

## CE 315 – Fluid Mechanics

### Required

**2007 Catalog Data: CE 315 Fluid Mechanics 3** Prereq M E 212; Math 315. Fluid statics, laminar and turbulent flow, similitude, pipe flow, boundary layer, lift and drag and measurement techniques.

**Prerequisites:** ME 212 (Dynamics) and Math 315 (Differential Equations).

**Textbook:** Young, et al. *A Brief Introduction to Fluid Mechanics*, 4<sup>th</sup> ed., John Wiley & Sons, 2007.

### Course Objectives:

1. To introduce basic laws, principles, and concepts that describe fluids at rest and in motion.
2. To develop student's ability to apply fluid mechanics principles to elementary engineering problems.
3. Use sound engineering judgment to make appropriate assumptions and perform fluid mechanic calculations.
4. To develop student's ability to effectively communicate fluid mechanic fundamentals in conversation and in written reports.

### Topics:

1. Characteristics of fluid – density, ideal gas law, viscosity, vapor pressure, and surface tension
2. Fluid Statics – pressure, pressure measurement, and buoyancy
3. The Bernoulli Equation – Newton's 2<sup>nd</sup> law, static, dynamic & total pressure, and energy line
4. Conservation of mass, linear momentum and energy
5. Similitude, dimensional analysis and modeling
6. Viscous flow in pipes – laminar and turbulent flow & major and minor losses
7. Flow over immersed bodies – boundary layer, drag, and lift

**Class Schedule:** Three 50 minute sessions per week.

**Contribution of course to meeting the Professional Component:** The course is an engineering topic, with contribution in engineering sciences.

**Course Outcomes:** This course contributes to the following educational outcomes.

<b>Outcome</b>	<b>Role of CE 315</b>
1. A firm foundation and knowledge of mathematics, science, and engineering principles and the ability to apply the knowledge (Outcome A).	1. & 2. Basic fluid mechanics fundamentals are learned and applied through weekly homework assignments and a group project.
4. The ability to think logically, critically, and creatively.	1. & 2. Open-ended and iterative problems challenge students to apply knowledge in a new way. 1. Additional reading regarding the interaction between fluids and biological systems (e.g. human circulatory system – pipe flow, trees – reconfiguration or lowering of drag coefficient with increasing wind velocity); Fieldtrip to local bridge over river that is designed to slip off its base under high-flow conditions exposes students to current and creative fluid-related design example.
5. The ability to work in multidisciplinary teams (Outcome D).	1. Team project to measure drag coefficient of dandelion seed promotes teamwork. 2. Project teams are comprised of at least one CE student and one ME student. Regularly scheduled cooperative work sessions stimulate team work.
6. The ability to identify, formulate and solve civil engineering problems (Outcome E).	1. Open-ended problems force students to use engineering judgment and make appropriate. assumptions to move forward with calculations. 2. Water resources problems are used to introduce civil engineering problems.
9. The ability to communicate effectively in written, oral and graphical forms (Outcome G).	1. Students required to randomly answer questions orally at the beginning of class; students draft written report regarding the Trans Alaska Pipeline System (TAPS). 2. Cooperative in-class work sessions foster conversation skills while group reports Group projects develop writing skills.
11. A knowledge of contemporary issues (Outcome J).	2. Group projects and cooperative work sessions specifically address contemporary topics.

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