Contactors: G-L, F-S, L-L system

1. **Course number and name:** 020CONCS4 Contactors: G-L, F-S,L-L systems**.**

2. **Credits and contact hours:** 4 ECTS credits, 2x1:15 contact hours

3. **Name of instructor:** Samar Kaddah

4. **Instructional Materials:**

- Course handouts
- In-class problems

5. **Specific course information**

a. Catalog description:

This course covers the design, sizing, and application of gas-liquid (G-L), liquid-liquid (L-L), and fluid-solid (F-S) contactors in industrial processes. It includes both G-L and L-L separation technologies, such as tray and packed columns, countercurrent flow systems, and the selection criteria for various contactor devices. The course also explores fluid dynamics, characterization of solids, and hydrodynamic regimes in fixed and fluidized beds, with a focus on industrial applications and heat transfer mechanisms. Students will gain practical insights into the advantages, disadvantages, and technological considerations for each type of contactor system. Practical work.

b. Prerequisites: 020PDTCS2 Mass Transfer

c. Required/ Selected Elective/Open Elective: Required

6. **Educational objectives for the course**

a. Specific outcomes of instruction:

- Study the transfer flows in a gas-liquid separation column in the case of physical absorption.
- Study the transfer flows in a current gas-liquid separation column in the case of chemical absorption (reactive absorption) based on the calculation of the Hatta criterion and the acceleration factor.
- Identify the mass transfer regime by a quantitative study (Hatta criterion and the acceleration factor): slow, moderate, fast, pseudo-first order.
- Characterization of solids (powder) in terms of inter- and intra-particle porosity, specific surface area, compressibility of the powder by the Carr index and the Hausner index and its effect on the flow of the grains, the density (packed and aerated), cohesiveness and hydraulic radius.
- Study the particle size distribution of the powder across equivalent diameters (volume, surface area, and specific surface area) and form factors.
- Study of the hydrodynamic regime through fixed beds (Darcy's law, the Kozeny-Carman relation and the Ergun relation) in the case of laminar and turbulent flow.
- Study of the hydrodynamic regime through fluidized beds through an evaluation of the minimum fluidization speed, the expansion of the bed, etc.
- Calculation of TDH disengagement height for cyclone positioning and powder recycling.

- Study of the heat transfer in a contactor with application examples.

b. PIs addressed by the course:

PI	1.2	2.1	2.2
Covered	x	x	x
Assessed	x	x	x

7. Brief list of topics to be covered

- The transfer flows in a gas-liquid separation column in the case of physical and chemical absorption.
- Identify the mass transfer regime by a quantitative study through the Hatta criterion and the acceleration factor.
- Characterization of solids (particles) in terms of granulometry, compressibility, etc.
- Study of the hydrodynamic regime through fixed and fluidized beds.
- Calculation of TDH disengagement height for cyclone positioning and powder recycling.
- Study of heat transfer in a contactor with application examples.