

MAE 130A INTRODUCTION TO FLUID MECHANICS

(Required for AE and ME; Elective for CE and EnE)

- Catalog Data:** **MAE 130A: Introduction to Fluid Mechanics (Credit Units: 4) F.** Fundamental concepts; fluid statics; fluid dynamics; Bernoulli's equation; control-volume analysis; basic flow equations of conservation of mass, momentum, and energy; differential analysis; potential flow; viscous incompressible flow. Prerequisites: Physics 7A, Physics 7B, Mathematics 2D, Mathematics 2E, MAE30, and MAE80, each with a grade of C- or better. Only one course from MAE130A, MAE H130A, CEE170, and CEE H170 may be taken for credit. (Design Units: 0)
- Textbook:** White, Frank M. *Fluid Mechanics*, 5th edition, McGraw-Hill, 2003.
- References:**
- Coordinator:** Haris J. Catrakis
- Course Outcomes:** Students will:
Formulate, model, and analyze mathematically and physically fluid mechanics problems using the basic concepts of conservation of mass, momentum, and energy.
Investigate and calculate the fluid flow behavior in basic as well as applied fluid mechanics problems, including models based on inviscid fluid dynamics and potential flows.
Solve fluids engineering problems, including fluid statics and fluid dynamics problems, by applying control volume analysis, differential analysis, and related methods.
- Prerequisites By Topic:** Newtonian Mechanics
Applied Vector Calculus and Differential Equations
- Lecture Topics:** Introduction and Fundamentals
Fluid Statics
Fluid Dynamics
Fluid Kinematics
Control Volume Analysis
The Differential Equations of Fluid Motion
Potential Flow, using Complex Potential
Vorticity Dynamics, Kelvin-Helmholtz Instability
Tensor Notation
Constitutive Relations
Viscous Incompressible Flow
- Class Schedule:** Meets for 4 hours of lecture and 1 hour of discussion each week for 10 weeks.
- Computer Usage:** Computer-based plotting and visualization recommended.
- Laboratory Projects:**

Professional Component: Contributes toward the Mechanical Engineering Topics courses.
Contributes toward the Aerospace Engineering Topics courses.

Relationship to Program Outcomes: This course relates to Program Outcomes a, e, k, and m; with additional Mechanical Engineering outcomes 1 and 2 as stated at:
<http://undergraduate.eng.uci.edu/degreeprograms/mechanical/mission>

Design Content Description

Approach:

Lectures: %

Laboratory Portion: %

Grading Criteria:

Homework: 12.5%

Quizzes: 12.5%

Midterm Exam: 35%

Final: 40%

100%

Estimated ABET Category Content:

Mathematics and Basic Science: ___ credit units or ___%

Engineering Science: 4 credit units or 100 %

Engineering Design: 0 credit units or 0 %

Prepared by: William A. Sirignano/Haris Catrakis **Date:** July 2007

CEP Approved: Fall 2004