IŞIK UNIVERSITY FACULTY OF ENGINEERING DEPARTMENT OF MECHANICAL ENGINEERING

ME 353 FLUID MECHANICS COURSE SYLLABUS 2015-2016 Summer

Required Semester: **5** Level of Course: **Third year** Language of Instruction: **English**

Instructor: **Dr. Hakan Öksüzoğlu**, ITU Instructor's office hours: **Tuesday 15:00-16:00**

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Class hours: **Tuesday 9:00-15:00 D/K503** 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:

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

Other sources:

1. F. M. White, "Fluid Mechanics", 4th Edition, McGraw Hill, 1999 Turkish translation (Kadir Kırkköprü, Erkan Ayder), Literatür Yayınevi, 2004.

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" 3rd ed, Mc Graw Hill, 2013 Turkish translation (Tahsin Engin), Palme Yayıncılık, 2015.

5. D.F.Young, B.R. Munson, T.H. Okiishi, W.W. Huebsch, "A Brief Introduction to Fluid Mechanics", 5th Edition, Wiley and Sons, Turkish translation (Nuri Yücel et al), Nobel Yayınevi, 2013.

Class Policies

	Number	Ratio (%)	The final exam grade will also count for the make-up exams of eligible students.
Midterm Exams	**2**	**20 + 20**	
Quizzes	**5**	**4 + 4 + 4 + 4 + 4**	
Homework	**2**	**5 + 5**	
Final Exam	**1**	**30**	

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

Contribution of course to 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

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.

Course assessment procedures (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 homework 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.