# JOHN CABOT UNIVERSITY

COURSE CODE: ENGR 220
COURSE NAME: **Fluid Mechanics**
Sample Summer Syllabus

**TOTAL NO. OF CONTACT HOURS:** 45
**CREDITS:** 3.0
**PREREQUISITES:** MA299 Calculus II

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## COURSE AIMS:

This course covers theory and application of fluid statics, momentum transfer, and viscous fluid flow. Fundamentals of microscopic phenomena and application to macroscopic systems are addressed. Course work covers both open-channel and conduit (pipe) flow. The fluid statics and dynamics of incompressible and compressible fluids are considered.

## SUMMARY OF COURSE CONTENT:

Fluid characteristics, fluid statics, elementary and viscous fluid dynamics, finite control volume analysis, conservation of mass and energy, momentum transfer, pipe networks, open-channel flow, compressible and choked flow, operation of turbomachines in fluid systems.

## LEARNING OUTCOMES:

Upon successful completion of this course, the student will:

(1) be familiar with the properties and behavior of liquids and gases, be able to classify of various types of fluid flows, and will understand the basic concepts of boundary layer theory.
(2) be familiar with the hydrostatic equation and its application.
(3) be familiar with the Bernoulli equation and its application to flow measurement devices and the solution of fluid mechanics problems.
(4) be familiar with the velocity and acceleration fields, control volume and system representations, and the Reynolds Transport Theorem.
(5) understand the application of the basic principles of fluid mechanics through the use of the continuity, momentum, energy, and state equations.
(6) be familiar with open-channel flow, laminar and turbulent pipe flow, and the use of the engineering diagrams to compute pressure loss in such flows.
(7) understand the principles of compressible fluid flow and the operation of turbomachines.

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**TEXTBOOK:**

Fundamentals of Fluid Mechanics, 7th Ed., by Munson, Rothmayer, Okiishi, and Huebsch.

| SCHEDULE | | | |
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| **Session** | **Session Focus** | **Reading Assignment / Other Assignment** | **Meeting Place/Exam Dates** |
| Week 1 | Ch. 1.1-1.5: Introduction to Fluid Mechanics, Analysis of Fluid Behavior, Density and Specific Gravity, the Ideal Gas Law; Ch. 1.6-1.9: Viscosity, Vapor Pressure, and Surface Tension; Ch. 2.1-2.6: Pressure in Fluids at Rest, Standard Atmosphere, Manometry; Ch. 3.1-3.5: Development of the Bernoulli Equation. | TBA | |
| Week 2 | Ch. 3.6-3.8: Examples of Use of the Bernoulli Equation; Ch. 5.1-5.4: Conservation of Mass, the Continuity Equation, Conservation of Linear Momentum, Conservation of Energy and the Energy Equation, Irreversible Flows. | TBA | First quiz: Thursday, (Week 2) |
| Week 3 | Ch. 8.1-8.5: Characteristics of Pipe Flow, Laminar vs. Turbulent Flow, Shear Stress and Pipe Velocity Profiles, Major and Minor Friction Losses, Pipe Flow Examples. | TBA | Second quiz: Thursday, (Week 3) |
| Week 4 | Ch. 9.1-9.4: Flow Past Immersed Bodies, External and Boundary Layer Flow Characteristics, Friction and Pressure Drag, Buoyant Lift; Ch. 10.1-10.4: Open-channel Flow Characteristics, Surface Waves, Energy Considerations, Uniform-depth Channel Flow. | TBA | Third quiz: Thursday, (Week 4) |
| Week 5 | Ch. 11.1-11.5: Compressible Flow Characteristics, Choked Flow, Isentropic and Non-isentropic Flow of Ideal Gases; Ch. 12.1-12.9: Pressure Changing Machines, Centrifugal Pumps, Axial and Mixed-flow Pumps, Hydraulic Turbines, Compressors, Gas Turbines. | TBA | Fourth quiz: Thursday, (Week 5)<br><br>Final Exam COMPREHENSIVE on Friday, (End of Week 5) |