EML 3701 - FLUID MECHANICS
Common Course Syllabus

Catalog Data: 3 credits, Characteristics of a fluid, fluid statics, flow fields, fundamental laws, control volume concept, some applications of the fundamental laws in integral form, dimensional analysis and similitude, flow in pipes, single path pipeline problems, networks, and boundary layer concepts.

Goals:
To introduce our students to the basic concepts and laws of fluid mechanics and their applications to engineering and scientific problems.

Prerequisites:
1. EGN 3311 - Statics or equivalent
2. EGN 3343 – Engineering Thermodynamics or equivalent

Co-requisites:
1. MAP 3305 – Engineering Math 1

Topics: (The number of hours merely provides guidelines and is subject to change by individual instructor)
1. Characteristics of a fluid: density, compressibility, viscosity, vapor pressure and surface tension (4 hours).
2. Fluid statics: pressure distribution in a stationary fluid, forces and moments on plane and curved submerged surfaces, buoyancy, U.S. Standard Atmosphere, pressure distribution in a uniformly accelerating fluid (6 hours).
3. Fundamental laws in integral form for a moving fluid; control volume concept, conservation of mass, the linear momentum equation, the energy equation, applications (8 hours).
4. Fundamental laws in differential form: conservation of mass, Euler's equation, streamlines, and Bernoulli's equation (4 hours).
5. Viscous flows: turbulence, Reynolds number, dimensional analysis and the Pi theorem, similitude, modeling, wind tunnel tests (6 hours).
6. Viscous Flow in pipes: the friction factor, Moody diagram, pressure drop in a pipe, and three types of pipe-flow problems (8 hours).
7. Flow over immersed bodies: Lift and Drag (6 hours)
8. Additional topics at the discretion of the instructor.

Course Outcomes: (numbers in parentheses indicate correlation of the outcome with the appropriate ABET program outcomes 1-7)
1. Students will be able to determine hydrostatic forces on plane and curved submerged surfaces. (1)
2. Students will be able to perform control volume analysis for conservation of mass, momentum and energy. (1)
3. Students will be able to carry out dimensional analysis. (1)
4. Students will be able to determine the pressure drop in a pipe resulting from laminar flow or turbulent effects as well as losses due to changing shape of the pipe. (1)

Design Content:
This course has no design content.
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