SUBJECT NO-ME60073, SUBJECT NAME- COMPUTATIONAL METHODS IN THERMAL ENGG.

LTP- 3-1-0,CRD- 4

SYLLABUS :-

Root finding: Complex algebraic and transcendental equations. Solution of linear equations by LU decomposition and Newton Raphson method. Root finding used in integration, evaluation of areas, surface of revolution, length of curve and volumes. Evaluation of centroid of regular geometric bodies. Double integration to compute areas, triple integration to compute volumes and quadruple integration to compute view factors. Interpolation and its use in thermal engineering. Interpolation used to find pump power and flow rate from pump characteristics. Solution of ordinary differential equations, Runge-Kutta method and Euler method. Solution of non-linear equations of any order and any degree. Solution of initial value problems and boundary value problems. Solution of boundary value problem through initial value problems, shooting method, optimization of objective functions to determine the solution of boundary value problems. Application of shooting method or the optimization method to solve thermal engineering problems like: boundary layer flow on a flat plate, thermal boundary layer on a vertical and flat plate, flow near a rotating disk, Falkner-Skan wedge flow, travel of projectile in air with drag, meeting of two projectiles, temperature distribution in a circular fin, triangular fin and general solution to steady 1D heat conduction in any shape. Introduction to finite difference (FD) method. Forward, CD and upwind schemes. Solution of ODE by FD method. Solution of non-linear differential equation by EES. Introduction to stability, numerical errors and accuracy. Application of finite difference method to thermal engineering problems. Solution of hydrodynamic and thermal boundary layer equations by FD method. Solution of Falkner-Skan problem by FD method. Extensive Application to transient heat transfer by FD method. FD method used for 2D and 3D problems. Demonstration and use of software such as EES to apply different methods and solve system of equations (linear or nonlinear) mentioned above.