

Faculty of Biological, Agronomic and Environmental Engineering

BIRC2109 Process engineering : unit operations

[52.5h+22.5h exercises] 6 credits

Teacher(s): Marc Meurens, Patricio Ruiz Barrientos
Language: French
Level: Second cycle

Aims

Principles and basic techniques of unit operations: mass and heat transfer, mass conservation, physical equilibrium, phases diagrams and charts, etc.

Principles of diffusion and mass transfer between phases.

Separation: mechanical, diffusions. Fluid-solid and fluid-fluid separation.

Calculation and design of main equipments used in unit operations.

Main themes

Diffusion and mass transfer (diffusion theory, mass transfer coefficient, film theory). Absorption, distillation, rectification, humidification, de humidification, drying). Hydrodynamics of liquids through porous particles and membranes (filtration - extraction)

Particles in fluids. Mechanical separation. Sedimentation. Decantation. Centrifugation. Cyclones.

Phase equilibrium (distillation, crystallization)

Content and teaching methods

Content

Phase equilibrium. Distillation. Number of ideal plates. Materials balance in plate columns. Principles of diffusion. Film theory. Experimental determination of mass transfer coefficients. Absorption in plate columns. Absorption with chemical reaction. Mass transfer correlations. Hydrodynamics in packed towers.

Liquid- liquid countercurrent extraction. Supercritical extraction. Drying of porous and non-porous solids. Phases equilibrium.

Mass and heat transfer. Principles of filtration. Pressure drop. Compressible and incompressible filter cakes. Filter medium resistance cakes. Cross flow filtration. Membranes.

Particles in fluids. Mechanical separation. Sedimentation. Decantation. Centrifugation, Cyclones.

Phase equilibrium. Crystallization

Methods

Exercises and practical works: calculations and design of equipments.