EML 3701 - FLUID MECHANICS
Common Course Syllabus

Catalog Data: 3 credits, Prerequisites: EGM3510, EML 3100; corequisite: EML 4930 Analytical Methods in ME. 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 pipe line problems, networks, 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 by Topics:
1. Differential and integral calculus.
2. Newton's second law.
3. First law of thermodynamics.
4. Ideal gas law.

Topics: (The number of hours merely provides guidelines and is subject to change by individual instructor)
1. Characteristics of a fluid (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 (8 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 (12 hours).
4. Fundamental laws in differential form: conservation of mass, Euler's equation, streamlines, and Bernoulli's equation (4 hours).
5. Real flows: turbulence, Reynolds number, dimensional analysis and the Pi theorem, similitude, modeling, wind tunnel tests (6 hours).
6. Viscous Flow in ducts: the friction factor, Moody diagram, pressure drop in a duct, and three types of pipe-flow problems (6 hours).
7. Additional topics at the discretion of the instructor.

Course Outcomes:
1. Student should be able to determine the forces on plane and curved submerged surfaces.
2. Student should be able to analyze fluid flow systems by the control volume approach; such as the power developed by a pump, the flow rate through a pipe using a venturi meter, the drag on an object by measuring the flow field velocity around the object, forces on a plate from an impinging jet.
3. Student should be able to determine the pressure drop in a pipe resulting from viscous or turbulent effects.

4. Student should be able to determine the flow rate a pump will deliver if the pump characteristics are known.

Design Content:
This course has no design content.

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