

1. EM324 Fluid Mechanics
2. Credits Hours (4) / Contact Hours (5)
3. Course Director: Prof Mark Murray
4. Text book: Munson, Young and Okiishi's Fundamentals of Fluid Mechanics, 9th edition by Munson, Gerhart, Hochstein and Gerhart, 2021 – ISBN 9781119598114
5. Specific course information
 - a. An introductory course in fluid dynamics stressing both the integral and differential forms of the conservation laws of fluid flow. Engineering applications are made to hydrostatics and to ideal and real fluid flows. Laboratory experiments and problems sessions complement the lectures
 - b. Prerequisites and co-requisites: SM212 and 2/C Standing (or Dept. Chair Approval)
 - c. Required course for Nuclear and Mechanical Engineering Programs
6. Educational objectives for the course
 - a. Demonstrate an understanding of fluid properties including the measurement of the property and its dependence on pressure and temperature.
 - b. Demonstrate the ability to solve hydrostatic problems involving manometers, hydrostatic forces on planar and curved surfaces, and hydraulics.
 - c. Demonstrate the ability to solve fluid dynamic problems involving conservation of mass, momentum, and energy for viscous and inviscid flow.
 - d. Demonstrate the understanding the naval related topics of ship stability, aerodynamics, turbomachinery and fluid transport.
 - e. Demonstrate and understand dimensional analysis used in fluids experiments.
 - f. Demonstrate the ability to collect data and analysis of experimental results.
 - g. Demonstrate the ability to use differential and vector calculus to solve fluids problems.
 - h. Demonstrate the ability to clearly present laboratory results and design projects in written and oral reports.
 - i. Demonstrate the ability to contribute to laboratory and design teams.
7. Specific program outcomes address by this course

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Reinforced			X		X	X	
Mastered	X						

8. Brief list of topics to be covered
 - a. Introduction to fluids and viscosity
 - b. Pressure, hydrostatics and manometry
 - c. Hydrostatic forces on submerged surfaces (planar and curved)
 - d. Bernoulli equation
 - e. Integral forms of conservation laws: mass and momentum
 - f. Differential forms of conservation laws: continuity equation and Navier Stokes equations (simple solutions of N-S equations)
 - g. Finite differencing and CFD
 - h. Dimensionless groups and modeling
 - i. Laminar/turbulent flow regimes and pipe flow
 - j. Mechanical form of energy equation; Pipe flow losses, pumps
 - k. Laminar/turbulent boundary layers
 - l. External flow: Lift and Drag
 - m. Open channel flow (Spring Offering)
 - n. Introduction to Potential flow (Fall Offering)