ME 3080 Fluid Mechanics (3,0)[1]

Credits: 3 **Contact hours:** 3

Course Coordinator: Richard S. Miller, Associate Professor of Mechanical Engineering

Textbook: Fundamentals of Fluid Mechanics," B.R. Munson, D.F. Young, T.H. Okiishi, and W.W. Huebsch, Seventh ed., John Wiley & Sons, Inc., 2009

Specific Course Information

Catalog Description: Behavior of fluids at rest or in motion, including the study of fluid properties. Emphasizes a rational, analytical approach from which are developed basic principles of broad applicability to all fields of engineering. *Prerequisites*: ME 2010, ME 2030, MTHSC 2080 (or concurrent enrollment)

Prerequisites or Concurrent enrollment: Vector mathematics (MTHSC 2060), Physical analysis (PHYS 1220), Calculus of several variables (MTHSC 2060), Kinematics of particles and rigid bodies (ME 2010), Newton's laws of physics (PHYS 1220), Conservation laws of mass, momentum, and energy (ME 2030).

Course Type: Required

Specific Goals for the Course:

Course Outcomes (see program student outcomes designations below):

1. Students will be able to solve for fluid properties and flow parameters, such as forces and flow rates, in internal and external flow problems through proper application of the conservation laws and the corresponding governing equations in integral and differential forms in the Lagrangian and Eulerian reference frames. [(a),(e),(k)]
2. Students will be able to use the ``systematic methodology" to solve problems in a wide variety of systems involving hydrostatics, and potential and viscous flows in the incompressible regime. [(a),(e),(k)]

Program Student Outcomes: The following outcomes are addressed by this course:

(a) An ability to apply knowledge of mathematics, science, and engineering
(e) An ability to identify, formulate, and solve engineering problems
(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Brief List of Topics[2]**:**

1. Fluid properties. (1, 0)
2. Hydrostatics, pressure measurements, fluids in rigid body motion. (5, 0)
3. Lagrangian vs. Eulerian formulations, flow representation – streamlines, streaklines, pathlines, concepts of acceleration. (6, 0)

[1] Designates lecture and laboratory contact hours.
[2] Contact hours are indicated as (lecture, laboratory/recitation)

4. Conservation equations: control volume and differential formulations. (8, 0)
5. Dimensional analysis and similitude. (3, 0)
6. Boundary layers and pipe flows. (6, 0)
7. External flow: lift and drag concepts. (3, 0)
8. Turbomachinery. (3, 0)
9. Tests. (3, 0)