

GUJARAT TECHNOLOGICAL UNIVERSITY

B. E. SEMESTER: VI Aeronautical Engineering

Subject Name: **Computational Fluid Dynamics – II**

Subject Code: **160105**

Teaching Scheme				Evaluation Scheme		
Theory	Tutorial	Practical	Total	University Exam (Theory) (E)	Mid Sem Exam (Theory) (M)	Practical (I)
3	0	2	5	70	30	50

Sr. NO.	Course Contents	Total Hrs
1.	GRIDS WITH APPROPRIATE TRANSFORMATIONS: Introduction and general transformation of the equations Metrics and Jacobian The transformed version of Generic form for CFD Elliptic grid generation Adaptive grids	07
2.	UPWIND SCHEMES: Development of Upwind scheme:, High resolution scheme Flux vector Splitting and its application to 1-D unsteady Eulers equation Second order upwind scheme, TVD and flux limiters.	07
3.	CFD TECHNIQUES TO NUMERICAL SOLUTIONS: Implicit method and explicit method Beam and warming method Multi dimensional problem The Godunov approach Method of relaxation, Engquist and Oshero scheme for a scalar conservation law	08
4.	APPLICATIONS OF CFD TO PURELY SUBSONIC FLOW THROUGH NOZZL: Boundary conditions and initial conditions for the problem Solution of subsonic-supersonic flow through nozzle using conservation forms of equations Nozzle flow solutions with shock capturing and numerical	08
5.	Numerical solution to Prandtl Mayer Expansion Waves: Prandtl Mayer function and Governing equations Transformation of physical plane to computational plane Finite difference equations and MacCormark technique to solve the equations. Numerical	08

6.	Numerical solution to Navier-Stokes equation: Description to physical problem and governing equations Finite difference equations to governing equations Calculation of step size and boundary conditions applied Navier-Stokes Code: Flow charts for Main Program, Mac Cormack subroutine, TAUXY function subprogram	07
7.	Numerical solution to unsteady flow problem: Conservation form of governing equations Methods of Jacobian to governing equations Roots of an equations using methods of Jacobian Shock tube problem definition and numerical solutions	06

Text Books:

1. Computational fluid dynamics-Basics with applications: J.D.Anderson

Reference Books:

1. Computational fluid dynamics:T.J. Chung
2. T.K. Sengupta, Fundamentals of Computational Fluid Dynamics.
3. J.H. Ferziger, M. Peric , Computational methods for Fluid dynamics, Springer.