2012-13

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY

(COURSE STRUCUTRE FOR AUTONOMOUS SCHEME)

I Year M. Tech. (Machine Design) M.E.	**T**	**P**	**C**
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MEMD1T5D - COMPUTATIONAL FLUID DYNAMICS

(Elective I)

Unit – I

Introduction: Finite difference method, finite volume method, finite element method, governing equations and boundary conditions. Derivation of finite difference equations.

Unit – II

Solution methods: Solution methods of elliptical equations – finite difference formulations, interactive solution methods, direct method with Gaussian elimination. Parabolic equations-explicit schemes and Von Neumann stability analysis, implicit schemes,alternating direction implicit schemes, approximate factorization, fractional step methods, direct method with tridiagonal matrix algorithm.

Unit – III

Hyperbolic equations: explicit schemes and Von Neumann stability analysis, implicit schemes, multi step methods, nonlinear problems, second order one-dimensional wave equations. Burgers equations: Explicit and implicit schemes, Runge-Kutta method.

Unit – IV

Formulations of incompressible viscous flows: Formulations of incompressible viscous flows by finite difference methods, pressure correction methods, vortex methods.

Unit – V

Treatment of compressible flows: potential equation, Eluer equations, Navier-stokes system of equations, flowfield-dependent variation methods, boundary conditions, example problems.

Unit – VI

Finite volume method: Finite volume method via finite difference method, formulations for two and three-dimensional problems.

Unit – VII

Grid generation: Introduction, co–ordinate Transformation, Differential equation methods, algebraic methods, Transfinite Interpolation methods

Unit – VIII

Inviscid incompressible Flow: Introduction Potential flow problems,Panel methods, panel methods for subsonic and super sonic flows.

Text Book:

1. Computational fluid dynamics, T. J.Chung, Cambridge University press,2002.
2. Introduction to computational fluid dynamics : P.Niyogi , SK Chakrabartty and M.K.Laha Pearson education

Reference:

1. Text book of fluid dynamics, Frank Chorlton, CBS Pub
2. Computational fluid dynamics John Anderson TMH publishers