Physics 647
Geophysical Fluid Dynamics
Fall 2019

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Office Hours:

Monday 4:15-5:15pm in 112 NSCI
Wednesday 2:30-3:30pm in 112 NSCI

Semester schedule (calendar)

Homework

Project talk schedule

Project Web Pages

Web information to help with the projects

Video page

Link to Auroral Forecast at the GI

This syllabus is located at: http://ffden-2.phys.uaf.edu/645.fall2019.html

Course Description

Geophysical Fluid Dynamics deals with large-scale fluid motion on a rotating body (i.e. a planet). Often, the rotation, stratification and surface curvature place important constraints on the dynamics of the fluid. These "fluids" can be oceans, atmospheres, ionized atmospheres, molten rock and even ice. We will develop the mathematical (and hopefully intuitive) tools to study these very cool dynamical systems.

This course will cover the following topics among others:

Characteristics of geophysical fluids

Basic fluid dynamics
Waves and instabilities
Rotation and stratification
Introduction to Turbulence
Course Syllabus

Prerequisites: Graduate standing or permission of instructor. Mathematical methods will be used extensively in this course.

Materials Needed:


Lectures: Note room: MWF 10:30-11:30 in Room 138 Natural Sciences (Reich) Building. If you miss the first class, check back here for any changes in schedule. The lectures supplement but do not substitute for the reading. Lectures will cover the major topics, emphasizing and discussing the important points. They are not sessions to regurgitate material already written in the text (though they sometimes may be!). Your personal participation is important, and it is critical that you read the assigned material before lecture. Time permitting, several lectures will cover special topics beyond the scope of the text. These will be announced before hand.

Homework: There will be approximately one homework assignment per week. The assignment will be given out (and posted on the web and in the hall in front of my office) on Wednesdays and will be due in class on the following Wednesday. You are encouraged to work with others on the homework, but please make sure the work you turn in is not simply copied from someone else. These assignments help me assess your understanding of the material, and will count toward the bulk of your final grade.

Late problem sets will not in general be accepted.

Project: There will be a project due worth approximately 20% of the course grade. The project will be in the form of a web page and presentation on a topic in geophysical fluids that you find interesting and we agree on together. These topics could include research you are involved in, as well as general topics of interest and importance in GFD. The topic must be agreed to by Oct 2nd and must be competed by Dec 2nd. They will be graded both for presentation and content. More details will be discussed in class.

Exams: Exams will be take home exams: Check back for more details and dates

Grading: The course will be graded on a plus/minus grade scale and the grade will consist of the following components:

2 take home exams  30 %
Homework  40 %
Project  30 %

I grade on a curve however to satisfy university requirments, above 95% will be at least an A, above 85% will be at least a B above 75% will be at least a C, above 65% will be at least a D (in most cases the actual curve is significantly lower!).

Contacting Me: I have office hours as listed above. You can drop by at other times if I'm not busy, or make an appointment. I am (almost) never available before class.

Special Needs: The Office of Disability Services implements the Americans with Disabilities Act (ADA), and insures that UAF students have equal access to the campus and course materials. We will work with the Office of Disabilities Services (203 WHIT, 474-7043) to provide reasonable accommodation to students with disabilities.
Plagiarism etc: Plagiarism and cheating are matters of serious concern for students and academic institutions. This is true in this class as well. The UAF Honor Code (or Student Code of Conduct) defines academic standards expected at the University of Alaska Fairbanks which will be followed in this class. (Taken from the UAF plagiarism web site, which has many links with good information about this topic)

Complaints and Concerns: You are always welcome to talk to me about anything, however, if you have a non-subject matter question or concern that cannot be resolved by me, contact the department chair, Dr. Wackerbauer, Physics Department Office, room 102 NSCI.

Alternate References: To see the same topics explained differently, try the following:

Geophysical Fluid Dynamics, Joseph Pedlosky, Springer-Verlag
Lectures on Geophysical Fluid Dynamics, Rick Salmon, Oxford University Press
Fluid Mechanics, P. Kundu, Academic Press
An Introduction to Dynamic Meteorology, J. Holton
Physical Fluid Dynamics, D. J. Tritton, Oxford University Press
Atmosphere-Ocean Dynamics, Adrian E. Gill, Academic Press
Elementary Fluid Dynamics, D. J. Acheson, Oxford Press
Div, grad, curl and all that, H.M. Schey, Norton Press

under construction (let me know any which you find and like)

General Advice: Physics is not something you read and memorize, rather it is something you learn how to do. Try the following study procedure:

1. Read the material prior to lecture, so that you will know what it's about.
2. Listen carefully to the lecture and take notes, ask questions and participate.
3. This is crucial: Do not go back and read and re-read the chapter until you "understand it." Rather, start working problems, going back through the chapter to clarify points as they come up. I suggest read relevent sections in other texts to see alternate ways of presenting the material
4. Think! Physics is, by in large intuitive, so if you think through a problem first you can often figure out the answer before working through to the solution..

Last updated 4 September, 2019