**MECHANICAL ENGINEERING PROGRAM**

**ABET COURSE SYLLABUS**

**ME 341 Fluid Mechanics I (3 Units) Required**

**Course Description: (2019-20 Catalog)** Fluid properties and fluid statics. Euler and Bernoulli equations. Conservation equations; dimensional analysis. Viscous pipe flow.
3 lectures.

**Prerequisite Courses:** ME 212, MATH 242 or MATH 244.

**Prerequisites by Topic:** Engineering dynamics course that covers relative motion, work energy and momentum. Mathematics course that covers ordinary differential equations.

**Textbook: (and/or other required material)** Fox and McDonald's Introduction to Fluid Mechanics, 9th Edition, Pritchard, P.J. and Mitchell, J.W., Wiley & Sons, 2016.

**References:** None

**Course Coordinator/Instructor:** Hans C. Mayer, Assistant Professor of Mechanical Engineering

**Course Learning Outcomes:** The overall course objective is to establish a fundamental familiarity with the application of fluid mechanics concepts in certain subdisciplines of fluid mechanics. This fundamental familiarity will serve as bases for further study, research, and employment for the practicing engineer. For each subdiscipline, the objectives can be best stated in terms of abilities to solve and analyze certain specific types of problems. The students will be able to formulate fluid system models based on a theoretical appreciation of the basic concepts. By subdiscipline, the course goals are:

1. Introduction to the fundamental concepts of fluid mechanics. To be able to solve problems involving fluid properties and shear forces resulting from Newtonian fluids
2. Fluid Statics. To be able to calculate the magnitude and location of hydrostatic forces on flat plates and curved surfaces.
3. Integral equations for a control volume.
4. To be able to analyze fluid systems using the integral form of the continuity, momentum, moment of momentum, and energy equation. Be able to formulate an appropriate fluid system model using the integral equations.
5. Brief introduction to differential analysis of fluid motion followed by application to incompressible inviscid flow. To be able to assess the validity of Bernoulli's Equation for various fluid

systems. To be able to determine the pertinent fluid properties from measurements taken by a Pitot tube.

6. Dimensional analysis and similitude. To identify the common dimensionless numbers of fluid mechanics and to be able to model fluid systems. Be able to evaluate the physical and mathematical significance of dimensionless numbers.
7. Internal incompressible viscous flow. To be able to analyze flow through a single path and simple multipath pipe systems. Be able to explain the physical relationship between the various parameters in a piping system.

**Relationship of Course to Mechanical Engineering Student Outcomes:**

SO 1: Develop (D)
SO 2:
SO 3:
SO 4:
SO 5:
SO 6:
SO 7:

**Topics Covered:**

1. Introduction to Fundamental Concepts of Fluid Mechanics
2. Fluid Statics
3. Integral Equations For a Control Volume
4. Incompressible Inviscid Flow
5. Dimensional Analysis and Similitude
6. Internal Incompressible Viscous Flow

**Laboratory Projects:** None

**Class/Lab Schedule:** Three 50-minute lectures per week.

**Contribution of Course to Meeting the Professional Component:**

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|---|---|
| (a) College-level mathematics and basic sciences: | 0 credits |
| (b) Engineering Topics: | 3 credits |
| Design: | 0 credit |
| (c) General Education: | 0 credits |
| (d) Other: | 0 credits |

**Prepared by:**
Hans C. Mayer

**Date:**
10/14/19