IŞIK UNIVERSITY
FACULTY OF ENGINEERING
DEPARTMENT OF MECHANICAL ENGINEERING
COURSE SYLLABUS

ME 353 FLUID MECHANICS

Required

Semester: **5**

Level of Course: **Third year** Year of Study: **2015-2016 Fall Semester**
Language of Instruction: **English**

Instructor: **Prof. Dr. Erkan Ayder**
Faculty of Mechanical Engineering, ITU
Department of Mechanical Engineering, Işık University (Part Time)

Instructor's office hours: Tuesday **13:30-14:00**

Instructor's office no/phone no/e-mail address:
Office: **Room # LMF 121;** Phone: **(0212)2931300-2698;** e-mail: **aydere@itu.edu.tr**
Class hours: TTTT 1234
Prerequisite: **ME242, MATH203**

Course description: Basic definitions, Fluid kinematics, Fluid statics, Manometers and measurement of pressure, Hydrostatic forces on plane and curved surfaces, Rigid body motion, Integral form of conservation equations, Control volume and system concepts, Bernoulli equation, Differential Analysis of Fluid Flow, Navier-Stokes equations and applications, Dimensional analysis and similitude, Viscous Flows in Pipes, External Flows, Turbomachinery.

Course Objectives:

I. To familiarize the students with basic flow concepts
II. To introduce analysis of fluid statics in engineering applications
III. To introduce fluid kinematics
IV. To introduce control volume and differential analysis of basic flow problems
V. To introduce the students with Bernoulli's equation and its applications
VI. To introduce viscous flow and applications.

Textbook:

R.C. Hibbeler, "Fluid Mechanics", Pearson, 2013; www.MasteringEngineering.com

Other sources:

1. B. R. Munson, T. H. Okiishi, W. W. Huebsch, A. P. Rothmayer, "Fluid Mechanics", 7th edition, SI version, Wiley and Sons, 2013.

2. V.L. Streeter, E.B. Wylie, "**Fluid Mechanics**", Mc. Graw Hill, 1983.
3. J.H. Shames, "**Mechanics of Fluids**", Mc Graw Hill, 1992.
4. Cengel , Y.A. and Cimbala, J.M., " **Fluid Mechanics/Fundamentals and Applications**", Mc Graw Hill, 2006 ve Türkçe Çeviri Editörü (Tahsin Engin), Güven Bilimsel Yayınevi, 2007.
5. D.F.Young, B.R. Munson, T.H. Okiishi, W.W. Huebsch, "**A Brief Introduction to Fluid Mechanics**", 5th Edition, Wiley and Sons, ve Türkçe Çevirisi (Nuri Yücel, Nureddin Dinler, Haşmet Türkoğlu, Zekeriya Altaç, Nobel Yayınevi, 2013.
6. F. M. White, "**Fluid Mechanics**", 4th Edition, McGraw Hill, 1999 ve Türkçe çevirisi (Kadir Kırkköprü, Erkan Ayder), Literatür Yayınevi, 2004.

(List of lessons, labs, exams, including number of sessions each week and duration o each session)

Week	Topics
1	Introduction, Definitions: Fluid, Density, Specific Weight, Specific Gravity, Viscosity, Compressibility, Shear Stress, Vapor Pressure.
2	Fluid statics: Pressure variation in a fluid at rest, rigid body motion, manometers, measurement of pressure,
3	Fluid statics: Hydrostatic forces on plane and curved surfaces
4	Fluid kinematics: Velocity field, Acceleration field, Control volume and system concepts.
5	Control Volume Analysis: Conservation of Mass, Newton's Second Law (Linear Momentum Equation)
6	Control Volume Analysis: Newton's Second Law (Linear Momentum Equation) **First Midterm Exam**
7	Bernoulli Equation, Static, dynamic and total pressure, fluid velocity, pressure and flowrate measurement techniques, Siphon and cavitation, head and piezometric lines.
8	Differential Analysis of Fluid Flow: Conservation of Mass, Conservation of Linear Momentum
9	Differential Analysis of Fluid Flow: Conservation of Linear Momentum
10	Dimensional Analysis, Similitude and Modeling
11	Viscous Flow in Pipes **Second Midterm Exam**
12	External Flows
13	Turbomachinery
14	Power Hydraulics

Design content: None.

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Class Policies:
Requirements of the course, grading: number, type, weight of midterm exams, quizzes, problem sets, lab report, term papers etc. Attendance requirements.

	Number	**Ratio (%)**
Midterm Exams	2	40 (each contributing 20 %)
Quizzes	10 (minimum)	20
Homeworks	2	10 (each contributing 5 %)
Final Exam	1	30
		100

The final exam grade will also count for the make-up exams of eligible students.
Other information to be announced.

Contribution of course to Program Objectives

ME 353 Fluid Mechanics will contribute to the following Program Objectives:

1. To prepare students for engineering practice and to enroll students in engineering graduate programs.
2. To help students master the fundamental notions and principles of mechanical engineering discipline and to help them to be able to independently learn various applications, to examine and critically evaluate.

Contribution of course to Program Outcomes

ME 353 Fluid Mechanics will contribute to the following Program Outcomes:

Knowledge and Understanding
1. A comprehension of calculus-based physics and advanced mathematics.
2. A comprehension of engineering sciences.
3. An ability to apply knowledge of mathematics, science and engineering to mechanical engineering problems
4. A comprehension of professional and ethical responsibility

Intellectual Skills
7. An ability to design and conduct experiments, as well as to analyze and interpret data.
8. An ability to design thermal and mechanical systems, components or processes to meet desired needs.
9. An ability to identify, formulate and solve engineering problems.

Generic Skills
10. An ability to function on multi-disciplinary teams.
12. A recognition to engage in life-long learning.

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Course <u>assessment procedures</u> (Related to course objectives and program outcomes)

1. Practical examples and innovative applications that promote the design skills will be emphasized, as supplement to the introduction to basic concepts and physical laws and fundamental principles of fluid mechanics in lectures.
2. The textbook covers a wide range of exercises and problems at various levels to motivate the students towards the program outcomes.
3. Quizzes and homeworks will aim to test the knowledge and skill of the student as part of continuous learning.
4. Midterm exams and the final exam will test the minimum knowledge and skills of the students toward achieving the course objectives and program outcomes.

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