

PONTIFICIA UNIVERSIDAD CATÓLICA DE CHILE  
SCHOOL OF ENGINEERING  
DEPARTAMENT OF CHEMICAL ENGINEERING AND BIOPROCESSES  
ABET COURSE SYLLABI

**IIQ2023 UNIT OPERATIONS II**

**Credits and contact hours:** 10 UC credits / 10 hours (3 h. Lectures; 1,5 h. Labs; 5,5 h. Independent learning experiences)

**Instructor's name:** Pedro Bouchon

**Course coordinator's name** To be defined

**Textbook:** None

**Course Catalog Description:** The Unitary Operations II course seeks to apply physicochemical and mass transfer fundamentals in the analysis of separation processes most frequently used in the chemical, food and biotechnology industries. Also, the main equipment used are described and basis for their design and analysis are given in both, continuing and steps operations. The course considers the development of home-works, unit operations laboratories, case studies, field trip and written evaluations.

**Prerequisite Courses:** IIQ2003 Transport Phenomena

**Co-requisite Courses:** None

**Status in the Curriculum:** Minimum course

**Course Learning Outcomes:**

1. To analyze a steady-state process of interface separation, applying correctly physical-chemistry fundamentals, as well as mass and energy balances.
2. To understand and apply the concepts of equilibrium and driving force in an interface separation process and their relevance to analyze a staged process and a continuous contact process.
3. To use mass transfer coefficients to describe the mass rate of transport, to identify through its use the controlling phase in a biphasic system and to employ them in the design of a continuous process of interface separation.
4. To describe the main equipment used in interface separation processes, to dispose a good base for its design and for the analysis of the effect of operating variables in a stage-wise and a continuous contact processes.
5. To analyze an interface separation process in which the mass and energy balances are coupled.
6. To demonstrate problem solving skills and the ability to conduct experiments as well as to analyze and interpret data related to mass

transfer unit operations.

7. To understand the professional practice of process engineering through cases studies and a field trip.

**Relation of Course to ABET  
Criteria:**

- a. Knowledge of mathematics, science and engineering
- b. Design and conduct experiments: analyze and interpret data
- c. Design a system, component, or process
- d. Multidisciplinary teams
- e. Identify, formulate, and solve engineering problems
- g. Effective communication
- k. Techniques, skills, and modern tools for engineering practice.

**Topics covered:**

1. Introduction to separation and mass transfer processes. Classification.
2. Distillation. Stage-wise process analysis. Uses of mass balances (McCabe-Thiele method), and mass and energy balances (Ponchon-Savarit method)
3. Liquid-liquid extraction
4. Liquid-solid extraction (leaching)
5. Interfacial mass transport and mass transfer coefficients.
6. Analysis of continuous (differential) contact processes.
7. Absorption of gases.
8. Drying.
9. Cooling Tower.
10. Crystallization

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