

## *Prof. Mujumdar Transport Process Research – Research Roadmap on Hybrid Thermal Management using Phase Change Materials for Electronic Components and Systems*

### **Before: 2004**

Completion of Research Courses

Phase Change Materials for  
Electronics Cooling Literature  
Survey

Basic work completed  
Numerical Simulation &  
Experimental completed  
Single PCM & Single Heat Source  
in Enclosure

### **Current/Future: 2005 - 2007**

**2005**

#### **IC package Cooling Applications**

- Numerical Simulations
  - Discrete Heat Source
  - Single & Multiple PCMs
- Experimental Study
  - Flow Visualization
  - IR Thermal Camera study
- Rapid Simulations - Slope Method
- PCM embedded in Heat Sinks
- Effect of PCM volumes
- Parametric study
- Feasibility of PCMs
  
- Research Proposal Submission

**2006**

#### **System Level Cooling Applications**

- CFD Numerical Simulations
  - Parametric study
- Experimental Study
  - Validation study

**2007**

Research completion and Thesis writing