Physics 472B
Fluid Dynamics module
Spring 2020

Note: Starting date for Module moved to 24th of Feb. (moved 2 classes later)

Instructor: David Newman
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Office Hours:

  Monday 3:30-5:00pm in 112 Reich
  Wednesday 11:30-1:30pm in 112 Reich

Semester schedule (calendar)

Homework

Link to Auroral Forecast at the GI

Video page

Class slides

This syllabus is located at: http://ffden-2.phys.uaf.edu/472b_spring_2020.html

Course Syllabus
Course Content: Fluid Dynamics deals with fluid motion. Basic properties and configurations 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 some of the mathematical (and hopefully intuitive) tools to study these dynamical systems.

This course will cover the following topics among others:

- Characteristics of fluids
- Basic fluid dynamics
- Waves and instabilities
- Introduction to Turbulence

Prerequisites: Algebra, trigonometry and calculus will be used extensively. Plus a bit of differential equations and a little PDEs.

Materials Needed:


Calculators: No calculators may be used during exams. Otherwise, buy yourself a nice one. A basic, simple scientific calculator with trigonometric, exponential, and logarithmic functions is all that you need.

Lectures: 1:00pm MWF in 204 Reich. 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. Your personal participation is important.

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 on the following Friday in class. You are encouraged to work with others on the homework, but make sure the paper you turn in is not simply copied from someone else. These assignments help me assess your understanding of the material, and will count toward your final grade.

Late problem sets will not be accepted.

Hour Exams: Exams will be given during lecture on:

March 28

The exams will be closed-book, but you will be given one side of an 8 1/2 x 11-inch sheet with most of the needed equations. No calculators are allowed. The exams will be graded and handed back as soon as possible.

Grading: The course grade will consist of the following components (though I reserve the right to make grade adjustments based on performance trends):

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tr>
<td>1 hour exam</td>
<td>33%</td>
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<tr>
<td>Homework</td>
<td>33%</td>
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<tr>
<td>Participation</td>
<td>33%</td>
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</tbody>
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I grade on a curve however to satisfy university requirements, 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:

Fluid Mechanics, P. Kundu, Academic Press
Elementary Fluid Dynamics, D. J. Acheson, Oxford Press

Physical Fluid Dynamics, D. J. Tritton, Oxford University Press
MAThematical Fluid Mechanics, Richard Meyers, Dover Press
An Introduction to Dynamic Meteorology, J. Holton
Atmosphere-Ocean Dynamics, Adrian E. Gill, Academic Press

Geophysical Fluid Dynamics, Joseph Pedlosky, Springer-Verlag
Lectures on Geophysical Fluid Dynamics, Rick Salmon, Oxford University Press

Here is a good web site on how to study physics which might be of interest and use: How to study physics

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 chapter prior to lecture, so that you will know what it's about.
2. Listen carefully to the lecture and take notes.
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 you try to answer all "Checkpoint" problems in the text and the questions at the end of the chapter. If you understand these, you've probably understood the salient points of the chapter.
4. Think! Don't simply try to fit the problems into the form of another problem, think through the problem first.
5. Interesting Physics computer demos

Last updated 24 February, 2020