

ME 566 Incompressible Flow, Spring 2011

Description: This course explores the fundamentals of fluid flow by developing the basic conservation equations for a continuum; develops flow descriptors based on kinematics; arrives at the Navier-Stokes equations and then examines the exact solutions for several important flows, both stationary and transient using similarity variables when possible. Also included is an introduction to the vorticity description of flow and additional selected topics. Three companion courses exist: ME 566, concentrates on viscous flows including on turbulent boundary layers and ME 569, an introduction to theoretical turbulence, and turbulence modeling (in alternate years).

Three (3) Credits; course meets three times per week for 50 minutes each.

TEXTBOOK: Fluid Mechanics by P.K. Kundu and I.R. Cohen, 4th Ed., Academic Press

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Office hours: 10-11A MWF (after class). Any changes will be announced in class.

PREREQUISITE

- BY TOPIC:**
1. Undergraduate fluid mechanics
 2. Multivariable calculus, some vector calculus

TOPICS:

1. Introduction, fluid flow and fundamentals – Ch. 1
2. Vector calculus (Gauss, Stokes, Leibnitz) – Ch. 2
3. Kinematics of fluid flow – Ch. 3
4. Conservation relationships – Ch. 4 (Sec 1-10)
5. Navier-Stokes equations – Ch. 4 (Sec. 11)
6. Simple and classical flow analyses/Review – Ch. 9 (Sec. 1-10)
8. Vortex dynamics – Ch. 5
9. Low Reynolds number flows – Ch. 9 (Secs. 11-14)
10. Surface Tension Effects -- Supplement
11. Microflows/Review -- Supplement

COMPUTER USE: Several assignments may require computer generated solutions using an optional language and/or application

COURSE EVALUATION:

Quizzes:	40%
Oral Presentation:	20%
Assignments:	40%

BOOKS

ON RESERVE: There are a number of books on reserve at the Valley Library (2-day) as additional references. You should be able to locate them by going to <http://osulibrary.oregonstate.edu/reserves/student>

These texts, listed by author are:

- Panton (sometimes used as course text)
- Currie (brief, concise, quite readable, clear notation)
- Batchelor (classic FM text, harder to read)
- White, Viscous Flow (good summary of equations, exact solutions of NS)
- Van Dyke (classic picture book)
- Cengel and Cimbala (good undergraduate course text, useful for review of concepts)

STATEMENT REGARDING STUDENTS WITH DISABILITIES:

"Accommodations are collaborative efforts between students, faculty and Services for Students with Disabilities (SSD). Students with accommodations approved through SSD are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through SSD should contact SSD immediately at 737-4098

CHEATING:

There is a "zero tolerance" policy in effect for cheating. *Copying* of any material, or obtaining information from another student to be turned in for a grade is considered cheating. Cheating will result in a grade of zero on that piece of work. In addition, any instance in which a student is caught cheating will be handled in accordance to the policies mentioned in the Schedule of Classes and at the following web site:

<http://osu.orst.edu/admin/stucon/regs.htm>.