Modules:	**<u>Energy Recovery and Reuse</u>**	
	1. Objectives:	• Describe pinch analysis and its methodologies, benefits and applications • Apply pinch analysis methods to find targets for heat exchanger networks • Apply pinch analysis methodology to design and evolve heat exchanger networks • Discuss other energy recovery techniques for chemical and process industries • Analyze and improve energy efficiency of chemical, thermal and related processes

	2. Scope	• Introduction/Overview
		  - Energy Reuse and Efficiency; Heat Exchanger Networks; Pinch Analysis; Industrial Experience; Contents and Learning Outcomes
		• Heat Exchangers
		  - Types, Basic Principles; Design Equations
		• Pinch Analysis Concepts
		  - Main steps; Temperature-Enthalpy Diagram; Composite Curves, Problem Table, Pinch and its Significance; Grand Composite Curves; Choice of Minimum Driving Force; Heat Exchanger Network – Grid Representation and Design for Maximum Energy Recovery; Examples
		• Targeting
		  - Utilities; Threshold Problems; Area and Number of Units; Optimal $(DT)min$; Examples
		• Heat Exchanger Network Design
		  - Stream Splitting and Cyclic Matching; Network Relaxation; Threshold Problems; Examples
		• Other Energy Recovery Techniques
		  - Waste Heat Recovery using Absorption Chillers; Recompression and Reuse of Vapor Streams; Power Recovery from High Pressure Streams; Use of High Efficiency Pumps, Compressors and Drivers; Process Modifications for Energy Efficiency
		• Industrial Applications
		  - Case Studies (from Chemical Processes and/or Waste Heat Recovery Applications)
		• Discussion and Conclusion (1 hour)
		  - Discussion on energy recovery and reuse techniques, their application including an integrated approach for improving energy efficiency of processes

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