Sungkyunkwan University (SKKU) International Summer Semester (ISS) 2026

Fluid Mechanics

Prof. Chang-Hwan Choi, Stevens Institute of Technology

SHORT COURSE DESCRIPTION

This course introduces students to properties of fluid, basic flow analysis techniques, fluid kinematics, hydrostatics, manometry, pressure distribution in rigid body motion of a fluid, control volume analysis, conservation of mass, linear and angular momentum, Bernoulli and energy equations, dimensional analysis, viscous flow in pipes, flow metering devices, external flows, estimation of lift and drag, and turbomachinery.

READING MATERIALS

- Class materials including lecture slides, example problems, and supporting material will be shared with students for viewing before and after lectures.
- Recommended textbook: Frank M. White, Fluid Mechanics, 9th Edition, McGraw-Hill, 2021.

COURSE REQUIREMENTS AND GRADING

- Prerequisites: Differential Equations, Dynamics, Thermodynamics
- Attendance is mandatory. If one is absent more than three times, one will fail the course.
- Grading: Quizzes 70%, Final exam 30%.
- Grade of 60 or above is Pass.

COURSE SCHEDULE

– WEEK I –

Monday (29 June) Introduction: The Concept of a Fluid, Thermodynamics Properties of a Fluid

Tuesday (30 June) Quiz 1; Pressure Distribution in a Fluid: Hydrostatic Pressure and Forces

Wednesday (1 July) Quiz 2; Pressure Distribution in a Fluid: Pressure Distribution in Rigid-Body Motion, Pressure Measurement

Thursday (2 July) Quiz 3; Integral Relations for a Control Volume: Conservation of Mass, The Linear/Angular Momentum Equations

– WEEK II –

Monday (6 July) Quiz 4; Integral Relations for a Control Volume: The Energy Equation, The Bernoulli Equation

Tuesday (7 July) Quiz 5; Differential Relations for Fluid Flow: Differential Equations of Mass Conservation, Linear/Angular Momentum, and Energy

Wednesday (8 July) Quiz 6; Differential Relations for Fluid Flow: Stream Function, Vorticity, Incompressible Viscous Flows

Thursday (9 July) Quiz 7; Dimensional Analysis and Similarity: The Pi Theorem, Nondimensionalization of the Basic Equations, Modeling and Similarity

– WEEK III –

Monday (13 July) Quiz 8; Viscous Flow in Ducts: The Friction Factor, Laminar Fully Developed Pipe Flow

Tuesday (14 July) Quiz 9; Viscous Flow in Ducts: Turbulence Modeling, Turbulent Pipe Flow

Wednesday (15 July) Quiz 10; Viscous Flow in Ducts: Different Types of Pipe Flow Problems, Minor Losses in Pipe Systems, Multiple-Pipe Systems

Thursday (16 July) Quiz 11; Flow Past Immersed Bodies: The Flat-Plate Boundary Layer Flow

– WEEK IV–

Monday (20 July) Quiz 12; Flow Past Immersed Bodies: Experimental External Flows

Tuesday (21 July) Quiz 13; Turbomachinery: Pumps, Turbines

Wednesday (22 July) Final Exam