ME304 FLUID MECHANICS II

2016-2017 SPRING

Çankaya University
Faculty of Engineering
Mechanical Engineering Department

ME 304 FLUID MECHANICS

INSTRUCTOR:
Prof. Dr. Haşmet TÜRKOĞLU, Room: L-A07

Teaching Assistant:
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Prerequisite:
ME303 Fluid Mechanics I

Course Objective:
Teach derivation and application of basic equations in differential form governing the fluid motion, solution of differential equations to find velocity distribution, calculation of forces exerted by flows on bodies, introduce the dimensional analysis, similitude and the boundary layer concept.

Course Outcomes:
Understanding and usage of basic approaches employed for detailed analysis of flow fields and their applications to engineering problems.

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

Reference Books:
Introduction to Fluid Mechanics, D. F. Young, B. R. Munson and T. H. Okiishi and W. W. Huebsch John Wiley & Sons, Inc., 5th Edition.
Mechanics of Fluids, M. C. Potter and D. C. Wiggert, Prentice Hall, Second Edition.

Assessment Criteria:
Attendance: 5%
Midterm Exams: % 40 (2 exams)
Homework + Quizzes % 15

At the end of each chapter, homework problems are assigned and a 15-minute quiz is given.

Final Exam: % 40

Attendance:
According to the university regulations, students must attend at least 70% of the lecture hours. Otherwise, the student gets NA (Not Attended) from the course. Valid excuses are exempt from computation of these percentages. Apart from the university regulations, it is of student's benefit to attend all of the lecture hours. Generally, it is extremely challenging to pass a course unless you attend the lectures.

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COURSE PLAN

Week	Topics
1	DIFFERENTIAL ANALYSIS OF FLUID MOTION: Derivation of continuity equation. Stream function for two-dimensional incompressible flows.
2	DIFFERENTIAL ANALYSIS OF FLUID MOTION: Motion of fluid elements (kinematics), derivation of momentum equation.
3	INCOMPRESSIBLE INVISCID FLOW: Derivation and application of Euler's equation. Derivation and application of Bernoulli equation. Static, stagnation and dynamic pressure. Flow Measurement.
4	INCOMPRESSIBLE INVISCID FLOW: Irrotational flow. Bernoulli equation for irrotational flow. Velocity potential and stream function.
5	INCOMPRESSIBLE INVISCID FLOW: Elementary plane flows. Superposition of plane flows.
6	DIMENSIONAL ANALYSIS AND SIMILITUDE: Introduction. Buckingham Pi theorem. Determination of Pi groups.
7	DIMENSIONAL ANALYSIS AND SIMILITUDE: Dimensionless groups of significance in fluid mechanics. Flow similarity and model studies.
8	MIDTERM EXAM I
9	BOUNDARY LAYER: The boundary layer concept, boundary layer thicknesses.
10	BOUNDARY LAYER: Laminar flat-plate boundary layer: Exact solution. Momentum integral equations.
11	FLOW ABOUT IMMERSED BODIES: Drag and lift on surfaces parallel and normal to flow.
12	FLOW ABOUT IMMERSED BODIES: Flow over cylinder and sphere: Drag and lift forces. Flow over different geometrical shapes.
13	MIDTERM EXAM II
14	COMPRESSIBLE FLOW: Introduction. Analysis of steady one-dimensional compressible flow. Fanno line and Rayleigh line.