

# Course Learning Objectives - CBE 201

## Materials and Energy Balances (4)

At the conclusion of this course, the student should be able to:

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1. Convert process flow rates and compositions between mass, molar, and volume units.
2. Report numerical results with the correct number of significant figures.
3. Construct process flow diagrams for single and multi-unit processes. (Distillation, flash, reaction, crystallization, evaporation, mixing and dissolution. Recycle and bypass streams.)
4. Determine the degrees of freedom when solving a system of equations.
5. Perform material balances for processes without chemical reactions.
6. Perform mass balances for processes with a single chemical reaction.
7. Perform mass balances for processes with multiple chemical reactions.
8. Calculate the compositions of binary, multi-phase systems using Raoult's Law.
9. Calculate the compositions of binary, multi-phase systems using Henry's Law.
10. Perform energy balances for systems with a latent heat change (such as vaporization).
11. Perform energy balances for systems with mixing and/or dissolution processes. (Heat of mixing, heat of solution.)
12. Perform energy balances for systems with reaction. (Heat of reaction.)
13. Perform energy balances for isothermal and adiabatic processes.
14. Use Excel to balance material and energy flows.
15. Perform material balances on transient systems (time dependent). Derive the analytical solution for a separable first order differential material balance equation.
16. Perform energy balances on transient systems. Derive the analytical solution for a separable first-order differential energy balance equations.