Course Syllabus

SUNY ME 464/ME 564 : Fundamentals of Aerodynamics

Course Derail

Title : ME 464/ME 564 : Fundamentals of Aerodynamics

Credit : 3

Classroom Location : A724

Schedule: TUTH 3:30 – 4:50 PM

Prerequisites : ME 305; ME 310; ME 364

Instructor Detail

Instructor : Sejong Oh, Ph. D.

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Couse Description

With brief review of fluid mechanics on the physical characteristics of flow field around an airfoil shaped object for high Reynolds number especially in incompressible regime. Based on these knowledges, the kinematics of fluid particle for incompressible and inviscid flow (potential flow). And the governing equations and the mathematical methods to solve the problems.

The characteristics of lift/drag/pitching moment will be analyzed and why the shape of airfoil has been developed.

2-dimensional characteristics of airfoil theory will be extended to 3-dimensional wing theory.

The effects of the relation between lift and drag will be analyzed for airplane performance.

Textbook

John D. Anderson, Jr. Fundamentals of Aerodynamics, sixth edition, McGraw-Hill, 2017

- Summarized lecture notes will be provided before each lecture by mail

Course Learning Objectives

- The aerodynamic characteristics of airfoils and wings in incompressible regime (Mach number is less than 0.3)
- Brief knowledge of basic governing equation of fluid motion in high Reynolds number regime
- Characteristics boundary layer, flow separation, and turbulent effects
- Kinematics for fluid particles
- Governing equation and mathematics methods for potential flow analysis
- Geometrical definition of airfoils and wings
- Lift/Drag/Pitching moment characteristics of airfoils (2-dimension) with angle of attack
- Lift/Drag/Pitching moment characteristics of wings (3-dimension) with angle of attack
- If possible, the importance of Lift/Drag force on airplane performances

Grading

Homework	30% **(20% grads)**
Midterm	30% **(20% grads)**
Term Projects for grads	**20% for grads**
Final Exam	40%

- Homework will be assigned after each chapter of textbook (ch1-ch5) for some problems of end of each chapter.
- Term projects for grad students will be assigned at the end of semester.
- Grading scale

A+ : 95-100 A : 90-95 A- : 85-90

B+ : 80-85 B : 75-80 B- : 70-75

C : 60-70 D : 50-60 F : -50

Course outline: : Aug. 18 – Dec. 14, 2023

Week 1	Review of fluid mechanics	Lecture note
Week 2	Review of fluid mechanics	Lecture note
Week 3	Introductory concepts	Ch 1.1-1.7
Week 4	Introductory concepts	Ch 1.8-1.6
Week 5	Principle and Equations	Ch 2.1-2.10
Week 6	Principle and Equations	Ch 2.10-2.18
Week 7	Inviscid, Incompressible flow	Ch 3.1-3.8
Week 8	Inviscid, Incompressible flow	Ch 3.8-3.14
Week 9	Inviscid, Incompressible flow	Ch 3.15-3.18
Week 10	Airfoil theory	Ch 4.1-4.6
Week 11	Airfoil theory	Ch 4.6-4.9
Week 12	Midterm	
Week 13	Airfoil theory	Ch 4.10-4.16
Week 14	Wing theory	Ch 5.1-5.3
Week 15	Wing theory	Ch 5.4-5.7
Week 16	Airplane performance	Lecture note
Week 17	Final Exam	