

PROFORMA FOR NEW COURSE

1.	Title of the Course	Advanced Fluid Mechanics
2.	Course Number	ME5104
3.	Status of the Course	Core/Elective
4.	Structure of Credits	3-0-0-3
5.	Offered To	PG
6.	New Course/Modification to	New
7.	To be Offered by	Department of Mechanical Engineering
8.	To take effect from	July 2019
9.	Prerequisite	Nil
10.	Whether approved by the Program	Yes
11.	Course Objective: To provide a fundamental understanding of advanced topics in fluid mechanics; to discuss the modelling of fluid flow in detail for various situations of relevance; to provide training to students in applying the modelling techniques to various real-life and industrial flow phenomena.	
12.	Course Content: Introduction: vectors, tensors, notation; Kinematics: Lagrangian and Eulerian descriptions, streamlines, stress and strain, vorticity, circulation, stream function, cylindrical and polar coordinates; Conservation laws: equations for conservation of mass, momentum and energy, Bernoulli equation; Vorticity dynamics: Kelvin's circulation theorem, vorticity equation, interaction of vortices; Irrotational flow: complex variables, elementary flows, superposition, conformal mapping, numerical solutions, axisymmetric flows, 3-D flows; Laminar flow solutions: diffusion; exact analytical solutions, similarity solutions; Laminar boundary layers: introduction to the boundary layer approximation, flat plate, Blasius solution, Falkner-Skan flow, separation, cylinders and spheres, free shear flows; Low Reynolds number flows: creeping flow, Stokes flow, lubrication theory.	
13.	Text book(s): 1. Kundu P K, Cohen I M and Dowling D R, <i>Fluid Mechanics</i> , 5th Edition, Academic Press (2014) 2. White F M, <i>Viscous Fluid Flow</i> , 3rd Edition, McGraw Hill Education (2017)	
14.	Reference(s): 1. Batchelor G K, <i>An Introduction to Fluid Dynamics</i> , Cambridge University Press (2000) 2. Fox R W, McDonald A T and Pritchard P J, <i>Introduction to Fluid Mechanics</i> , 6th Edition, John Wiley & Sons, Inc. (2004) 3. Panton R L, <i>Incompressible Flow</i> , 4th Edition, Wiley (2013) 4. Schlichting H and Gersten K, <i>Boundary Layer Theory</i> , Springer (2000)	