Gazi University
Faculty of Engineering
Mechanical Engineering Department
ME301 FLUID MECHANICS I

Instructors:
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Teaching Assistants:

Course content:

Definition of fluid. Fluid properties. Fundamental concepts: Definition of continuum, timeline, pathline, streakline and streamline. Description and classification of fluid motion. Fluid statics and fluids in rigid body motion. Fundamental laws and equations: Derivation and application of continuity, linear and angular momentum, and energy equations in integral form. Internal, incompressible, laminar and turbulent flows. Analysis of flows in pipe systems and calculation of head losses.

Text Book:

Introduction to Fluid Mechanics, R. W. Fox, P. J. Pritchard and A. T. McDonald, John Wiley & Sons, Inc., Seventh Edition.

Reference Books:

1. Introduction to Fluid Mechanics, Donald F. Young, Bruce R. Munson, Theodore H. Okiishi and Wade W. Huebsch, John Wiley & Sons, Inc., Fifth Edition.
2. Akışkanlar Mekaniği Temelleri ve Uygulamaları, Y. A. Çengel, ve J. M. Cimbala, (Çeviri Editörü: Tahsin Engin), Palme Yayıncılık, Üçüncü Baskı, 2014.
3. Mechanics of Fluids, M. C. Potter and D. C. Wiggert, Prentice Hall, Second Edition.

Course Objective:
To introduce basic properties and importance of fluids in engineering applications. To teach and apply basic methods employed for analysis of engineering problems involving fluids.

Course Outcomes:
Understanding of basic properties of fluids. Learning the methods used for analysis of fluid motion, and force and energy exchange between fluid and the surfaces in contact with fluids, and application of these methods for design and development of systems involving fluids.

Assessment Criteria:

Midterm Exams: % 50 (2 exams)

Quizzes % 5

Experiments: % 5 (2 Experiments)
After completion of the related chapters, two experiments are carried out. The experiments are performed as groups. The date of the experiments and the groups are posted in the term. Before coming to experiment, every student should read the handouts. Every student have to attend both experiments and give reports.

Final Exam: % 40

COURSE PLAN

Week	Topics
1	INTRODUCTION: Definition of fluid, fluid mechanics in engineering, scope of fluid mechanics, methods of analysis, dimensions and units.
2	FUNDAMENTAL CONCEPTS: Definition of continuum, fluid as a continuum, velocity field, timeline, pathline, streakline and streamline. Stress field. EXPERIMENT I.
3	FUNDAMENTAL CONCEPTS: Viscosity, Newtonian and non-Newtonian fluids, vapor pressure and surface tension, description and classification of fluid motion.
4	FLUID STATICS: The basic equation of fluid statics, analysis of hydrostatic force on plane submerged surfaces.
5	FLUID STATICS: Analysis of hydrostatic force on curved submerged surfaces. Buoyancy and stability.
6	FLUID STATICS: Analysis of fluids in rigid-body motion.
7	BASIC EQUATIONS FOR A SYSTEM: Conservation of mass, momentum, moment of momentum and energy equations.
8	MIDTERM EXAM I, EXPERIMENT II.
9	BASIC EQUATIONS IN INTEGRAL FORM: Derivation of Reynolds transport equation. Derivation and application of conservation of mass and momentum equations for a control volume.
10	BASIC EQUATIONS IN INTEGRAL FORM: Derivation and application of moment of momentum and conservation of energy equations for a control volume.
11	ANALYSIS OF INTERNAL INCOMPRESSIBLE FLOW: Derivation of extended Bernoulli equation. Calculation of major and minor head losses and usage of tables and graphs.
12	ANALYSIS OF INTERNAL INCOMPRESSIBLE FLOW: Flow analysis in serial system of pipes, flow analysis in parallel system of pipes.
13	MIDTERM EXAM II and solutions of exam problems.
14	ANALYSIS OF INTERNAL INCOMPRESSIBLE FLOW: Analysis of pipe networks, analysis of interconnected reservoir systems.