

Separation Processes I

Calendar: 4th semester

Contact Hours: 30h00 T + 22h50 TP + 15h OT

Scientific Area: Processos em Engenharia Química e Biológica

Learning outcomes of the curricular unit

The objectives to be achieved by students are: to design and analyze the behavior of settlers, filters, cyclones and fluidized beds; to analyze the influence of operating conditions in the final separation. In this curricular unit students must obtain the following skills: calculation and design several equipments for different separation processes studied for enabling them with an essential tool in projecting in Chemical industries.

Syllabus

Chapter 1 - 2.0 weeks

1. Classification: Sifting, Elutriation. Magnetic Separators. Cyclones.

Chapter 2 - 1.0 week

2. Fragmentation of solids. Coarse, intermediates and fine crushers.

Chapter 3 - 0.5 weeks

3. Solid mixing and homogenization.

Chapter 4 - 1.5 weeks

4. Movement of fluids through porous beds. Eq Darcy, Kozeny, Ergun.

Chapter 5 - 2.0 weeks

5. Filtration at constant pressure and constant flow. Cross-flow filtration.

Chapter 6 - 1.0 week

6. Centrifugation. Sizing and types of centrifuges.

Chapter 7 - 1.0 week

7. Crystallization. Nucleation. Crystal growth.

Chapter 8 - 1.5 weeks

8. Fluidization. Types and fluidizing velocities.

Chapter 9 - 1.0 week

9. Movement of solids in fluids. Newton's and Stokes' equations.

Chapter 10 - 1.0 week

10. Decantation. Principle of sedimentation; suspension characteristics. Flotation.

Chapter 11 - 1.5 weeks

11. Sedimentation. Drop pattern. Thickening.

Demonstration of the syllabus coherence with the curricular unit's objectives

The content of this curricular unit is intended to address the concepts necessary for an understanding and characterization of solids and design of process units for separating them, as is the case of sieving. This UC also aims solids separation in the separation fluid or fluids with different characteristics, eg the density centrifugation or decantation. The contents are discussed based on a dynamic display of matter and solving practical examples of the laboratory and industry.

Teaching methodologies

Theoretical lectures will be presented, promoting the involvement and participation of all students by developing their thinking skills and stimulating their critical thinking. Materials will be available for consultation on the contents taught in the Moodle platform. Some guided visits are expected to enhance the consolidation of the subjects taught.

Demonstration of the coherence between the teaching methodologies and the learning outcomes.

The curricular unit of Process Separation I aims to provide students with knowledge of separation processes used extensively by the chemical industry. At the same time it is intended that students acquire the knowledge to analyze and size the separation equipment. The teaching methodologies are consistent with the objectives of the course as the individual tests performed by students allows them to enhance their autonomy and capacity for problem solving and analysis and design/ sizing of separation equipment.