ERSC305

Course Summary

Description

Course Description: This course will explore the fluid mechanical principles guiding the atmosphere and ocean on a global scale. We will examine the inherit variables in the equations of motion, hydrostatic equations, and balanced flow principles. An examination of the atmospheric general circulation will be discussed including vertical and horizontal structure of temperature, pressure and density as well as a discussion on the dynamics of convection. Ocean dynamics will be discussed including the air--ocean interaction, thermohaline circulation and ocean heat budget and transport. Prerequisite: ERSC206

Course Scope:

When examining the atmosphere, it is important to learn the fluid dynamics governing laws. The governing laws of fluid dynamics along with the thermodynamical properties and conservation of mass provide a complete explanation of physical phenomena of the atmosphere and oceans. This includes provide current state of the atmosphere as well as development of the prognostic equations of atmospheric state.

In this course, we will learn about the laws of motion, thermodynamic laws and properties of mass and apply them to the fluids of the atmosphere and oceans. This provides the foundation to understanding the atmosphere and the dynamical properties.

Objectives

After successfully completing this course, you will be able to

- CO-1 Interpret the thermodynamic equation (including dry/moist air and ocean properties).
- CO-2 Analyze the conservation of mass.
- CO-3 Apply the laws of motion including the equation of motion on a rotating sphere, geostropic wind, and thermal wind.
- CO-4 Examine the large-scale atmospheric energy and momentum budget.
- CO-5 Diagram the vertical distribution of temperature, pressure and density in both the atmosphere and ocean.
- CO-6 Illustrate the concept of hydrostatic balance for both the atmosphere and ocean.
- CO-7 Apply wind stress and Ekman layers.
- CO-8 Analyze the thermohaline circulation of the ocean.

Outline

Week 1: Characteristics of the Atmosphere and Ocean and Basic Forces

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Learning Objectives

COI5: Diagram the vertical distribution of temperature, pressure and density in both the atmosphere and ocean.

COI6: Illustrate the concept of hydrostatic balance for both the atmosphere and ocean

Readings

Holton, Chapter 1

Marshall and Plumb, Preface Chapter 1

Assignment

Introductions Forum Post and Week 1 Form

Week 1 Assignment

Week 2: Thermal structure of Atmosphere and Ocean

Learning Objectives

COI1: Interpret the thermodynamic equations (including dry/moist air and ocean properties)

COI2: Analyze the conservation of mass

Readings

Holton, Chapter 2 pages 42-54

Marshall and Plumb, Chapter 3 and Chapter 9.1

Assignment

Week 2 Form

Week 2 Assignment

Week 3: Atmospheric and Oceanic Equations of Motion

Learning Objectives

COI3: Apply the laws of motion including the equation of motion on a rotating sphere, geostrophic wind and thermal wind.

Readings

Holton, Chapter 2 pages 29-41, Chapter 3.

Marshall and Plumb, Chapter 9.2-9.4, Chapter 6 and Chapter 7

Assignment

Week 3 Form

Week 3 Assignment

Week 4: Mid-Term Exam

Learning Objectives
Readings
Assignment

Mid-Term Exam

Week 5: Atmospheric Energy and Momentum Budget

Learning Objectives

CO4: Examine the large-scale atmospheric energy and momentum budget

Readings

Holton, Chapter 4 pages 86-107 and Chapter 10.1-10.3

Marshall and Plumb, Chapter 8

Assignment

Week 5 Form

Week 5 Assignment

Week 6: Wind Stress and Ekman Layers

Learning Objectives

CO-7: Apply wind stress and Ekman layers

Readings

Marshall and Plumb, Chapter 10

Assignment

Week 6 Form

Week 6 Assignment

Week 7: Thermohaline Circulation

Learning Objectives

CO-8: Analyze the thermohaline circulation of the ocean

Readings

Marshall and Plumb, Chapter 11.

Assignment

Week 7 Form

Research Project

Week 8: Final Exam

Learning Objectives
Readings
Assignment

Final Exam

Evaluation

Reading Assignments:
Each week, there will be selected readings and additional videos/modules to view to gain an in-depth understanding. This information is listed within the weekly Lesson. The readings are required in order to be successful within the other graded assessments.

Forum Assignments:
Each week there will be a forum assigned that will be a place for students to ask a question that they found troubling and students are to respond to at least two other student's questions. Initial posts are due by Wednesday, with the responses due by Sunday. There will be no forum on weeks 4 and 8 to allow time to work on the exams.

It is important that the questions provide sufficient background and information so the person responding has enough information to provide you a detailed response. The responses should be thorough and answer the question while providing a citation to where the information was retrieved.

Weekly Assignment:
There is a weekly assignment each week (except Weeks 4, 7 and 8). This quiz contains short answer questions for that week's material. Make sure that the responses are thorough and detailed to ensure you sufficiently answer the question. Mid-Term and Final Exam The mid-term will cover material from weeks 1-4 and the final will cover material from weeks 5-8. These exams will be a combination of short answer and multiple choice. Research Project This research project will be outlined in detail in the Lessons section. This research project will be a collaborative case study type of assignment that will require working in groups and presenting the final results to the other students.

MidTerm and Final Exam
The mid-term will cover material from weeks 1-4 and the final will cover material from weeks 5-8. These exams will be a combination of short answer and multiple choice.

Research Project
This research project will be outlined in detail in the Lessons section. This research project will be a collaborative case study type of assignment that will require working in groups and presenting the final results to the other students.

Please see the Student Handbook to reference the University's grading scale.

Grading:

Name	Grade %
Forum	15.00 %

Week 1 Forum	1.88 %
Week 2 Forum	1.88 %
Week 3 Forum	1.88 %
Week 5 Forum	1.88 %
Week 6 Forum	1.88 %
Week 7 Forum	1.88 %
Week 4 Forum	1.88 %
Week 8 Forum	1.88 %
Weekly Assignment	25.00 %
Week 1 Assignment	5.00 %
Week 2 Assignment	5.00 %
Week 3 Assignment	5.00 %
Week 5 Assignment	5.00 %
Week 6 Assignment	5.00 %
Mid-Term Exam	20.00 %
Mid-Term Exam	20.00 %
Final Exam	20.00 %
Final Exam	20.00 %
Research Project	20.00 %
Research Project	20.00 %

Materials

Book Title: Atmosphere-Ocean Dynamics, 1st ed - e-book available in the APUS Online Library

Author: Gill, Adrian

Publication Info: Academic Press

ISBN: 9780122835223

Book Title: An Introduction to Dynamic Meteorology, Vol 88, 4th Ed - e-book available in the APUS Online Library; hard copy not available from the APUS Bookstore, please try other sources.

Author: Holton, James

Publication Info: Academic Press

ISBN: 9780123540157

Book Title: Atmosphere, Ocean and Climate Dynamics: An Introductory Text, 1st ed - e-book available in the APUS Online Library

Author: Marshall, John

Publication Info: Academic Press

ISBN: 9780125586917

Book Title: To find the library e-book(s) req'd for your course, please visit http://apus.libguides.com/er.php to locate the eReserve by course #. You must be logged in to eCampus first to access the links.

Author: N/A

Publication Info: N/A

ISBN: N/A

Required Technology

- See the Technology Requirements section of the undergraduate catalog for the minimum hardware and software requirements.
- Microsoft Office 365 is available to APUS students for free. To sign up, visit http://products.office.com/en-us/student. If you have questions about accessing the software, please contact Classroom support at classroomsupport@apus.edu.

Additional Resources

Wallace, John and Peter Hobbs (2006): *Atmospheric Science: An Introductory Survey. 2nd Edition*. New York, NY, Elsevier Academic Press.

Holton, James R. (2004): *An Introduction to Dynamic Meteorology 4th Edition*. New York, NY. Elsevier Academic Press.

Bluestein, Howard (1992): *Synoptic-Dynamic Meteorology in Midlatitudes*. New York, NY, Oxford University Press.

Marshall, John, and R. Alan Plumb (2008): *Atmosphere, Ocean, and Climate Dynamics: An Introductory Text*. New York, NY, Elsevier Academic Press.

Web Sites

In addition to the required course texts, the following public domain web sites are useful. Please abide by the university's academic honesty policy when using Internet sources as well. Note web site addresses are subject to change.

Site Name	Web Site URL/Address
COMET/MetED	www.meted.ucar.edu

Course Guidelines

Citation and Reference Style

- Attention Please: Students will follow the APA Format as the sole citation and reference style used in written work submitted as part of coursework to the University. Assignments completed in a narrative essay or composition format must follow the citation style cited in the APA Format.

Tutoring

- Tutor.com offers online homework help and learning resources by connecting students to certified tutors for one-on-one help. AMU and APU students are eligible for 10 free hours* of tutoring provided by APUS. Tutors are available 24/7 unless otherwise noted. Tutor.com also has a SkillCenter Resource Library offering educational resources, worksheets, videos, websites and career help. Accessing these resources does not count against tutoring hours and is also available 24/7. Please visit the APUS Library and search for 'Tutor' to create an account.

Late Assignments

- Students are expected to submit classroom assignments by the posted due date and to complete the course according to the published class schedule. The due date for each assignment is listed under each Assignment.
- Generally speaking, late work may result in a deduction up to 15% of the grade for each day late, not to exceed 5 days.
- As a working adult I know your time is limited and often out of your control. Faculty may be more flexible if they know ahead of time of any potential late assignments.

Turn It In

- Faculty may require assignments be submitted to Turnitin.com. Turnitin.com will analyze a paper and report instances of potential plagiarism for the student to edit before submitting it for a grade. In some cases professors may require students to use Turnitin.com. This is automatically processed through the Assignments area of the course.

Academic Dishonesty

- Academic Dishonesty incorporates more than plagiarism, which is using the work of others without citation. Academic dishonesty includes any use of content purchased or retrieved from web services such as CourseHero.com. Additionally, allowing your work to be placed on such web services is academic dishonesty, as it is enabling the dishonesty of others. The copy and pasting of content from any web page, without citation as a direct quote, is academic dishonesty. When in doubt, do not copy/paste, and always cite.

Submission Guidelines

- Some assignments may have very specific requirements for formatting (such as font, margins, etc) and submission file type (such as .docx, .pdf, etc) See the assignment instructions for details. In general, standard file types such as those associated with Microsoft Office are preferred, unless otherwise specified.

Disclaimer Statement

- Course content may vary from the outline to meet the needs of this particular group.

Communicating on the Forum

- Forums are the heart of the interaction in this course. The more engaged and lively the exchanges, the more interesting and fun the course will be. Only substantive comments will receive credit. Although there is a final posting time after which the instructor will grade comments, it is not sufficient to wait until the last day to contribute your comments/questions on the forum. The purpose of the forums is to actively participate in an on-going discussion about the assigned content.
- “Substantive” means comments that contribute something new and hopefully important to the discussion. Thus a message that simply says “I agree” is not substantive. A substantive comment contributes a new idea or perspective, a good follow-up question to a point made, offers a response to a question, provides an example or illustration of a key point, points out an inconsistency in an argument, etc.
- As a class, if we run into conflicting view points, we must respect each individual's own opinion. Hateful and hurtful comments towards other individuals, students, groups, peoples, and/or societies will not be tolerated.

University Policies

Student Handbook

- Drop/Withdrawal policy

- Extension Requests
- Academic Probation
- Appeals
- Disability Accommodations

The mission of American Public University System is to provide high quality higher education with emphasis on educating the nation's military and public service communities by offering respected, relevant, accessible, affordable, and student-focused online programs that prepare students for service and leadership in a diverse, global society.