CHEE 3363: Fluid Mechanics for Chemical Engineers

Spring 1010
Section: 31763
Lecture: 4:00pm - 5:30pm, MW
Location: D3 W205
Catalog data: Cr. 3 (3-0).
Prerequisites: CHEE 2332, MATH 3321, and credit for/concurrent enrollment in CHEE 3343.
Description: foundations of fluid mechanics, fluid statics, kinematics, laminar and turbulent flow; macroscopic balances; dimensional analysis and flow corrections.

Instructor: Dr. Jacinta C. Conrad (jcconrad@uh.edu), S226 Engineering Building 1
Office hours: M, 10:00am-12:00pm or by appointment

Teaching Assistant: Binh Trinh (bttrinh@uh.edu), S49-49B Engineering Building 1
Office hours: TTh, 4 - 5:30pm

Textbook:

· Fox, Pritchard, and McDonald, Introduction to Fluid Mechanics, 7th ed., 2008.

References:

· Street, Watters, and Vennard, Elementary Fluid Mechanics, 7th ed., 1996.
· Munson, Young, and Okiishi, Fundamentals of Fluid Mechanics, 2006.

Prerequisite topics:

· Engineering thermodynamics
· Engineering mechanics: fundamental laws; statics and dynamics
· Stress and strain; elastic material behavior
· Vectors, vector analysis and operations
· Calculus and differential equations

Topics:

· Introduction to fluid mechanics, review of vector analysis and operations (2 classes)
· Fundamental laws and principles, stress analysis, force on a body, constitutive equations (1-2 classes)
· Fluid statics and fluids in rigid body motion (2-3 classes)
· Macroscopic mass and momentum equations and applications (3 classes)

Exam 1: Saturday, February 20, 2010

· Macroscopic energy balance, Bernoulli's equation, applications (3 classes)
· Viscous flows; Newtonian and non-Newtonian fluids, basic equations of motion (4 classes)
· Dimensional analysis and similarity (1 class)

· Laminar and turbulent flow in piping systems (2 classes)

Exam 2: Saturday, April 3, 2010

· External flows, boundary layer theory, momentum integral equation (3 classes)
· Flow measurement, compressible and isentropic/adiabatic flow (3 classes)
· Special topics: microfluidics and/or biofluid flows (2 classes)

Final project due: Saturday, May 1, 2010, 5pm

· Course review (1 class)

Final exam: Monday, May 10, 2010, 5-8 pm

Evaluation:
· Homework: 10%
· Quizzes: 10%
· Two exams: 20% each, total 40%
· Final exam: 35%
· Design project: 5%

Exam policies:
· All exams are mandatory.
· No makeup exams will be given.
· All exams, save the final, will be given on Saturday.
· All regrade requests **MUST** be put in writing, and submitted at one time no later than one week after exams are returned.
· All questions on an exam submitted for regrading will be regraded.

Special dates:
· January 25, 2010: Last day to add a course.
· February 1, 2010: Last day to drop a course or withdraw without receiving a grade.
· March 15-19, 2010: Spring break
· April 6, 2010: Last day to drop a course or withdraw with a "W."

Academic dishonesty:
· Please see section 3.02 for the University of Houston policy on academic dishonesty.
· All items capable of transmitting and/or receiving wireless signals in an exam room are expressly forbidden. This includes but is not limited to: cell phones, pagers, PDAs, and laptops.

ABET Outcomes Assessment:

Outcome 1: Students will demonstrate a knowledge of the fundamentals of fluid mechanics (a).

Outcome 2: Students will demonstrate the ability to use various techniques for analyzing problems with frictional flow (a,c).

Outcome 3: Students will demonstrate an understanding of the basics of boundary layer theory for use in transport of heat and mass (a).

Outcome 4: Students will demonstrate the ability to apply fluid mechanics principles and their relevance to engineering and the ability of these to solve societal problems (e).

ABET Criterion 3: Program Outcomes and Assessment:

a an ability to apply knowledge of mathematics, science, and engineering

b an ability to design and conduct experiments, as well as to analyze and interpret data

c an ability to design a system, component, or process to meet desired needs

d an ability to function on multi-disciplinary teams

e an ability to identify, formulate, and solve engineering problems

f an understanding of professional and ethical responsibility

g an ability to communicate effectively

h the broad education necessary to understand the impact of engineering solutions in a global and societal context

i a recognition of the need for, and an ability to engage in, life-long learning

j a knowledge of contemporary issues

k an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice