

5 th Semester	RCH5C003	CHEMICAL ENGINEERING THERMODYNAMICS	L-T-P 3-0-0	3 CREDITS
--------------------------	----------	--	----------------	-----------

Module I: (12 hr)

The first law of thermodynamics, the thermodynamic state and state function, constant volume and constant pressure processes.

Properties of pure fluids: PVT behavior of pure substances, virial equations of state, the ideal gas, applications of virial equations, cubic equation of state, theorem of corresponding states.

Second Law: Entropy, work function, phase rule, introduction to third law.

Module II: (10 hr)

Criteria of phase equilibrium, ideal solutions (use of Raoult's) law, generation of Pxy and Txy diagram for ideal solution.

Non-ideal behavior, partial properties, Gibbs-Duhem equation, calculation of fugacity coefficient using generalized correlation, excess Gibbs energy, Lewis-Randall rule, activity coefficient for VLE data.

Module III: (8 hr)

Solution thermodynamics: Thermodynamic properties and VLE from equation of state, properties of fluid mixtures using Redlich-Kwong equation of states.

Module IV: (8 hr)

Chemical reaction equilibrium: Criteria to chemical reactions, Gibbs energy change equilibrium constant, effect of temperature, calculation for single reaction in homogeneous and heterogeneous systems.

Books:

1. Introduction to Chemical Engineering Thermodynamics, 7th ed. by J M Smith, H C Van Ness, and M M Abbott, McGraw-Hill.
2. Textbook of Chemical Engineering Thermodynamics, 2nd ed. by K V Narayanan, PHI, 2013.
3. Chemical, Biochemical, and Engineering Thermodynamics, 4th ed. by S I Sandler, Wiley.
4. Engineering and Chemical Thermodynamics, 2nd ed. by M D Koretsky, Wiley.
5. Introductory Chemical Engineering Thermodynamics, 2nd ed. by J R Elliott and C T Lira, PHI.
6. Fundamentals of Chemical Engineering Thermodynamics, 1st ed. by T Matsoukas, PHI.
7. Chemical Engineering Thermodynamics by Y V C Rao, Orient Blackswan.

Digital learning resources:

1. Chemical engineering thermodynamics by Prof. Sasidhar Gumma, Department of Chemical Engineering, IIT Guwahati (Link: <https://nptel.ac.in/courses/103/103/103103144/>)
2. Chemical Engineering Thermodynamics by Prof. Sandip Roy, Department of Chemical Engineering, IIT Bombay (Link: <https://nptel.ac.in/courses/103/101/103101004/>)