

CE 374 FLUID MECHANICS (3-0)
2018-2019 SPRING SEMESTER

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COURSE OUTLINE

1- INTRODUCTION (4 hrs)

- 1.1- Definition of fluid
- 1.2- Scope of fluid mechanics
- 1.3- Concept of continuum
- 1.4- Dimensions and system of dimensions
- 1.5- Units and system of units
- 1.6- Physical properties of fluids (density, specific weight, viscosity, surface tension, vapor pressure, compressibility)

2- HYDROSTATICS (4 hrs)

- 2.1- Scalar, vector, tensor quantities and fields
- 2.2- Surface and body forces
- 2.3- Definition and governing equation
- 2.4- Pressure distribution in an incompressible static fluid
- 2.5- Measurement of pressure (barometer, manometer)
- 2.6- Hydrostatic forces on plane surfaces
- 2.7- Hydrostatic forces on curved surfaces
- 2.8- Buoyancy

3- KINEMATICS (3 hrs)

- 3.1- Definition of kinematics
- 3.2- Derivatives, acceleration of a fluid particle
- 3.3- Deformation of fluid elements
- 3.4- Flowlines (pathline, streamline)
- 3.5- Classification of fluid flows

4- BASIC EQUATIONS AND THEIR APPLICATIONS (10 hrs)

- 4.1- Laws of nature
- 4.2- System and control volume concepts (Reynolds transport theorem)
- 4.3- Conservation of mass principle
- 4.4- Conservation of momentum principle
- 4.5- Conservation of energy principle
- 4.6- Energy and hydraulic grade lines
- 4.7- Velocity coefficients

5- PIPE FLOW (9 hrs)

- 5.1- Laminar and Turbulent Flows
- 5.2- Flow development entrance region
- 5.3- Friction losses
- 5.4- Single pipes
- 5.5- Minor losses
- 5.6- Pipe systems (pipes in series, pipes in parallel and pump discharge lines)

6- OPEN CHANNEL FLOW (9 hrs)

- 6.1- General characteristics of open channel flow
- 6.2- Geometric elements of channel section
- 6.3- States of open channel flow
- 6.4- Pressure and velocity distribution in open channels
- 6.5- Uniform flow (Manning Eq.)
- 6.6- Energy concept and specific energy
- 6.7- Momentum concept and specific force

Text Book:

Mechanics of Fluids, Potter M.C., Wiggert D.C., Brooks/Cole, California, 2002

Lecture Notes:

CE 272 Fluid Mechanics.

İ Aydın, Z Bozkuş, M Ger, M Göğüş, M Köken, H Önder, B A Sakarya, Ş Tiğrek, N Tokyay.
(Available at K3-212)

CE 372 Hydromechanics.

D Altınbilek, İ Aydın, Z Bozkuş, M Ger, M Göğüş, M Köken, H Önder, B A Sakarya, Ş Tiğrek, N Tokyay. (Available at K1-stationery store)

Web sites: <http://courses.ce.metu.edu.tr/ce374/>

Reference Books:

White, F.M., "Fluid Mechanics", Mc Graw Hill, New York, Sixth Edn., 2006

Munson, B. R., Young, D. F., and Okiishi, T. H., "Fundamentals of Fluid Mechanics", John Wiley and Sons Inc., U.S.A., 1990.

Çengel, Y.A., Cimbala, J.M. "Fluid Mechanics" Mc Graw Hill, New York, 2006

Kundu, P.K., Cohen, I.M. "Fluid Mechanics" Elsevier Academic Press, Third Edn., New York, 2004

Batchelor, G.K. "An Introduction to Fluid Dynamics" Cambridge Mathematical Library Eddition, 2006

Jain, S.C. "Open Channel Flow" John Wiley & Sons Inc., New York, 2001

Chow, V. T. "Open-Channel Hydraulics" McGraw-Hill, Kogakusha, Tokyo 1959

French, R. H., "Open-Channel Hydraulics", McGraw-Hill, Singapore, 1987.

Henderson, F. M., "Open Channel Flow" McMillan Company, New York, 1966.

- **Three midterms**
- **Final Exam**
- **Recitation hours**
- **Attendance is strongly recommended !!**

Grading: (tentative)

Midterms + Attendance : 65 %

Final : 35 %

Exam	Date (Tentative)	Hours
Midterm 1	March 19th	Will be announced
Midterm 2	April 16th	Will be announced
Midterm 3	May 14th	Will be announced
Final	Will be announced	