Sepation Processes IIB

Calendar: 5th semester

Contact Hours: T: 30,0; TP: 22,5; OT: 7,5

Intended learning outcomes of the curricular unit:
The curricular unit of Separation Process I B aims to equip students with knowledge of membrane separation, adsorption and ion exchange chromatography. At the same time it is intended that students acquire the knowledge to analyze and to scale up the separation equipment.
After the approval of this course, students should be able to: 1) Identify and apply advanced separation processes such as distil ation optimized, supercritical extraction, membrane separation, adsorption, exchange and ion chromatography. 2) Know to scale up equipment for separation processes studied to simpler and complex mixtures. 3) Analyze and study the operation of this equipment.

Syllabus:
1. Membrane Processes: Pressure processes. Transport models. Concentration polarization. Modes of operation. "Fouling" of membranes. Selection and Sizing. Summary of sequences of operations. Dialysis and Electrodialysis (ED). Stacking membranes. Sizing and design. Pervaporation. Transport equations. Sizing equipment. Gas permeation. Liquid membrane 2. Sorption processes: adsorption and ion exchange chromatography. Kinetics and equilibrium. Equilibrium. Fixed beds. Linear theories of sorption and chromatography of the solute movement theory: application to adsorption and chromatography. Dispersal mechanisms in columns 3. Ion exchange: Advantages and disadvantages, types of resins; Factors affecting the efficiency. Ion exchange equilibrium. Capacity of the resin. Operating conditions 4. Process chromatography: adsorption, ion exchange, molecular exclusion, affinity, reverse phase, covalent, hydrophobic interaction chromatography. Large-scale chromatographic processes.

Demonstration of the syllabus coherence with the curricular unit's intended learning outcomes.
The curricular unit of Separation Process I B aims to equip students with knowledge of membrane separation, adsorption, ion exchange and chromatography, which are separation processes widely used in biotechnological industries. At the same time it is intended that students acquire the knowledge to analyze and to scale up the separation equipment. The importance of this process in the industries is significant, thus, the curricular unit subjects is limited to only these separation process, which al ows a more broadening and insightful lectures about these themes. Consequently, this curricular unit is structured in only 4 chapters corresponding each of them to a particular separation process, namely, membrane separation, adsorption, ion exchange and chromatography.

Teaching methodologies (including evaluation):
Theoretical material will be presented to promote the involvement and participation of all students by developing their reasoning skills and stimulating their critical thinking. Materials about the subjects lectured will be available for consultations on Moodle. Online mini-tests will be weekly proposed to evaluate the subjects taught in the previous week. At any time students can contact the teacher using the Moodle platform.
The assessment consists of 20% for the practical component (Minitest) and 80% of the theoretical component (final exam).

Demonstration of the teaching methodologies coherence with the curricular unit's intended learning outcomes.
The curricular unit of Separation Process I B aims to equip students with knowledge of membrane separation, adsorption, ion exchange and chromatography, which are separation processes widely used in biotechnological industries. At the same time it is intended that students acquire the knowledge to analyze and to scale up the separation equipment. The teaching methods are consistent with the objectives of the course since the realization of individual and weekly tests by the students allows students to inculcate the autonomy and capacity to problem solving and analysis and project / design of separation equipment.