1. **MEEG331** **FLUID MECHANICS 1**

2. **Credits 3** **Contact Hours 3**

3. **Fall 2016** Dr. Ajay K. Prasad; Office 376 Harker Lab and
Dr. Merve Erdal, contact Main Office, 126 Spencer Lab

4. **Textbook** "Fluid Mechanics," by Frank White ISBN13: 9780073398273

   a. **Other Supplemental Materials:** None.

5. **Specific course information**

   b. **Catalog Description:** Incompressible fluid mechanics: fluid statics, control volume analysis for mass, momentum and energy; differential analysis of viscous and inviscid flow; dimensional analysis.

   c. **Prerequisite:** MATH 351 and a C- or better in MEEG112 or CIEG211

   d. **Course is required.**

6. **Specific goals for the course**

   a. **Specific Outcomes of Instruction:** This is the first of two required courses in fluid mechanics. It begins with a description of relevant fluid properties, and covers topics related to fluid statics and dynamics. Possible flow situations include pressure distributions and forces on submerged and floating objects, estimating shear forces between sliding surfaces, applying conservation of mass, determining forces on objects due to external or internal flows, determining energy losses due to fluid flow, applying Bernoulli's equations to a variety of engineering problems, solving simple flows using differential equations, and conducting dimensional analysis to study relationships between flow parameters. In a concurrent laboratory course MEEG333, students perform experiments that reinforce concepts being studied in class.

   b. **Student Outcomes Addressed:**

      - Outcome h (broad educations necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context)
      - Outcome i (recognition of the need for and an ability to engage in life-long learning)

7. Brief list of topics to be covered

- Fluid properties: density, viscosity, surface tension, bulk modulus, thermal expansion coefficient.
- Pascal's law, manometry, pressure transducers, forces on submerged surfaces, buoyancy forces, stability of floating objects.
- Control volume approach; conservation of mass, momentum, and energy; Bernoulli's equation, mechanical energy equation, forces on objects due to fluid flow, conservation of angular momentum, turbomachinery.
- Differential equations for fluid mechanics: rotation, stretching, and shear for a fluid particle. Differential continuity equation, Euler equation, Cauchy equation, Navier-Stokes equation, simple flow solutions.
- Dimensional analysis, Buckingham Pi theorem, scaling from model to prototype.