Semester:	6				
Course Code:	ME5070				
Course Name:	Fluid Dynamics				
Credits Value:	3 (Notional hours: 150)				
Pre-requisites:	CE2020				
Core/ Optional:	Optional				
Hourly Breakdown	Lectures (hours)	Tutorials (hours)	Practical classes (hours)	Assignments (hours)	Independent Learning & Assessment (hours)
	37	03	06	04	100

Course Aim: This course aims at introducing fundamentals used in fluid mechanical problem solving involved with inviscid fluid flow, boundary layer flows, and compressible fluids. Specifically, to enable students to appreciate problem solving approaches associated with a broader range of fluid flows in practical applications.

Intended Learning Outcomes:
On completion of this course, students will be able to:

- **apply** inviscid theory to flow situations of practical interest,
- **understand** approaches to solve turbulent boundary layer flows and estimate drag forces, and solve simple viscous fluid flow using Navier-Stokes equations,
- **describe** the fundamental compressible flow interactions in ducts with smoothly varying cross-sectional area and analyze the effects of friction and heat transfer in compressible flows through constant-area ducts.

Course Content:

- **Ideal fluid flow:** Euler’s equation of motion, two-dimensional irrotational motion, superposition of plane flows, circle theorem, Blasius theorem, application of conformal transformation, aerofoil theory
- **Real fluids:** Fluid motion with friction, Navies-Stokes equation, exact solutions, very slow motion; boundary layer equation for 2-D flows, exact solutions, approximate methods, boundary layer control, Flow with heat transfer, Turbulence and diffusion processes
- **Compressible flows:** Mach number and speed of sound, categories of compressible flow, isentropic flow of an ideal gas (effect of variations in flow, cross-sectional area, converging–diverging duct flow, constant area duct flow), non-isentropic flow of an ideal gas (adiabatic constant area duct flow with friction (Fanno flow), frictionless constant area duct flow with heat transfer (Rayleigh flow), normal shock waves), two-dimensional compressible flow, thin-airfoil theory in supersonic flow.

Teaching/ Learning Methods:
Classroom lectures, laboratories, tutorials and in-class exercises and assignments

Assessment Strategy:

Continuous Assessment 50%		Final Assessment 50%		
Details:		Theory (%)	Practical (%)	Other (%)
Tutorial/Labs/Assignments/Quizzes	30%	50%		
Mid Semester Examination	20%			

Recommended Reading:

- White, FM (2003), *Fluid Mechanics* (5th Edition), New York, McGraw-Hill.
- Massey BS(2012), *Mechanics of Fluids* (6th Edition), Springer US.
- Cengel YA, Cimbala AM (2014), *Fluid Mechanics –Fundamentals and Applications* (3rd Edition), McGraw Hill.
- Kundu, Pijush K, Ira M. Cohen, and David R. Dowling (2015), *Fluid mechanics* (6th Edition). Academic press.
- Douglas, JF, Janusz Maria Gasiorek, John A. Swaffield (2017), *Fluid Mechanics* (6th Edition), Pearson Education Limited, United Kingdom,.
- Markus Raffel, Christian E. Willert, Fulvio Scarano, Christian J. Kähler, Steve T. Wereley, Jürgen Kompenhans (2018), *Particle Image Velocimetry: A Practical Guide (Experimental Fluid Mechanics)* (3rd Edition), Springer,.