



THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Transport Phenomena and Kinetics

MATSCEN 3151

Credit Hours:

3.00

Course Levels:

Undergraduate (1000-5000 level)

Course Components:

Lecture

Course Description:

Provides students with concepts related to transport phenomena and kinetics as applied to processing of metals, ceramics, polymers, and composite materials.

Prerequisites and Co-requisites:

Prereq: 2010 and 2241; and Math 2177 or 2415; or 2174; and enrollment as MatScEn-BS major; or permission of instructor.

Course Goals / Objectives:

- Learn the concepts related to fluid flow, heat and mass transfer, and kinetics as applied to processing of metals, ceramics, polymers, and composite materials
 - Learn to calculate momentum, heat, and mass flux in one and/or two-dimensional system
 - Learn how to solve analytically and numerically one and/or two-dimensional heat transfer and diffusion problems
 - Learn concept related to chemical reaction kinetics and rate controlling steps in various processes
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Course Topics:

- Fluxes, Phenomenological laws, and Conservation laws
 - Momentum transfer and viscosity
 - Convective and diffusive momentum transport
 - Momentum transport in turbulent flow
 - Modes of heat transfer (conduction, convection, and radiation)
 - Steady and unsteady heat conduction
 - Heat transfer coefficients
 - Fick's law and diffusivity of materials
 - Solution of diffusion equation (error function, and numerical)
 - Vacancy and interstitial mechanisms of self-diffusion
 - Interdiffusion and Darken's equation
 - Mass transfer in fluid systems, mass transfer coefficients
 - Chemical reaction kinetics, rate controlling steps
 - Interface reaction controlled processes
 - Diffusion controlled processes
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Designation:

Required