services - Group study sessions and tutoring programs
- Communication Center - Individualized help with writing and multimedia projects
- Academic Coaching
- Find Your Advisor for your major

Personal Support

Georgia Tech Resources

- The Office of the Dean of Students | **404-894-6367**
- Counseling Center | **404-894-2575** | Smithgall Student Services Building 2nd floor
  - Services include short-term individual counseling, group counseling, couples counseling, testing and assessment, referral services, and crisis intervention.
  - *Students in crisis may walk in during business hours (8am-5pm, Monday through Friday) or contact the counselor on call after hours at **404-894-2204**.*
- Stamps Health Services | **404-894-1420**
- OMED Educational Services| **404-894-3959**
- Women's Resource Center | **404-385-0230**
- LGBTQIA Resource Center | **404 385 4780**
- Veteran's Resource Center | **404-385-2067**
- Georgia Tech Police | **404-894-2500**

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

List of Course Topics*

Week	Atmospheric Dynamics Lecture Topics	Practicum Assignment
Week 1 (8/22/22 – 8/26/22)	Fundamentals	Assign Lab 1 – METAR analysis
Week 2 (8/29/22 – 9/2/22)	Statics	Lab 1 Due Assign Lab 2 – Surface and Upper Level Weather Map Analysis
Week 3 (9/5/22 – 9/9/22)	Kinematics	Lab 2 Due Assign Lab 3 – 2D Kinematic Flow Fields
Week 4 (9/12/22 – 9/16/22)	Kinematics	Lab 3 Due Assign Lab 4 – Soundings
Week 5 (9/19/22 – 9/23/22)	Dynamics in an inertial reference frame	Lab 4 Due Assign Lab 5 – NCEP/NCAR Reanalysis webpage
Week 6 (9/26/22 – 9/30/22)	Dynamics in a rotating reference frame	Lab 5 Due Assign Lab 6 – Plotting Weather Maps in Python
Week 7 (10/3/22 – 10/7/22)	Dynamics in a rotating reference frame	Lab 6 Work Time
Week 8 (10/10/22 – 10/14/22)	Balanced flows	Lab 6 Due Assign Lab 7 – Coriolis Force
Week 9 (10/17/22 – 10/21/22)	Balanced flows	Lab 7 Due Assign Lab 8 – Rotating Tank
Week 10 (10/24/22 – 10/28/22)	Balanced flows	Lab 8 Due Assign Lab 9 - WxDiscussion
Week 11 (10/31/22 – 11/4/22)	Quasi-geostrophic theory	Assign Lab 10: Case Study Lab 9: WxDiscussion Group A
Week 12 (11/7/22 – 11/11/22)	Quasi-geostrophic theory	Assign Case Study Project Lab 9: WxDiscussion Group B

Week 13 (11/14/22 – 11/18/22)	Quasi-geostrophic theory	Case Study Work Time Lab 9: WxDiscussion Group C
Week 14 (11/21/22 – 11/25/22)	THANKSGIVING BREAK (11/24-11/26) – NO LAB	THANKSGIVING BREAK (11/24-11/26) – NO LAB
Week 15 (11/28/22 – 12/2/22)	Introduction to atmospheric waves	Lab 10 Due

*Course topics subject to change