

ME 528

Title: Numerical Heat Transfer--- **Computational Fluid Dynamics and Heat Transfer**

Time: Location: **ERF**

Lecturer: Professor Suresh K. Aggarwal, 2059 ERF, 312-996-2235, ska@uic.edu

Office Hours: Open

Text: Computational Fluid Mechanics and Heat Transfer, 2nd Edition, J. C. Tannehill, D. A. Anderson, and R. H. Pletcher, Publisher: Taylor & Francis.

Reference Books: (1) Numerical Heat Transfer and Fluid Flow, S. V. Patankar, Hemisphere Publishing Corporation, 1980; (2) Handbook of Numerical Heat Transfer, W. J. Minkowycz, E. M. Sparrow, G. E. Schneider, and R. H. Pletcher, John Wiley and Sons, Inc. 1988

Prerequisite: An Intermediate Level Heat Transfer (ME 421) or Fluid Mechanics (ME 417) Course, and Basic knowledge of numerical techniques (ME 428), or consent of the instructor.

Semester Credit hours: 4

List of Topics:	Hours
1. Solution of Ordinary Differential Equations Initial-value and boundary-value problems, Shooting method, Stiff ODEs	6
2. Introduction to Partial Differential Equations	2
3. Fundamentals of Finite-Difference Approximations to PDE Taylor series approach, Polynomial approximation, Control volume approach, Numerical issues such as Accuracy, round-off errors, consistency, modified PDE	5
4. Stability of Numerical Methods (Stability analysis)	4
5. Finite-Difference Solution of PDEs Hyperbolic, Parabolic, and Elliptic PDEs, Upwind, central and higher-order schemes, Explicit and implicit methods ADI methods, Solution of algebraic equations.	10
6. Numerical Solution of Fluid Flow and Heat Transfer Eqs.	12

Parabolic flows (Boundary Layer Flows, Jets etc.)
and Elliptic Flows (Navier-Stokes Equations)

7. Advanced Topics (Grid Generation, Parallel Computations etc.) 6

Total **45 hours**

Grading:	Homework & Projects	40%
	Mid-Term	20%
	Final	40%