

**PTFE 3210 FUNDAMENTALS OF TRANSPORT IN POLYMER & FIBER PROCESSES AND STRUCTURE**

Credit: 2-3-3

**Course Coordinators:** Dr. Wallace W. Carr

**Prerequisites:** ME 3322 or CHEM 3411 and MATH 2403 or MATH 2413

**Catalog Description:** An introduction to heat and mass transfer, psychrometrics, and flow through porous media, emphasizing applications to polymers, fibers and textiles.

**Course Learning Objectives:**

1. Learn concepts in heat and mass transfer, psychrometrics, and flow through porous media.
2. Develop problem solving abilities.
3. Gain a foundation for analyzing transport problems in polymers & fiber processes and structures.

**Textbook:** F. Incropera and D. Dewitt, Fundamentals of Heat and Mass Transfer, 5th edition, John Wiley & Sons, 2002.

**Topical Outline of Lectures:**

1. Basic Principles of Heat Transfer
2. Steady State Conduction
3. Transient Conduction
4. Psychrometrics
5. Convection
6. Heat Exchangers
7. Thermal Radiation
8. Transient Mass Transfer with Emphasis on Dyeing
9. Transport Through Fibrous Assemblies

**Course Outcomes:** Specifically, at the end of the course the students will be able to:

1. Demonstrate an understanding of the basic heat transfer mechanisms through solving practical heat transfer problems [1]\*.
2. Solve transient heat transfer problems with convective boundary conditions using lumped capacitance and exact solution methods [1].
3. Apply heat exchanger methodologies (log mean temperature difference and effectiveness-NTU) to calculate and specify heat exchanger parameters [1].
4. Solve basic diffusion mass transfer problems [1].
5. Solve transient mass transfer problems with convective boundary conditions using exact solutions [1].
6. Apply Darcy's Law to fibrous assemblies [1].

\* Numbers in Brackets refer to PFE Program Outcomes to which the Course Outcomes relate.

## **Topical Outline of Course**

**I. Basic Principles of Heat Transfer**

**II. Steady State Conduction**

**III. Transient Conduction**

**IV. Psychrometrics**

**V. Convection**

**VI. Heat Exchangers**

**VII. Steady State and Transient Mass Transfer**

**VIII. Darcy's Law**