Year & Sem: E3S2	Course Code: CH3606	Course Name: **Computational Fluid Dynamics**	No. of Credits: 4	L	T&PS	P
				2	2	0

Unit I: Introduction - Finite difference methods- finite element method - finite volume method- Treatment of boundary conditions- Governing differential equations. Finite difference methods - Taylor's series - Errors associated with FDE- FDE formulation for steady state heat transfer problems

Unit II: Cartesian, cylindrical and spherical coordinate systems- boundary conditions- Un steady state heat conduction Explicit Method - Stability criteria - Implicit Method - Crank Nickolson method - 2-D FDE formulation ADI- ADE. Finite volume method - Generalized differential equation, Basic rules for control volume approach, Source term linearization, boundary conditions. Un-steady state one, two, three dimensional heat conduction

Unit III: convection and diffusion, different methods i.e., upwind scheme, Exponential scheme, Hybrid scheme, power law scheme, calculation of flow field, staggered grid method, pressure and velocity corrections, SIMPLE Algorithms & SIMPLER (revised algorithm). Solution methods of elliptical, parabolic and hyperbolic partial differential equations in fluid mechanics - Burgers equation.

Unit IV: Formulations for incompressible viscous flows - vortex methods -pressure correction methods.

Unit V: Treatment of compressible flows- potential equation, Navier - Stokes equation - flow field dependent variation methods, boundary conditions. Linear fluid flow problems, 2-I) and 3-1) fluid flow problems.

References/Text Books:

1. Numerical heat transfer and fluid flow - S.V. Patankar
2. Computational Fluid Dynamics, T.J. Chung, Cambridge University
3. Text Book of Fluid Dynamics, Frank Chorlton, CBS Publishers

Lecture Plan: Unit-I & -II syllabus for MID-I, Unit-III & -IV syllabus for MID-II and Unit-V & -VI syllabus for MID-III examinations.

Video Lectures (Web Links):

1.
2.

Study Materials (Web Links):

1.
2.

Problems & Solutions (Web Links):

1.
2.