## CHEE 3363: Fluid Mechanics for Chemical Engineers

**Spring 2014**
**Section:** 17131
**Lecture:** 4:00–5:30pm, MW
**Location:** D2 Lect2
**Catalog data:** Cr. 3 (3-0)
**Prerequisites**: CHEE 2332, MATH 3321, and credit for/concurrent enrollment in CHEE 3334 or INDE 2333 (soft).
**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, 9:30–11:30am, immediately after class (MW 5:30–6:30pm), or by appointment

**Teaching Assistants:**
Michael Byington (mcbyington@uh.edu), S283 Engineering Building 1
*Office hours:* MT, 7–8pm
Tian Gu (tgu2@uh.edu), S256B Engineering Building 1
*Office hours:* W, 10am–12pm
Jinsu Kim (jkim76@uh.edu), S334A Engineering Building 1
*Office hours:* TTh, 3–4pm
Manjesh Kumar (mkumar8@uh.edu), S183 Engineering Building 1
*Office hours:* T, 4–6pm
Rahul Pandey (rpandey2@uh.edu), S334A Engineering Building 1
*Office hours:* T, 11am–1pm

**Required Reading**: Fox, Pritchard, and McDonald, Introduction to Fluid Mechanics, any edition. (8th ed. (2011) available at bookstore.)
**Recommended Reading**: Munson, Young, and Okiishi, Fundamentals of Fluid Mechanics, any edition.

**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 physics, review of vector analysis and operations (2 classes)

- Fundamental laws and principles, stress analysis, force on a body, constitutive equations (2 classes)
- Fluid statics and fluids in rigid body motion (2 classes)
- Macroscopic mass and linear momentum equations and applications (3 classes)

**Exam 1: Saturday, February 15, 2014**

- Macroscopic angular momentum equations and application (1 class)
- Macroscopic energy balance, Bernoulli's equation, applications (2 classes)
- Fluid kinematics, differential equations of motion (4 classes)
- Dimensional analysis in fluid mechanics (1 class)

**Exam 2: Saturday, March 22, 2014**

- Inviscid flows (1 class)
- Viscous flows (2 classes)
- External flows, boundary layer theory, momentum integral equation (3 classes)
- Compressible and isentropic/adiabatic flow (2–3 classes)
- Special topics (1 class)

**Final project due: Tuesday, April 29, 2014, 5pm (by email)**
**Final exam: Friday, May 2, 2014, 5–8pm**

**Evaluation:** Grades will be determined on the basis of exams, quizzes/in-class problems, attendance and submitted homework grades with the following weights:

- 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.
- No electronic devices of any sort are permitted.

**Special dates:**

- January 21, 2014: Last day to add a course.

- January 29, 2014: Last day to drop a course or withdraw without receiving a grade.
- March 10–15, 2014: Spring break
- March 26, 2014: 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.
- The instructor takes academic dishonesty *very seriously*.
- 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