ME/AE 331 Intermediate Fluid Mechanics - Spring 2012
Mechanical & Aerospace Engineering Department, Missouri S&T

Instructor: Prof. Arindam Banerjee (Email: banerjeea@mst.edu)
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Class schedule: **Tuesday-Thursday: 8.00-9.15 am**

Class Location: **Toomey Hall 260**

Office hours : **Monday/Wednesday: 4.00 – 5.00 pm**

Grading Outline: Homework – 20%, 2 mid-term exams: 25% each
Final Exam (Comprehensive): 30%.

Grading Policy: **FINAL GRADES** will be curved. Tentative breakdown: B-C: Cutoff at class mean score, A : Above 1 standard deviation from mean, D : Below 1 standard deviation from mean, F : Below 2 standard deviations from mean

Prerequisites: **ME/AE 231 or 1 undergraduate fluid mechanics class.**

Course objectives: This course is designed to follow ME/AE 231 and give the students an overview of various aspects of incompressible fluid flow. **In particular, derivation and solutions to the conservation equations, laminar boundary layers and viscous flows will be discussed.** In addition, the course will introduce advanced topics of incompressible flows: (a) numerical methods for solving fluid flows (FDM); (b) turbomachinery, and (c) turbulent flows. The topics are meant to equip the undergraduate students with all aspects of fluid dynamics and also provide graduate students a sound theoretical foundation for more advanced thermo-fluid courses or their research.

Textbook: **Wilcox, David C., Basic Fluid Mechanics. Fourth Ed., DCW Industries, 2010** (ISBN-13: 978-1-928729-44-0) – Price: $120

Software: **We will use Fluent CFD software and the software that comes with the text book for our programming needs. Occasional assignments will use MATLAB.**

Blackboard: All course related materials (including class notes) will be on Blackboard

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Topics to be covered:

1. Integral Relations for a Control Volume – solution of mass, linear momentum and angular momentum relations, laminar/turbulent boundary layers and other test cases.
2. Turbo-machinery: Pump Performance & Selection, Wind-turbine design and analysis, Hydraulic Turbine design and analysis
3. PDE governing fluid flow – detailed derivation, solution of viscous flow problems, boundary layers.
4. Preliminary CFD – usage of Fluent to solve basic fluid flow problems. Student will have a working knowledge of CFD after this class.
5. Fundamentals of Turbulent Flows – examples & turbulent boundary layers

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Policies

- Home-works are due at the **start** of class – no late home-works will be accepted. For distance students, home-works must be submitted by using Digital Drop-box in Blackboard before 8am on the due-date.
- The final exam is comprehensive (i.e. it will contain all topics covered in class)
- **If final exam score exceeds overall average, grade will be based entirely on the final.** However, the student must score **at least 50%** on the rest of the class work (home-work included). **No exception to this rule will be made.**
- On campus students **must** come to class – watching lectures online in lieu of coming to class is not an excuse for absence.
- Mid-term exams will be in class for Campus Students. Distance Students will need to pick a time (within 48 hrs of the scheduled exam) and let me know when they want to take the test. I will email them the test and will expect to have the test back (using Digital Drop-box in Blackboard) in 2 hrs. The extra time is to accommodate scanning and emailing the test.

Last Modified by: Dr. A. Banerjee **Date:** October 19, 2011