EGN 3353C: Fluid Mechanics – Fall 2011

1. **Catalog Description:** An introductory course in fluid mechanics. Statics and dynamics of incompressible fluids with application to viscous and inviscid flows. Dimensional analysis. Compressible Flow. Credits: 3
2. **Pre-requisites:** MAC 2313 (Analytical Geometry & Calculus 3) and EGM 2511 (Engineering Mechanics - Statics). EML 3100 (Thermodynamics) is recommended but not required.
3. **Course Objectives:** This course provides an introduction to fluid mechanics. It stresses fundamental engineering science principles applied to fluid mechanical systems. Students will learn the governing integral and differential equations for viscous and inviscid fluids and will apply these equations to internal and external flows. Upon completion of this course, students are expected to develop a working understanding of the basic theory of incompressible and compressible fluid mechanics. Students will learn problem-solving techniques and have the opportunity to apply their knowledge to a variety of problems.
4. **Contribution of course to meeting the professional component:**
   4a. This course supports several program outcomes enumerated in the Mission Statement of the Department of Mechanical and Aerospace Engineering. Specific ME program outcomes supported by this course include: (1) Using knowledge of chemistry and calculus based physics with depth in at least one of them (ME Program Outcome M1); (2) Using knowledge of advanced mathematics through multivariate calculus and differential equations (ME Program Outcome M2).
   4b. This course consists of approximate percentages of the following components: mathematics, 20%; physical sciences, 20%; engineering sciences, 60%
5. **Relationship of course to program outcomes:**
   This course achieves the following ABET outcomes [note that the outcome number corresponds to the respective ABET outcomes (a) through (k)]:
   (a) Apply knowledge of mathematics, science, and engineering (high coverage, addressed by lectures and example problems, assessed by exams and homework)
   (c) Design a system, component, or process to meet desired needs (medium coverage, addressed by lectures, recitations, and example problems, assessed by exams and homework)
   (e) Identify, formulate, and solve engineering problems (medium coverage, addressed by lectures, recitations, and example problems, assessed by exams and homework)

6. **Instructor:** Prof. Z. Hugh Fan, Ph. D.
   a. Office location: BEN 219
   b. Telephone: 846-3021
   c. E-mail address: hfan@ufl.edu
   d. Web site: grove.ufl.edu/~hfan
   e. Office hours: M7 (1:55-2:45 pm) & W6 (12:50-1:40 pm)
7. **Teaching Assistants**
   a. Kyle Allen, NSB 313, 392-1086, allek022@gmail.com, M3&M4, T2-3 (1619) and T8-9 (6870)
   b. Ariel Blanco, MAE-C 123, 392-7711, blanco07@ufl.edu, M7&F4, T4-5 (1620) and T6-7 (6364)
   c. Pan Gu, BEN 237E, 328-2234, pangu@ufl.edu, M6&W7, R10-11(8247)
   d. Richard Parker, NSB 313, 392-1086, parkerr@ufl.edu, M6&F8, T10-11 (7192)

8. **Meeting Times**: 11:45 am – 12:35 pm
9. **Class schedule:** MWF5
   Recitation Schedule: T2-3 (1619), T4-5 (1620), T6-7 (6364), T8-9 (6870), T10-11 (7192), and R10-11(8247);
   Recitation location: NEB-109; No recitation for the first week.
10. **Meeting Location**: WEIL 270
11. **Material and Supply Fees:** None
12. **Textbooks Required**
    a. Title: *Fox and McDonald's Introduction to Fluid Mechanics*
    b. Author: P.J. Pritchard
    c. Publication date and edition: 2011, 8th edition
    d. ISBN number: 0470547533
13. **Recommended Reading:**
    a. Reading assignment is posted on the course website.
    b. Optional references:
       i. *Fluid Mechanics: Fundamentals and Applications* by Cengel and Cimbala, 1st edition (2006)
       ii. *Multimedia Fluid Mechanics (DVD),* 2nd edition, by G. M. Homsy et al. (Editor), Cambridge University Press, 2008
14. **Course Outline**:
    a) Fundamental concepts
    b) Pressure and fluid statics
    c) Conservation equations and control-volume analysis
    d) Dimensional analysis and similarity
    e) Compressible flow
    f) Viscous flow
15. **Attendance and Expectations**: Attendance is **mandatory** (and occasionally graded). 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.
16. **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 emphasize the most recently covered material.

    1st exam; Wed., Oct. 5th, WEIL 270, 8:10 pm to 10:10 pm
    2nd exam: Tue. Nov. 8th, TUR L005 & LAR 310, 8:10 pm to 10:10 pm
    Final exam: Wed. Dec. 13, WEIL 270, 7:30-9:30 am, determined by the registrar

    a. Homework   14%
    b. Exam I   28%
    c. Exam II   28%
    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.

17. **Grading Scale**: 90-100: A, 87-89: A-, 84-86: B+, 80-83: B, 77-79: B-, 74-76: C+, 70-73: C, 67-69: C-, 64-66: D+, 60-63: D, 57-59: D-, and 0-56: E.

18. **Make-up Policy:** No late assignments will be accepted. Makeup exams are not normally allowed. If you cannot 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.

19. **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.

20. **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.

21. **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.

22. **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 Solutions

Policies/Procedures:
1. Homework is an essential element of this course. In general, students can expect problem sets assigned every week. The assignment and due dates are posted on the course website at grove.ufl.edu/~hfan.
2. Homework is due at the start of recitation on the following week and late submissions will not be accepted. One or two randomly selected problem will be graded.
3. Homework will be given back to you at the following recitation session. If TA can not give the homework back to you (e.g., due to your absence), TA will hold it for two weeks before discarding it. Note that we are prohibited by the privacy laws from leaving your homework in a public place (e.g., hallway) for you to pick up. Solutions will be available at the recitation session and TA's office hours as soon as possible after the due date.
4. Performance on the homework will comprise 14% 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 only your name on the first page, but write your name and UF ID on every other page. Your grade will NOT be on the first page (on the latter page) due to the privacy laws. Do not use pages torn from a spiral notebook. Use a stapler.
2. Start each problem on a new page if possible. It is not necessarily to copy the question (but you must write down the correct problem number).
3. Each homework problem must be completed in a format similar to the textbook example problems when appropriate. In general, it consists of the following components:
   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.
   Assumptions: Provide the appropriate assumptions and mathematical formulation for the basic laws that you consider necessary to solve the problem.
   Analysis (or 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 for correct answers as well as the following aspects.
- Use of proper format, paper; steps clearly labeled;
- Neatness/legibility;
- Schematic, complete with appropriate control volume and appropriate assumptions;
- Clearly developed and correct analysis;
- Algebraic expression of solution (if possible)