THE UNIVERSITY OF TEXAS-PAN AMERICAN

College of Engineering and Computer Science

Department of Mechanical Engineering

MECE 6372-01 Viscous Flow I – 3 Credits – Fall 2011

Room: ENGR 1.242   **Time:** TR 4:00 – 5:15 pm

Instructor: Dr. Constantine Tarawneh   **Office:** ENGR 3.228   **Phone:** (956) 665-2607

Office Hours: MTWR 1:10 – 2:25 pm **Strict**, or by Appointment

Email: tarawneh@utpa.edu   **Website:** http://mece.utpa.edu/~tarawneh/

Prerequisites:

Fluid Mechanics (MECE 3315) and Mechanical Engineering Analysis II (MECE 3450).

Course Objective:

The course is aimed towards familiarizing the student with the properties of a fluid, viscous-flow phenomena, and the fundamental equations of compressible viscous flow, such as the conservation of mass and momentum equations and the energy equation. Solutions to some of the most common Newtonian viscous-flow equations, such as the Couette and Poiseuille flows, and some unsteady duct flows, will also be explained. Finally, the laminar boundary layers will be studied in detail.

The material covered in this course is essential to all graduate students who are pursuing a Master's or Ph.D. degree in Mechanical Engineering. The course will help students gain a better understanding of the thermal sciences and will provide them with the necessary tools needed to approach viscous-flow problems analytically and numerically. The students will also gain some valuable knowledge in programming using FORTRAN and/or MATLAB.

Textbook:

Frank M. White, **Viscous Fluid Flow**, Third Edition, McGraw-Hill, 2006. [**ISBN** 0072402318]

Exams:

Each exam will consist of *two* parts: a short answer closed book, closed notes part and a problem solution open book, closed notes part (except for one, 8.5″x11″, hand-written sheet of notes). The final exam will be comprehensive with emphasis on the material covered after the mid-term exam, and will also include a take-home part. One full week will be given to complete the take-home part of the exam.

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Homework:

Homework will be assigned every week and is due at the beginning of the class meeting the following week. No late homework will be accepted without written permission. After the homework is graded and returned, solutions will be made available in a clearly marked folder placed outside the instructor's office. In solving the homework problems, the following *four* steps should be followed very carefully:

1. Briefly summarize the problem statement.
2. Provide a schematic diagram of the problem.
3. Solve the problem showing your work in detail by stating your assumptions and providing the equations you used and the numerical values you obtained.
4. Write a sentence or two discussing your findings.

Failure to follow the aforementioned four steps will result in points deducted from your homework assignment.

Semester Project:

Perform a literature review and present a written synopsis on a relevant topic of current fluid mechanics research. The written report, due on Monday 12/5/2011, can be brief and concise, but should include:

1. An outline of the history of the research development.
2. A summary of current understanding.
3. A summary of on-going research efforts.
4. A list of references.
5. A copy of the most relevant articles used.

Grading Policy:

Homework assignments (15%), semester project (15%), mid-term exam (30%), and final exam (40%). Course grade will be based solely on end of the semester overall course percentage. Cut-off percentages for letter grades will not be higher than: "A" greater than 85%, "B" greater than 75%, and "C" greater than 65%. Grade percentages below 65% will result in an "F" letter grade.

CHAPTER	TOPICS COVERED
1	*Preliminary Concepts*
2	*Fundamental Equations of Compressible Viscous Flow*
3	*Solutions of the Newtonian Viscous-Flow Equations*
	Mid-Term Exam
3	*Solutions of the Newtonian Viscous-Flow Equations*
4	*Laminar Boundary Layers*
	Review
	Final Exam (TBA)

Mechanical Engineering Department Classroom Policies

Attendance:

1. Attendance will be taken every time the class meets. Any student arriving to class **5 minutes** after the class has started will not be allowed in class. Students will be allowed a **maximum** of 5 absences for the whole semester for classes meeting three times a week, 3 absences for classes meeting twice a week, and 2 absences for classes meeting once a week. A **point** will be deducted from the total (100%) for each **unexcused** absence exceeding the maximum allowable.

2. Students **will not** be permitted to leave the classroom during lectures and exams except for **extreme emergencies**.

Homework and Exams:

1. **Absolutely** no assignments will be accepted late.

2. Make-ups for in-class exams for **extreme emergencies** will be scheduled at the end of the semester.

Plagiarism:

Any instance of cheating or plagiarism will result in **loss of credit** for the work, and will be reported to the Chair of the ME Department and/or the Dean of Students for appropriate action which may include **loss of credit** for the course or **dismissal** from the University.

Drop Policy:

Students can withdraw from a course through the *Office of the Registrar* on or prior to:

- September 14th, 2011, Wednesday: Twelfth class day (Census date); courses dropped by this date do not count toward six course drop limit.
- September 27th, 2011, Tuesday: Last day to change course to non-credit.
- November 14th, 2011, Monday: Last day to drop a class or withdraw from the University with a grade of "DR" or "W" recorded. After this date, student remains enrolled in course and receives whatever letter grade he/she earns.

American Disabilities Act Statement:

If you have a documented disability which will make it difficult for you to carry out the work as I have outlined and/or if you need special accommodations/assistance due to a disability, please contact the Office of Services for Persons with Disabilities (OSPD), Emilia Ramirez-Schunior Hall, Room 1.101 immediately, or the Associate Director at MAUREEN@UTPA.EDU, 665-7005. Appropriate arrangements/accommodations can be arranged.

ACKNOWLEDGEMENT OF RECEIPT OF SYLLABUS

By signing below, I hereby affirm that I have received a copy of the syllabus for **MECE 6372 Viscous Flow I** and have been informed by the **Instructor** that it is my responsibility to **carefully** read and understand this document. I also agree to prepare and submit to the **Instructor**, at the end of the semester, a folder that contains all my homework assignments, quizzes, exams, projects, reports and/or literature review (if applicable).

_____
Student ID Number

_____
Printed Name

_____
Signature

_____
Date