

## **EL510 Two Phase Flow and Heat Transfer**

### **Module One - Review of Fundamentals**

- Introduction and Review of Single Phase Flow
- Laminar Forced Convection Single Phase Heat Transfer
- Single Phase Natural Convection
- Turbulent Forced Convection Single Phase Heat Transfer

### **Module Two - Phase Change Principles and Fundamentals of Boiling**

- Thermodynamics of Phase Change
- The Boiling Curve
- Bubble Dynamics

### **Module 3: Boiling and Condensation on External Surfaces**

- Boiling from External Surfaces: Nucleate Boiling
- Boiling from External Surfaces: Film Boiling
- Condensation

### **Module 4: Two-Phase Flow with Heat Transfer**

- Two-Phase Flow Pressure Drop Fundamentals
- Two-Phase Multiplier for Homogeneous Flow
- Two-Phase Multiplier for Annular Flow (Martinelli-Nelson)
- Computational Algorithm for Two-Phase Flow in Pipes
- Friction Pressure Loss in Subcooled Nucleate Boiling
- Heat Transfer in Internal Two-Phase Flow

### **Module 5: Special Topics in Two-Phase Flow and Heat Transfer**

- Critical Heat Flux (CHF) in Internal Two-Phase Flow
- Flow Instability in Internal Two-Phase Flow
- Two-Phase Flow Through Orifices
- Cavitation in Fluid Components
- Two-Component Two-Phase Flows
- Pressure Relief Line Flow

### **Module 6: Measurement of Two-Phase Phenomena**

- Measurement in Place
- Prototype Models or Partial Mockups
- Data Analysis