**ENG ME 303 Fluid Mechanics**

**2008 - 2009 Catalog Data:**
**ENG ME 303 Fluid Mechanics** Prereq: ENG EK 301. Properties of fluids. Fluid statics. Flow kinematics and dynamics. Dimensional analysis. Control volume approach to conservation of mass, momentum, and energy. Bernoulli's equation. Pipe flow. Discussion of boundary layers, drag, and lift. Applications to flow measurement, turbomachinery, and propulsion. Includes lab. Cannot be taken for credit in addition to ENG BE 436. 4 cr.

**Class/Lab Schedule:** 4 lecture hours per week, Three 2 hour labs per semester

**Status in Curriculum:** Required

**Textbook(s) and/or Other Required Material:**
Munson B.R., Young D.F., Okiishi T.H., and Huebsch, W.W., Fundamentals of Fluid Mechanics, 6th ed., Wiley, 2009

**Coordinator:** Robin Cleveland, Associate Professor, Mechanical Engineering

**Prerequisites by Topic:**
1. Calculus
2. Engineering statics and dynamics

**Goals:**
To introduce students to the fundamental principles of fluid mechanics, emphasizing the understanding of physical and intuitive concepts.

**Course Learning Outcomes:**
As an outcome of completing this course, students will:

**i. Develop the ability to model and analyze one and two dimensional (static and dynamic) fluid mechanical systems** using applicable natural laws including those for ideal gases, and conservation of mass, momentum and energy, utilizing the control volume approach. (A, E)
**ii. Gain increased understanding of the experimental physical and intuitive aspects of fluid mechanics**, and the ability to judge when experiments, rather than (or in conjunction with) mathematical analysis are most likely to produce the desired solutions through methods such as dimensional analysis. (E, L)
**iii. Gain experience in performing fluids laboratory experiments** as part of a team and interpreting results. (B, D, L)
**iv. Gain experience in writing individual technical reports** on laboratory projects. (G)
**v. Gain experience in generating simple computer solutions** to the analysis of the laboratory experiments. (K)

**vi. Gain insight into the application of fluid mechanics to practical problems** in a variety of disciplines emphasizing aerospace and mechanical engineering, but also including bio- and civil engineering. (A, E, J)

**Course Learning Outcomes mapped to Program Outcomes:**
(For Program Outcomes, please see attached page or Department Web Site)

| **Program:** | A | B | C | D | E | F | G | H | I | J | K | L | M | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course:** | i, iv | ii, iii | ii, vi | iii | i, ii, vi | - | iv | vi | - | vi | iii, v | ii, iii | ii, vi | - |
| **Emphasis:** | 5 | 3 | 2 | 2 | 5 | 1 | 3 | 2 | 1 | 2 | 3 | 4 | 2 | 1 |

**Topics (time spent in weeks):**
1. Fundamental definitions. Ideal gases (1)
2. Fluid statics (1)
3. Conservation of mass, momentum and energy (1.5)
4. Bernoulli's equation and applications (1.5)
5. Introduction to Navier-Stokes equations (2)
6. Dimensional analysis and similitude (2.5)
7. Flow in pipes and channels (1.5)
8. Flow around immersed bodies (1.5)
9. In class exam (1)

**Contribution of Course to Meeting the Professional Component:**
Engineering Topics: 100%

**Status of Continuous Improvement Review of this Course:**
**Date:** February 18, 2009 **Reviewed by:** Fluids-Thermal Committee
**Prepared by:** Robin Cleveland **Date:** January 27, 2009