Course Title	Advanced Fluid Mechanics	Course Code				
Dept./ Specialization	Mechanical	Structure (LTPC)	3	1	0	4
To be offered for	UG / PG students	Status	Core ☐		Elective ■	
Faculty Proposing the course	Dr. Karthick S	Type	New ■		Modification ☐	
Recommendation from the DAC: Recommended		Date of DAC	08-10-2024			
External Expert(s)	Professor. Suman Chakraborty (IIT Kharagpur) Professor. Amit Agarwal (IIT Bombay)					
Pre-requisite	Basic Fluid Mechanics		Submitted for approval			
Learning Objectives	Develop a deep understanding of fluid dynamics principles and their mathematical formulations. Apply advanced concepts to solve complex fluid mechanics problems in real-world applications.					
Learning Outcomes	Upon completing this course, students will gain a deep understanding of advanced fluid mechanics principles and be able to apply them to solve complex fluid mechanics problems.					
Contents of the course	Recap of Fundamentals: Continuum Hypothesis and Fluid Kinematics. (L3+T2) Reynolds transport theorem and Integral form Equations. (L4+T2) Constitutive relations and the Navier Stokes equation for Newtonian fluids. Analytical solutions of the transient and steady Navier Stokes equations for incompressible viscous flows. (L6+T4) Inviscid flows and their flow past immersed bodies. (L4+T3) Boundary layer theory, Blasius Solution for flat plate, Von Kármán Momentum Integral equations, and Flow separation. (L9+T3) Turbulence, Derivation of RANS equations; turbulent shear flows. (L6+T2) The Navier–Stokes regularity problem. (L6) Special topics: The circulatory system in the Human body, Fluid flow in plants, and effluent dispersal. (L4)					
Text Book	1. Pijush K. Kundu, Ira M. Cohen, David R Dowling, Fluid Mechanics. Academic Press, Fifth Edition, 2012. 2. Landau, L. D., & Lifshitz, E. M. *Fluid mechanics* (Vol. 6). Butterworth-Heinemann, Third Edition, 2013.					
Reference Books	1. Tritton, David J. Physical fluid dynamics. Springer Science & Business Media, 2012. 2. The films, and text material from National Committee for Fluid Mechanics Films (NCFMF) 3. White F. M., & Xue, H. *Fluid mechanics*, McGraw-Hill Education, Ninth Edition, 2022. 4. R. Fox and A. MacDonald, Introduction to Fluid Mechanics, John Wiley and Sons, 2020. 5. Robinson, James C. "The Navier–Stokes regularity problem." Philosophical Transactions of the Royal Society A 378.2174 (2020): 20190526.					