COURSE CONTENT

Course
Course code : MCE 412
Course title: FLUID DYNAMICS AND AERODYNAMICS (2 UNITS)
Course status: Compulsory

Course Duration
Two hours per week for 15 weeks (30 hours)

Lecturer Data
Name of the lecturer: ENGR. KOMOLAFE, C.A
Qualifications obtained: M. Eng.(Mechanical), Ph.D (In view), Mnse, MNIMechE, Mniae, COREN Reg.
Department: Mechanical Engineering
Faculty: Science and Engineering
E-mail: komolafe.adekunle@lmu.edu.ng
Office Location: Room A103(Inner), Engineering Building
Consultation Hours: 12-2pm Everyday

Course Content
Inviscid flow concepts include: Euler equations, stream function, velocity potential, singularities, vorticity and circulation laws. Viscous flow topics include boundary layers, separation and turbulent flow. In addition, external flows lift and drag, thin airfoil theory, finite wing theory and airfoil design will be discussed.

Course Objectives
At the end of this course, students would be able to:

- acquire knowledge of Basic fluid mechanics and aerodynamics including basic fluid-flow relationships.
- understand fluid flow equations and their fundamental principles;
- acquire knowledge of two-dimensional flow, their basic equations and flow regimes in addition to boundary layers.
- understand general airfoil theory, airfoil coefficients and finite wing theory.

Course Requirement
To aid better understanding and for fast grasping of the course (Fluid dynamics and Aerodynamiccs) It requires that the students be familiar with basic fluid mechanics at lower levels (200 and 300 levels). In addition, the course requires that each student for the course be ready to carry out practical work in the laboratory .

Method of Grading

S/N	**Grading**	**Score** (%)
1.	Test	10
2.	Assignment	10
3.	Practical (laboratory work)	10
4.	Final Examination	70
	Total	**100**

Course Delivery Strategies

- Provision of detailed explanation in class on the topic.
- Provision of adequate illustration on the board.
- Making lecturing periods interactive through group discussion.
- Giving the students class work during the lecture period.
- Giving take-home assignments at the end of each lecture.

COURSE OUTLINES

Module 1

Week 1: Introduction to Fluid dynamics (Basic fluid properties and Methods for studying fluid flow patterns)

Week 2: Fundamental definition of fluid particles, Nature or types of fluid flow and laws governing the motion of bodies to fluid motion

Week 3: Equations of fluid motion (Euler's equation, Bernoullis equation of motion etc.)

Module 2

Week 4: Concept of velocity potential, streamlines, stream tubes and stream function.
Week 5: Singularity, Vorticity and Circulation laws.
Week 6: Theories of boundary layers

Module 3

Week 7: Concept of Separation, Laminar and Turbulent flows
Week 8: Basic concept of Aerodynamics and Mid semester Examination
Week 9: External flows Lift and Drag force and coefficient of drag. .

Module 4

Week 10: General airfoil theory and airfoil coefficients
Week 11: Thin airfoil analysis and applications
Week 12: Thin airfoil theory in supersonic flow

Module 5

Week 13: Wing finite theory and airfoil design
Week 14: Wing loading
Week 15: Revision

Tutorials: Questions will be given to the student at the end of each lecture.

Reading lists

Kothandaraman, C.P and Rudramoorthy, R. (2007). Fluid Mechanics and Machinery, second Edition, New Age International (P) Ltd; Publishers.

Kundu, P.K. and Cohen, I.M. (2004). Fluid Mechanics, 3rd Edition, Elsevier Academic Press, Califonia, USA.

Nakayama, Y. (2000). Introduction to Fluid Mechanics, Butterworth-Heinmann, Linacre House, Jordan Hill, Oxford OX 28DP.

Cengel, Y.A. and Cimbala, J.M. (2010). Fluid Mechanics (Fundamentals and Applications), McGraw-Hill Education, New York.

Flandro, G.A; Howard, M.M. and Roach, R.L. (2012). Basic Aerodynamics (Incompressible Flow), First Edition, Cambridge University Press, USA.

Anderson *J. D.* (2011). Fundamentals of Aerodynamics, Fifth Edition, McGraw-Hill Education, New York.