

## Syllabus of 1<sup>st</sup> Year Courses offered by Chemical Engineering Department

### **CL-1101: Chemical Engineering Fundamentals (2 – 1 – 0 – 6)**

**Prerequisites:** None

**Syllabus:** Role of chemical engineers; overview of chemical plants; unit operations and unit processes; basics of material and energy balance; basics of chemical kinetics; basics of reactors; momentum, heat and mass transport processes; continuity equation, Newton's law of viscosity, Fourier's law of conduction, Fick's law of diffusion; thermodynamic systems, variables and processes; equilibrium and phase rule; equations of state; volumetric properties of mixtures; internal energy and enthalpy; first law of thermodynamics and applications; second law of thermodynamics; statistical interpretation of entropy; power and refrigeration cycles.

#### **Text Books:**

- R.M. Felder, R.W. Rousseau, L.G. Bullard, Elementary Principles of Chemical Processes, 4th Edition, John Wiley & Sons, Asia, 2017
- J.M. Smith, H.C. van Ness and M.M. Abott, Introduction to Chemical Engineering Thermodynamics, 7th Edition, McGraw Hill, 2010.

#### **References:**

- S.K. Ghosal, S.K. Sanyal and S. Datta, Introduction to Chemical Engineering, McGraw Hill, 1993.
- Milo D. Koretsky, Engineering and Chemical Thermodynamics, 2nd Edition, Wiley, 2012.
- J.F. Richardson, J.H. Harker and J.R. Backhurst, Coulson & Richardson's Chemical Engineering, Vol. 1, 5<sup>th</sup> Edition, Butterworth-Heinemann, 2003.
- W.L. Badger, and J.T. Banchero, Introduction to Chemical Engineering, McGraw-Hill, 2006
- W.L. McCabe, J.C. Smith and P. Harriott, Unit Operations of Chemical Engineering, 7<sup>th</sup> Edition, McGraw Hill, 2005

**CL-1102: Fundamentals of process calculations (2 – 1 – 0 – 6): [For BSBE students – in 1<sup>st</sup> semester]**

**CL-1103: Fundamentals of process calculations (2 – 1 – 0 – 6): [For CST students – in 1<sup>st</sup> semester]**

**CL-2201: Fundamentals of process calculations (2 – 1 – 0 – 6): [For ME students – in 4<sup>th</sup> semester]**

**Prerequisites: None**

**Syllabus:** Overview of chemical plants; Importance of process calculations; unit conversion; processes and process variables; fundamentals of material balance; material balance: single and multi-unit processes, without and with reaction, without and with recycle, bypass and purge; material balance: reactive processes; enthalpy balance: without and with phase transitions; psychrometric chart; energy balance: non-reactive and reactive processes; calculations for ideal and real gas systems; equation of states; compressibility chart.

**Text Books:**

- R.M. Felder, R.W. Rousseau and L.G. Bullard, Elementary Principles of Chemical Processes, 4<sup>th</sup> Edition, John Wiley & Sons, Asia, 2017.
- D.M. Himmelblau and J. B. Riggs, Basic Principles and Calculations in Chemical Engineering, 8<sup>th</sup> Edition, Prentice Hall of India, 2012.

**Reference Books:**

- O.K.M. Watson and R.A.R. Hougen, Chemical Process Principles, Part 1: Material and Energy Balances, 2<sup>nd</sup> Edition, John Wiley & Sons, 2004.
- W.L. Badger and J.T. Banchero, Introduction to Chemical Engineering, McGraw Hill Publications, 2006.
- N. Chohey, Handbook of Chemical Engineering Calculations, 4<sup>th</sup> Edition, McGraw Hill, 2012.

**CL-1201: Chemical Process Calculations (2 – 1 – 0 – 6):**

**Prerequisites:** None

**Syllabus:** Introduction; unit systems and dimensions; general material balance equation; degree of freedom analysis; material balance: single and multi-unit processes, without and with chemical reactions, without and with recycle, bypass and purge; material balance: reactive processes; material balance: combustion reactions; enthalpy balance: without and with phase transitions; psychrometric chart; energy balance: non-reactive processes; energy balance on reactive systems: heat of formation, reaction, combustion, and solution; mass and energy balance: transient processes.

**Text Books:**

- R.M. Felder, R.W. Rousseau and L.G. Bullard, Elementary Principles of Chemical Processes, 4<sup>th</sup> Edition, John Wiley & Sons, Asia, 2017.
- D.M. Himmelblau and J. B. Riggs, Basic Principles and Calculations in Chemical Engineering, 8<sup>th</sup> Edition, Prentice Hall of India, 2012.

**Reference Books:**

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- W.L. Badger and J.T. Banchero, Introduction to Chemical Engineering, McGraw Hill Publications, 2006.
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