

CHE 906 Advanced Transport Phenomena

Credit Hours: 3

Prerequisites: EME-921 Momentum, Heat and Mass Transfer in Chemical Engineering & Separation Processes

Course Objectives:

Transport phenomena a subject of engineering science deals with momentum, heat and mass transfer. This course provides an advanced overview of fluid mechanics, energy transfer, mass transfer and their applications. The students will learn to apply these principles to steady and unsteady multi dimension flow, and turbulent flow.

Course content:

The course covers:

- Conservation equations: continuity, momentum, energy, and chemical species equations
- Fundamentals of diffusion, diffusion coefficients, multi-component diffusion
- Diffusion in turbulent/laminar flows
- Rate of generation in momentum energy and mass transfer
- Steady and unsteady state microscopic balances
- Steady and unsteady state balances with and without generation

Course Outcomes

By the end of the course, a student should be able to:

- Apply momentum balance equations (Navier-Stokes) to a variety of fluid flow systems and problems.
- Use boundary layer theory to obtain approximate analytical and numerical solutions to momentum balances at high Reynolds numbers.
- Essential understanding of diffusion of gases in solids
- Be able to solve steady & unsteady flow problems with and without inclusion of generation term.

Recommended Reading (including Textbooks and Reference books)

- "Transport Phenomena", 2nd Edition, R.B. Bird, W.E. Stewart, E.N. Lightfoot, 2002
- Transport Phenomena: A Unified Approach, Robert S. Brodkey, Harry C. Hershey, 1988.
- Advanced Transport Phenomena: Fluid Mechanics and Convective Transport Processes, L. Gary Leal 2007.