

Fundamentals of Carbon Capture Process: Unit Operations

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<http://chemeprof.com> (see in particular: <http://chemeprof.com/unit-operations-and-lab-at.html>)

Monday PM: Session I

Overview of carbon dioxide absorption process, Unit Operations as formalism to analyze chemical processes, fluid mechanics, heat transfer, mass transfer/continuous contacting operations, process control.

Monday PM Session II

Introduction to fluid mechanics, flow in pipes, process piping calculations.

Primary Reference: "Process Fluid Mechanics", (1980) M. M. Denn: Chapter 3, Chapter 5, sections 5.1-5.4.

Alternative Reference: "Unit Operations" (1993) McCabe, Smith, Harriott, ("MSH"): Chapter 3 (first 10 pages), Chapter 4: pp 72-79, Chapter 6: pp 96-101.

Alternative Reference: "Transport Phenomena", (1960) R. B. Bird, W. E. Stewart, E. N. Lightfoot: pp 180-190, 208-222.

Tuesday AM Session I

Introduction to heat transfer, conduction, convection, radiation. Heat exchange equipment.

Primary Reference: (MSH) (Chap10, not unsteady conduction), Chapter 11, Chap14 (first 10 pages).

Tuesday AM Session II

Newton's law of cooling and heat exchanger calculations for current and countercurrent configurations, log-mean temperature.

Primary Reference: (MSH) Chapter 11. Chap 15 (first 10 pages)

Wednesday AM Session I

Introduction to mass transfer, convection and diffusion. Equipment for continuous contacting absorption and stripping,

Primary Reference: (MSH) Chapter 21(pp 647-667).

Wednesday AM session II

Analysis of gas absorption for a “falling film” and a packed bed gas absorber.

Primary Reference: (MSH) Chapter 22 (pp 686-708)

Thursday AM Session I

Introduction to process flow sheeting, materials of construction and P&ID diagrams. Short introduction to process control and equipment.

Primary Reference: “Plant Design and Economics for Chemical Engineers”, (2003) Peters, Timmerhaus and West: Chapt 3: pp 67-90, Chapt pp 440-450,

Primary Reference: “Process Dynamics and Control” (2004), Seborg, Edgar, Mellichamp: Chapt 1.

Thursday AM Session II

Review/Recap of lectures