

## ChE 441 – SENIOR LABORATORY I

Type (check one): Required:   X   Elective:         

**2005-2006 Catalog Data:** ChE 441. Senior Laboratory I. Experimental study of applications of heat, mass and momentum transfer. Studies include filtration, ion exchange, distillation, etc. Both written and oral reports are required on results of experiments. Prerequisites: ChE 330. Offered in the Fall semester. *One semester; one credit.*

**Prerequisites:** ChE 330

**Co-Requisites:** ChE 443

**Textbook:** Departmental Laboratory Manual

**Other Required Materials:** None

**Other References:** Treybal, *Mass Transfer Operations*, Third Edition, McGraw-Hill.  
McCabe and Smith, *Unit Operations of Chemical Engineering*, Sixth Edition, McGraw-Hill, 2002.

**Instructor:** Dr. Asit K. Ray, Professor of ChE

**Course Objectives:**

1. To apply classroom knowledge acquired to run laboratory and pilot scale mass transfer processes.
2. Present experimental data both orally and in written form.

**Prerequisites by Topics:** Mass Transfer and Separation

**Topics:**

1. Tray Drying – Obtain drying data using the pilot tray dryer and use this to scale up to operations expected commercially.
2. Batch Filtration – Generate batch data to size a continuous filter and specify operating conditions to process a large amount of material.
3. Ion Exchange – Use operating data from laboratory packed column to devise process flow sheet and size columns for a large-scale operation.
4. Distillation – Obtain plate efficiency data at total reflux and other reflux ratios using a pilot 5 plate distillation column operated, using Allen-Bradley PLC-5 controller (a standard in the industry).
5. Absorption – Evaluate efficiency of a pilot scale absorption system by calculating HTU as function of process variables.
6. Aeration and deoxygenation of a water-filled container – study the mass transfer and determine the liquid mass transfer coefficient.

**Class Schedule:** One 3-hour session per week

**Prepared by:** Asit K. Ray, Ph.D. **Date:** September 2005

**Professional Component:  
ChE 441 – SENIOR LABORATORY I**

Category (check one)	<input type="checkbox"/> Math/Basic Science <input checked="" type="checkbox"/> Engineering <input type="checkbox"/> General Education <input type="checkbox"/> Other
Design (check one)	<input type="checkbox"/> Significant <input checked="" type="checkbox"/> Some <input type="checkbox"/> None
Realistic Constraints (check all that apply)	<input type="checkbox"/> Economic <input checked="" type="checkbox"/> Environmental <input type="checkbox"/> Sustainability <input checked="" type="checkbox"/> Manufacturability <input type="checkbox"/> Ethical <input checked="" type="checkbox"/> Health & Safety <input type="checkbox"/> Social <input type="checkbox"/> Political

**Relationship to Program Outcomes:**

Check all that apply:

- (a) an ability to apply knowledge of mathematics, science, and engineering
- (b) an ability to design and conduct experiments, as well as to analyze and interpret data
- (c) an ability to design a system, component, or process to meet desired needs
- (d) an ability to function on multi-disciplinary teams
- (e) an ability to identify, formulate, and solve engineering problems
- (f) an understanding of professional and ethical responsibility
- (g) an ability to communicate effectively
- (h) the broad education necessary to understand the impact of engineering solutions in a global and societal context
- (i) a recognition of the need for and an ability to engage in life-long learning
- (j) a knowledge of contemporary issues
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice