

METR 3210
ATMOSPHERIC THERMODYNAMICS
SPRING 2021

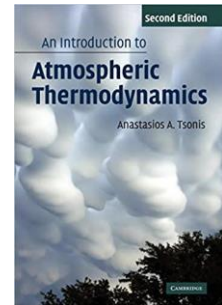
Instructor: Dr. Matthew Eastin
mdeastin@uncc.edu

Class Time: Monday / Wednesday at 2:30 – 3:45 pm
Class Location: Virtual (100% online - synchronous)

Office: Zoom meetings
Office Hours: By appointment

Teaching Assistant: None

Text (Required): **An Introduction to Atmospheric Thermodynamics**
Anastasios A. Tsonis
Cambridge University Press
2nd Edition



Course Description: The study of the physical processes associated with atmospheric thermodynamics and stability. Topics include atmospheric composition, equation of state, hydrostatics, first and second laws of thermodynamics for dry, moist, and saturated air, atmospheric stability, parcel buoyancy, and thermodynamic diagrams.

Course Student Learning Objectives (SLOs):

1. Apply the first and second laws of thermodynamics to both dry and moist air parcels.
2. Calculate dry and moist air parcel parameters from standard observations
3. Perform stability analyses using a Skew-T-log-P thermodynamic diagram

Programmatic Student Learning Objectives (SLOs):

1. Develop sufficient knowledge to describe, analyze, and forecast the three-dimensional structure, evolution, and dynamics of the atmosphere. (Meteorology – SLO1)

Course Policies:

Attendance and Participation: Attendance is essential to maintaining an effective learning environment. Regular class attendance and active participation is expected. **All virtual classroom cameras must remain on throughout each class period.** Use of cell/smart phones, email, texting, and/or personal music players during class is strictly prohibited.

Course Etiquette: Open and mutually respectful communication of varied opinions, beliefs, and perspectives during classroom or online discussion encourages the free exchange of ideas that is essential to higher learning and to the ability to learn from each other. Students are expected to display tolerance for others' views in the course. They are also to refrain from the use of any inappropriate language anywhere within the course.

Unwelcome conduct directed toward another person based upon that person's actual or perceived race, actual or perceived gender, color, religion, age, national origin, ethnicity, disability, or veteran status, or for any other reason, may constitute a violation of University Policy 406, The Code of Student Responsibility. Any student suspected of engaging in such conduct will be referred to the Office of Student Conduct.

Assignment Deadlines and Extra Credit: **I expect you to turn in assignments as scheduled** - except due to extraordinary circumstances or participation in a college sanctioned event. I will not accept late assignments. There will be **no individual extra credit**.

Exams: **All examinations will be administered online and occur as scheduled.** If you miss an exam for what you believe to be a valid reason, you must provide documentation for me to consider allowing a make-up. You are expected to adhere to the following procedures while taking these exams:

- You are to take the test by yourself; no group effort or help from outside people.
- You may NOT use your book and/or notes (unless explicitly directed to do so).
- You will have the full class period to complete each exam.
- You must remain seated in front of your virtual classroom camera throughout the exam.
- Your virtual classroom camera must remain ON throughout the exam.
- If your computer freezes, get back into the test as quickly as you can. As soon as you complete the test, send me an email detailing your problem.
- If you lose your ability to access the Internet during an exam, email me immediately when you have service, do not wait!

Academic Integrity: Students are responsible for knowing and following the UNCC Code of Student Academic Integrity <http://www.legal.uncc.edu/policies/ps-105.html> and the UNCC Code of Student Responsibility <https://legal.uncc.edu/policies/up-406> in all aspects of their work in this course. This code forbids cheating, fabrication or falsification of information, multiple submissions of academic work, plagiarism, abuse of academic materials, and complicity of academic dishonesty. Standards of academic integrity will be enforced in this course.

Accommodations: Students in this course seeking accommodations to disabilities must first consult with the Office of Disability Services and follow the instructions of that office for obtaining accommodations.

Copyright: My lectures and course materials, including videos, presentations, tests, exams, outlines, and similar materials, are protected by copyright. I am the exclusive owner of copyright in those materials I create. I encourage you to take notes and make copies of course materials for your own educational use. However, you may not, nor may you knowingly allow others to reproduce or distribute lecture notes and course materials publicly without my express written consent. This includes providing materials to commercial course material suppliers or similar services. Students who publicly distribute or display or help others publicly distribute or display copies or modified copies of an instructor's course materials may be in violation of University Policy 406, The Code of Student Responsibility.

Course Requirements:

Class Participation: Each student is required to attend class and actively participate (take notes, ask questions, and complete in-class activities) throughout the period. **All virtual classroom cameras must remain on throughout each class period.** Use of cell/smart phones, email, texting, and/or personal music players during class is strictly prohibited.

Homework: A total of eight homework assignments will be given. Each homework assignment will consist of in-depth exercises related to the current topic(s). You are required to show and/or explain your work on all homework assignments. **Access to a color printer is required.**

Exams: All exams will be given in class and will be closed book. There will be two exams during the semester (March 3 and April 12) and a cumulative final exam (TBD). The final exam day and time **may not** be rescheduled; plan your semester conclusion to accommodate the university-designated final exam time (see <http://registrar.uncc.edu/calendar-and-exam-schedules/exam-schedules>).

Evaluation:

The grading scale will be a standard percentile scale. Your final grade will be calculated using the following point distribution.

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Attendance and Participation	40	90-100	A
Homework (8 @ 20 pts. each)	160	80-89	B
Mid-Term Exams (2 @ 50 pts. each)	100	70-79	C
Cumulative Final Exam	100	60-69	D
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Total Points	400		

Tentative Class Schedule:

<u>Week</u>	<u>Date</u>	<u>Subject</u>	<u>Reading</u>
1	Mon 1/18	No Class – MLK Day	
	Wed 1/20	Introduction to the Course	Chapter 1
2	Mon 1/25	Equations of State and Gas Laws	Chapters 2 and 3
	Wed 1/27	Equations of State and Gas Laws	
3	Mon 2/01	First Law of Thermodynamics	Chapter 4
	Wed 2/03	First Law of Thermodynamics	
4	Mon 2/08	No Class – Spring Break	
	Wed 2/10	No Class – Spring Break	
5	Mon 2/15	Adiabatic Processes	
	Wed 2/17	Adiabatic Processes	
6	Mon 2/22	Thermodynamic Diagrams	Chapters 9.2 and 9.3
	Wed 2/24	Thermodynamic Diagrams	
7	Mon 3/01	Review	
	Wed 3/03	Exam 1	
8	Mon 3/08	Second Law of Thermodynamics	Chapter 5
	Wed 3/10	Second Law of Thermodynamics	
9	Mon 3/15	Phases of Water and Latent Heats	Chapter 6.1 and 6.2
	Wed 3/17	Phases of Water and Latent Heats	
10	Mon 3/22	Clausius-Clapeyron Equation	Chapters 6.3 and 6.4
	Wed 3/24	Clausius-Clapeyron Equation	
11	Mon 3/29	Water Vapor in the Atmosphere	Chapter 7
	Wed 3/31	Water Vapor in the Atmosphere	
12	Mon 4/05	Water Vapor in the Atmosphere	
	Wed 4/07	Review	
13	Mon 4/12	Exam 2	
	Wed 4/14	Hydrostatics	Chapter 8.1
14	Mon 4/19	Hydrostatics	
	Wed 4/21	Parcel Buoyancy and Atmospheric Stability	Chapter 8.2
15	Mon 4/26	Parcel Buoyancy and Atmospheric Stability	
	Wed 4/28	Stability Indices	
16	Mon 5/03	Stability Indices	
	Wed 5/05	Course Review	
17	Mon 5/10	Cumulative Final Exam (2:00 – 4:30 pm)	