

流體力學

114-2 開課

收藏

加入預選

流水號
13049

課號
ME2007

課程識別碼
502 31000

班次 03

3 學分

必修 ▼
機械工程學系 / 工學院院學士學位

陳子殷 ▼

二 2 / 五 3, 4

[進學講堂](#)

2 類

修課總人數 55 人
本校 55 人

領域專長
[分析力學與應用](#)

英文授課

[NTU COOL](#)

[核心能力與課程規劃關聯圖](#)

目 備註

機械系 本課程以英語授課。上課地點:機械103教室(進學講堂)

工學院院學士 本課程以英語授課。院學士核心必修-甲組

⚠ 修課限制

限本系所學生(含輔系、雙修生)

↗ 本校選課狀況

已選上	剩餘名額	已登記
77 / 55	0	0

目 課程概述

Why do golf balls have dimples? How do insects walk on water? Why don't redwood trees grow taller than 400 ft? How do garden sprinklers rotate without external power? Would swimming in Venus's ancient carbon dioxide seas be harder than in Earth's water?

These are just some of the questions we hope to explore in this 3-unit introductory fluid mechanics course for mechanical engineering juniors. We'll cover fundamental concepts like the continuum assumption, velocity fields, and vorticity. Using mass conservation and Newton's laws, we'll analyze fluid motion and solve basic engineering problems. Starting with inviscid flows, we'll introduce viscosity for internal (pipe) and external (airfoil, bluff body) flows, as well as free-surface flows. Dimensional analysis will also be presented, which is very useful to understand the role of different parameters for complicated problems.

🕒 課程目標

Learning Aims: Our goals and skills you will be expected to demonstrate by the end of this course.

To develop your understanding of the basic principles of fluid mechanics: you will demonstrate an ability to recognize the type of fluid flow that is occurring in a particular physical system. You will have an ability to choose the appropriate fluid mechanical principles needed to analyze fluid-flow situations.

To develop your skills in analyzing fluid flows through the proper use of modeling and the

application of basic fluid-flow principles: You will demonstrate an ability to apply appropriate simplifying assumptions and basic fluid-flow principles to formulate a mathematical description of a simple fluid-flow system. You will have an ability to solve and analyze the mathematical equations for a simple fluid flow system.

To study specific knowledge regarding fluid-flow phenomena observed in mechanical engineering systems, such as flow in a pipe, boundary-layer flows, drag, etc: You will be able to recognize basic flow phenomena that are present in a typical engineering system. You will have knowledge of important practical results in common fluid flows and their physical implications.

To demonstrate your capacity to design an engineering related to fluid mechanics. You will have the ability to solve engineering problems related to fluid mechanics.

Topics Covered: The content of the course will be covered in the following order:

Fluid statics: Pressure distribution in a fluid. Manometry. Force on plane and curved submerged surfaces. Buoyancy.

Fluid flow fields: Eulerian vs. Lagrangian descriptions. Velocity fields. Flow lines. Acceleration fields.

Control-volume analysis: Reynolds transport theorem. Mass balance. Momentum balance. Energy balance. s equation.

Local analysis: Kinematics. The stream function. Derivation of continuity and Navier-Stokes equations. Simple viscous-flow solutions.

Similitude: Dimensional analysis. Buckingham Pi theorem. Dimensionless groups. Modeling.

Pipe flow: Entry region. Fully developed flow. Laminar and turbulent flow. Colebrook formula. Minor losses.

External flows: Laminar and turbulent boundary layers. Flow transition. Separation. Drag.

☰ 課程要求

Calculus; General Physics; Dynamics; Engineering Mathematics; Thermodynamics.

🕒 預期每週課前或/與課後學習時數

🕒 Office Hour

📖 指定閱讀

Munson, Young, and Okiishi's Fundamentals of Fluid Mechanics (9th edn., International Adaptation (SI version), Wiley, 2021

III 參考書目

1. White, Fluid Mechanics, 8th edn., McGraw Hill
 2. Batchelor, An introduction to fluid dynamics, 2nd edn., Cambridge university press
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🕒 評量方式

1. 本校尚無訂定 A+ 比例上限。
 2. 本校採用等第制評定成績，學生成績評量辦法中的百分制分數區間與單科成績對照表僅供參考，授課教師可依等第定義調整分數區間。詳見 [學習評量專區](#)。
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🗨️ 針對學生困難提供學生調整方式

調整方式	說明
D1	由師生雙方議定 Negotiated by both teachers and students

🕒 補課資訊

📅 課程進度

特別贊助 |  華南銀行
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臺大課程網

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