

JF 206 (Aug) 3:0

Course Title:- Heat Transport: From Atoms to Continuum

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Part-1

Treatment of the transport of thermal energy by conduction in natural and fabricated structures. The physical nature of energy transport by three carriers--electrons, phonons, and molecules--will be explored from first principles. For solid-state transport, a common Landauer framework will be used for heat flow by electrons and phonons. Issues including the quantum of thermal conductance, ballistic interface resistance, and carrier scattering will be explored. Bulk material properties, such as thermal and electrical conductivity, will be derived from statistical particle

transport theories, and the effects of spatial confinement on these properties will be established.

Part-2

Modes of HT, Natural Convection: Role of viscosity and thermal diffusivity; onset of convection; Convection in enclosures and external flows; convection patterns; combined mass and heat transport; double diffusive instability; heat transfer in particle laden medium & convection in nano-fluids; applications; Temperature and heat flux measurements and Experiments-flow visualization.