1.	Title of the course	Computational Fluid Dynamics
2.	Course number	ME501L
3.	Structure of credits	2-0-2-3
4.	Offered to	PG
5.	New course/modification to	Modification To ME5101/20
6.	To be offered by	Department of Mechanical Engineering
7.	To take effect from	January 2022
8.	Prerequisite	CoT
9.	**Course Objective(s):** To introduce computational methods for solving linear and non-linear Partial Differential Equations (PDE) related to fluid dynamics and heat transfer. To discuss concepts about solving PDE in the Finite Volume (FV) framework.	
10.	**Course Content:** Governing equations for fluid flow and heat transfer; Classifications of Partial Differential Equations (PDE); Finite difference formulation: various aspects of finite difference equation, error and stability analysis, dissipation and dispersion errors, modified equations; Solutions of simultaneous equations: iterative and direct methods; Elliptic PDE: one and two dimensional steady heat conduction and their solutions, extension to three-dimensional; Parabolic PDE: unsteady heat conduction, explicit and implicit methods, solution of boundary layer equation, up-winding; Solution of incompressible Navier-Stokes equation: stream function and vorticity formulation, primitive variable methods: Marker And Cell (MAC) and Semi Implicit Method for Pressure Linked Equation (SIMPLE)	
11.	**Textbook(s):** 1. Patankar S V, Numerical Heat Transfer and Fluid Flow, 1st Edition, CRC Press (1980). 2. Muralidhar M and Sundararajan T, Computational Fluid Flow and Heat Transfer, 2nd Edition, Narosa (2011).	
12.	**Reference(s):** 1. Ghoshdastidar PS, Computer S imulation of Flow and Heat Transfer, 4 th edition, Tata McGraw-Hill), 1998. 2. Hirch C, Numerical Computation of Internal and External Flows, Elesvier, 2007. 3. Zikanov O, Essential Computational Fluid Dynamics, Wiley, 2010.	