

ATMOSSC 5950, ATMOSPHERIC THERMODYNAMICS

Autumn Semester 2020, 3 units, Call number: 13136

Lectures: MWF 1:50-2:45 PM, Derby Hall 140

In-Person Classes: Wed Cohort 2 (Last name beginning with H-Z), Fri Cohort 1 (with A-G)

Instructor: Prof. Jialin Lin

Email: lin.789@osu.edu This is the best way to reach me.

Telephone: 614-292-6634

Office: 1128 Derby Hall

Office Hours: Friday 3-5pm, or by appointment

Textbook: "Atmospheric Thermodynamics: Elementary Physics and Chemistry" (1st ed.) by G. North and T. Erukhimova (published by Cambridge University Press). (Ordered at the OSU bookstores.)

Reference Book: "Atmospheric Convection" (1st ed.) by K. Emanuel (published by Oxford University Press). (Ordered at the OSU bookstores.)

Course Objectives:

The basic objective of this course is to provide students with knowledge of the fundamentals of atmospheric thermodynamics. Thermodynamics deals with the processes that transfer energy and thermodynamic processes help to create and change atmospheric systems. Knowledge of the basic principles of thermodynamics and their interactions will facilitate students' comprehension of meteorological processes that determine the weather and climate of the Earth. Understanding thermodynamic processes is critical to accurate assessment of the current state of the atmosphere and to accurate evaluation of the output from numerical models of weather and climate. The four specific objectives of this course are: (1) to understand the basic principles of thermodynamics as they apply to dry air (i.e. air with no water vapor); (2) to understand the effects of the different phases of water on thermodynamic processes; (3) to determine how thermodynamic processes generate the observed structure of the atmosphere; (4) to examine how thermodynamic processes affect the stability of portions of the atmosphere.

Methods for accomplishing these objectives:

The objectives of the course will be accomplished through the lectures, in-class assignments, research project, and examinations. Determination of your final grade will be as follows:

In-class assignments and homeworks (11 total, will drop your worst score)	30%
Research project (Presentation 20%, Term Paper 20%)	40%
Three midterm exams (15% each, will drop your worst score)	30%

The grading scale is as follows: 100-93% A, 92-90% A-, 89-87% B+, 86-83% B, 82-80% B-, 79-77% C+, 76-73% C, 72-70% C-, 69-67% D+, 66-63% D, 62-60% D-, 59% and below E.

Academic Misconduct It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct

wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct (http://studentaffairs.osu.edu/info_for_students/csc.asp).

Disability Services Students with disabilities that have been certified by the Office for Disability Services will be appropriately accommodated, and should inform the instructor as soon as possible of their needs. The Office for Disability Services is located in 150 Pomerene Hall, 1760 Neil Avenue; telephone 292-3307, TDD 292-0901; <http://www.ods.ohio-state.edu/>.

Cell Phones Like on airplanes, interfere with navigation of the course, therefore, cell phones and pagers must be turned *OFF* during class as they interfere with the navigation of the course.

Health and safety requirements All students, faculty and staff are required to comply with and stay up to date on all university safety and health guidance (<https://safeandhealthy.osu.edu>), which includes wearing a face mask in any indoor space and maintaining a safe physical distance at all times. Non-compliance will result in a warning first, and disciplinary actions will be taken for repeated offenses.

Some Tips for Doing Well:

1. Pay special efforts to the in-class assignments and homeworks, which will help you to get solid skills in Atmospheric Thermodynamics.
2. Enjoy the research project.
3. Check the course website frequently for updates.
4. Relax and have fun.

The schedule may change, probably only slightly, as the class evolves. Instructor will alert students if/when schedule changes.

COURSE LECTURE OUTLINE

Date	LECTURE
08/26	Syllabus and course introduction
08/28	Lab: Instructions on Research Project
08/31	Introduction, Temperature
09/02	Introduction, Wind
09/04	Lab: Plot Soundings
09/07	Labor Day (NO CLASS)
09/09	Introduction, Global Maps
09/11	Lab: Plot Global Maps
09/14	Energy: Shortwave Radiation
09/16	Energy: Longwave Radiation
09/18	Lab: Stephen-Boltzmann Law
09/21	Energy: Turbulent Fluxes
09/23	Equation of State
09/25	Lab: Turbulent Fluxes
09/28	Hydrostatic Equilibrium
09/30	Hydrostatic Equilibrium
10/02	Lab: Equation of State and Hydrostatic Equilibrium
10/05	Midterm 1 Review
10/07	MIDTERM 1
10/09	Lab
10/12	Atmospheric Moisture
10/14	Lab: Plot Moisture Soundings
10/16	Autumn Break (NO CLASS)
10/19	Vapor Pressure
10/21	Vapor Pressure
10/23	Lab: Vapor Pressure
10/26	Mixing Ratio and Specific Humidity
10/28	Ideal Gas Law for Moist Air
10/30	Lab: Mixing Ratio and Specific Humidity
11/02	Midterm 2 Review
11/04	MIDTERM 2
11/06	Lab
11/09	Dry Static Energy and Potential Temperature
11/11	Veteran's Day (NO CLASS)
11/13	Lab: Dry Static Energy and Potential Temperature
11/16	Moist Static Energy

11/18 Equivalent Potential Temperature and Entropy
11/20 Lab: Moist Static Energy and Equivalent Potential Temperature

11/23 Convective Instability
11/25 Convective Instability
11/27 Lab: Convective Instability

11/30 Lab
12/02 Backup
12/04 Midterm 3 Review (**Term Paper Due**)

12/07 MIDTERM 3