

Principles of Processes Calculations

Undergraduate 3 credit course in Polymer Engineering curriculum

Amirkabir University of Technology

Chapter 1: Introduction to the definition of science, technology and engineering (Polymer and color engineering, moving from science towards engineering).

Chapter 2: Introduction to upstream processes for polymers (Processing equipment and instrumentation in polymer and color technologies).

Chapter 3: Units and conversion (Units and conversion, dimensional stability and results validity).

Chapter 4: Process variables (mole, molar mass and concentration - temperature and pressure - flow rate).

Chapter 5: Presenting results and data analysis (Interpolation and extrapolation, linear curve fitting, instrument calibration and log-log and semi-log curves).

Chapter 6: Introduction to material balance (batch, semi-batch and continuous processes - Material balance for one component system - Material balance for multi-component systems - General strategy for solving material balance problems - Material balance with chemical reactions - Material balance for recycle and bypass systems).

Chapter 7: Introduction to energy balance (Population balance and using computer in solving material and energy balance problems).

Chapter 8: Population balance and application in polymer and color engineering (stress relaxation and creep, relaxation and retardation times, dynamic mechanical experiment, molecular processes of stress relaxation, physical aging in glassy state).

Chapter 9: Process flow diagram (Process flow diagram and process and instrumentation diagram).

References:

1. D. M. Himmelblau, J. B. Riggs, Basic Principles and Calculations in Chemical Engineering, 8th edition, Pearson education incorporation, 2011.
2. M. Felder, and R. W. Rousseau, Elementary Principles of Chemical Processes, John Wiley & Sons, 2005.
3. S. Thomas and Y. Weimin, Advances in Polymer Processing: From Macro to Nano Scales, CRC Press, 2011.
4. Instrumentation symbols and Identification, American National Standard, 1992.