MT-517	Computational Fluid Dynamics
	Introduction and Governing Equations in CFD: Governing equations of fluid dynamics in differential and integral form with fixed and moving control volume, physical interpretation of terms involved in the governing equation, Mathematical behaviour of the PDE and its suitability for different types of flows. Discretisation: Basic schemes of discretisation, Finite difference method, Finite element method, Finite volume method, Boundary element method, merits and demerits of each method. Initial and Boundary Conditions: Initial and boundary conditions (symmetry, inlet, outlet, open boundary condition, wall, cyclic boundary conditions) and its mathematical description for steady and unsteady flows, incompressible flows, compressible flows, subsonic and supersonic flows. Numerical Solutions: Segregated versus coupled solver methods, residuals and imbalances, Accuracy of numerical schemes, Types of Errors, false diffusion, stability criterion, relaxation methods, Grid Independent study. Introduction to Turbulence: Introduction of turbulence, Turbulence transport equations, Turbulence models based on Reynolds Average Navier-Stokes equation (RANS), application of different turbulence models. Hands on experience with commercial CFD packages. Reference Books: 1. Wendt J.F, *Computational Fluid Dynamics*, 3rd Edition, Springer, 2009. 2. Versteeq H and Malasekra W, *An Introduction to Computational Fluid Dynamics,* Dorling Kindersley, 2008. 3. Hirsch C, *Numerical and Computation of internal and external flows*, A Butterworth-Heinemann, 2007. 4. Pozrikidis C, *Introduction to Theoretical and Computational Fluid Dynamic,* Oxford University Press, 1997.