CH213	CHEMICAL ENGINEERING THERMODYNAMICS-I	L	T	P	C	Int	Ext
		2	1	-	3.0	30	70

Semester III [Second Year]

COURSE OBJECTIVES:

1. To impart knowledge on first law of thermodynamics applied for closed and open systems.
2. To provide the knowledge on second law of thermodynamics and its application to estimate the entropy changes of thermodynamic processes.
3. To make the students apply the equations of state to estimate the volumetric properties and also understand the concepts of refrigiration and liquefaction
4. To introduce to the thermodynamic property relations of pure fluids, residual properties, thermodynamic diagrams and tables

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. Understand the scope of thermodynamics and apply the first law to closed and open systems to estimate heat and work interactions
2. Apply the second law of thermodynamics to heat engines & heat pumps to estimate the work interactions understand the refrigeration & liquefaction processes
3. Apply the ideal gas, virial and cubic equations of state to estimate the volumetric properties and also and also to understand the refrigeration & liquefaction processes
4. Derive the relations among various thermodynamic properties using fundamental property relations

UNIT I [CO:1] **(12)**

The First Law and other Basic Concepts:

Relevance and scope of chemical engineering thermodynamics, Joules Experiment, internal energy, first law of thermodynamics, energy balance for closed systems, thermodynamic state and state functions, equilibrium, the phase rule, the reversible process, constant volume and constant pressure processes, enthalpy, heat capacity, mass and energy balances for open systems.

UNIT II [CO:2] **(12)**

The Second Law of Thermodynamics:

Statements of Second law, heat engines and heat pumps, carnot engine with ideal gas state working fluid, the cop of carnot refrigerator, entropy, entropy changes of an ideal gas, mathematical statement of second law

Applications of Second law:

Entropy balance for open systems, calculation of ideal work and lost work, application of thermodynamics to turbines and compressors

UNIT III [CO:3] **(12)**

Volumetric Properties of Pure Fluids:

PVT behavior of pure substances, the ideal gas and ideal gas state, Virial equations of state and applications, cubic equations of state, generalized correlations for gases.**Refrigeration and Liquefaction:**

Vapor compression cycle, absorption refrigeration, Claude and Linde liquefaction process.

UNIT IV [CO:4] **(12)**

Thermodynamic Properties of Fluids:

Property relations for homogeneous phases, MaxwellÃ¢â‚¬â„¢s equations, residual properties, residual properties from the virial equations of state, two phase systems, thermodynamic diagrams, tables of thermodynamic properties, generalized property correlations for gases.

LEARNING RESOURCES:

TEXT BOOK:

Introduction to Chemical Engineering Thermodynamics by J.M.Smith, H.C.Vannessand M.M. Abbott, M.T. Swihart, 7th Edition (In SI units), Tata McGraw Hill (2004)

REFERENCE BOOK(s):

1. Engineering and Chemcial Thermodynamics by Milo D Koretsky, 2nd Edition, Wiley, 2012
2. Chemical Engineering Thermodynamics by Y.V.C.Rao, University Press(1997)
3. A textbook of Chemical Engineering Thermodynamics by K.V. Narayana, PHI(2009)