

## EGM 6812: Fluid Dynamics I – Fall 2008

1. **Catalog Description:** Flow kinematics. Fundamental laws and equations in integral and differential forms. Potential flows. Introduction to laminar flows in simple geometries, laminar and turbulent boundary layer flows. External flows. One-dimensional compressible flows. Credits: 3
2. **Pre-requisites:** EGN 3353C (Fluid Mechanics)
3. **Course Objectives:** To develop a fundamental understanding of the underlying principles of fluid mechanics.
4. **Instructor:** Z. Hugh Fan, Ph. D.
  - a. Office location: NEB 227
  - b. Telephone: 846-3021
  - c. E-mail address: hfan@ufl.edu
  - d. Website: grove.ufl.edu/~hfan; ID and password will be provided in the class.
  - e. Office hour: M4, 10:40 am– 11:30 am
5. **Teaching Assistant**  
Karthik Pitchaimani; NEB 132; Phone: 352-846-3018; Email: [lightpk@ufl.edu](mailto:lightpk@ufl.edu); Office hours: R3 (Thursday 9:35-10:25 pm)
6. **Meeting Times:** 9:35 – 10:25 am
7. **Class schedule:** MWF3
8. **Meeting Location:** NEB 102
9. **Textbooks Required**
  - a. Title: Incompressible Flow
  - b. Author: Panton
  - c. Publication date and edition: 2005, 3<sup>rd</sup> edition
  - d. ISBN number: 978-0-471-26122-3
10. **Recommended Reading:**
  - a. Reading assignment is posted on the course website.
  - b. *An Introduction to Fluid Dynamics*, Batchelor, G.K., Cambridge University Press, 1967.
  - c. *Vectors, Tensors, and the Basic Equations of Fluid Mechanics*, Aris, R., Dover, 1989.
11. **Course Outline:**
  - a) Introduction (Ch. 1)
  - b) Vector Calculus and Indicical Notation (Ch. 3)
  - c) Kinematics (Ch. 4)
  - d) Basic Laws in Integral and Differential Form: (Ch. 5)
  - e) Newtonian Fluids and Navier-Stokes Equations: (Ch. 6)
  - f) Dimensional Analysis (Ch. 8)
  - g) Incompressible Flows (Ch. 7, 10 and 11)
  - h) Vorticity Dynamics (Ch. 13)
  - i) Ideal Flow (Ch. 12, 17 and 18)
  - j) Introduction to Boundary Layers (Ch. 20): (time permitting, subject to change)
12. **Attendance and Expectations:** Attendance is mandatory. Excused absences will be given for documented medical reasons, UF related travel or job interview travel. Documentation must be in the form of a doctor's note, or letter from the sponsor of the travel. During class, cell phones must be turned off. Don't bring food to class.

### 13. Grading:

There will be two exams and a final exam. The exam date and time are tentatively planned as follows. The final is scheduled by the registrar. All exams will be cumulative but may emphasize the most recently covered material.

1<sup>st</sup> exam; Thu., Oct. 2, NEB 201, 8:10 pm to 10:10 pm

2<sup>nd</sup> exam: Thu., Nov. 13, NEB 201, 8:10 pm to 10:10 pm

Final exam: Thu, Dec. 18, NEB 201, 10 am -12 pm, determined by the registrar

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| a. Homework | 20% |
| b. Exam I   | 25% |
| c. Exam II  | 25% |
| d. Final    | 30% |

If a student feels that an exam or homework is graded unfairly, or if there is an error in the grading, it should be brought to the attention of the grader (TA for homework, Dr. Fan for exams) within two weeks after the graded material is handed back. Scores will not be reconsidered beyond two weeks after they are handed back.

14. **Grading Scale:** 90-100: A, 85-89: B+, 80-84: B, 75-79: C+, 70-74: C, 65-69: D+, 60-64: D, and 0-59: E.
15. **Make-up Policy:** No late assignments will be accepted. Makeup exams are not normally allowed. If you can not attend an exam or can not meet a due date, you must contact the instructor prior to the exam or due date. Arrangements will be made for students involved in conflicting official university activities. This policy applies to UF EDGE students as well.
16. **Honesty Policy** – All students admitted to the University of Florida have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a UF student and to be honest in all work submitted and exams taken in this course and all others.
17. **Accommodation for Students with Disabilities** – Students Requesting classroom accommodation must first register with the Dean of Students Office. That office will provide the student with documentation that he/she must provide to the course instructor when requesting accommodation.
18. **UF Counseling Services** – Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:
- University Counseling Center, 301 Peabody Hall, 392-1575, Personal and Career Counseling.
  - SHCC mental Health, Student Health Care Center, 392-1171, Personal and Counseling.
  - Center for Sexual Assault/Abuse Recovery and Education (CARE), Student Health Care Center, 392-1161, sexual assault counseling.
  - Career Resource Center, Reitz Union, 392-1601, career development assistance and counseling.
19. **Software Use** – All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

## Notes on Homework

### Policies/Procedures:

1. Homework is an essential element of this course. In general, students can expect a set of problems after a major topic.
2. Homework is due at the start of class on the due date assigned and late submissions will not be accepted. You can always submit it earlier. All policies apply to UF EDGE students as well. UF EDGE students email their homework assignments to TA.
3. Homework will be given back to you in about one week. Any homework unclaimed 2 weeks after that day may be discarded. Solutions will also be available on the website about one week after the due date.
4. Performance on the homework will comprise 20% of the student's final grade; consequently individual work must be expected on all problems. Students are encouraged to discuss the general principles involved in the homework sets with one another, but the solution of each problem must be completed individually.

### Format

1. Use 8.5" x 11" paper and write on one side only using a pencil. Write down your name and UF ID on every page. Do not use pages torn from a spiral notebook. Use a stapler.
2. Start each problem on a new page.
3. Each homework problem must be completed in a format consisting of the following components when appropriate:
  - Given:** After carefully reading the problem, state briefly and concisely what is known. Do not repeat the problem statement.
  - Find:** State briefly and concisely what must be found.
  - Schematic:** Draw a schematic of the physical problem to be considered. Note the control volumes used in the analysis by dashed lines on the sketch. Include coordinate axes when appropriate, and label relevant dimensions and velocities.
  - Basic Equations:** Provide the appropriate assumptions and mathematical formulation for the basic laws that you consider necessary to solve the problem.
  - Solution:** Provide full details of the analysis in a logical manner. Develop the analysis as far as possible before substituting numerical values. If possible, give the answer algebraically before computing the final numerical result. Clearly indicate your final answer.
4. Attach a listing of any computer program(s) used in the solution.

### Grading:

The problems will be graded on a 10-point scale, with points awarded in the following distribution below.

- 1 Use of proper format, paper; steps clearly labeled;
- 1 Neatness/legibility;
- 2 Schematic, complete with appropriate control volume and appropriate assumptions;
- 5 Clearly developed and correct analysis;
- 1 Algebraic expression of solution (if possible)

10 Total