Course Type	Course Code	Name of the Course	L	T	P	Credits
ESC	NCHE102	Engineering Thermodynamics	3	0	0	3

Course Objective
To impart basic knowledge on basic principles of thermodynamic concepts emphasizing on various laws of thermodynamics and their applications in the field of vapor compression power and refrigeration cycles.
Learning Outcomes
Students will be able to understand the system-surrounding interactions involving work and heat and to estimate relevant thermodynamic properties.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	**Introduction:** Overview, basic concepts: work, energy, heat, internal energy, properties of a system, extensive and intensive properties, equilibrium, state and path functions, temperature and zeroth law of thermodynamics	04	Define thermodynamics, related concept and terminologies to analyze thermodynamic systems.
2	**First law of thermodynamics**: First law of thermodynamics, energy balance, reversible process, constant volume and constant pressure processes, concept of enthalpy, heat capacity, applications of first law applied to flow processes	06	Explain 1st law of thermodynamics, define heat, work and concept enthalpy of a system
3	**Volumetric Properties of Fluids**: Ideal gas, PVT behaviour of pure substances, equation of states and their applications, equations for process calculations: isothermal process, isobaric process, isochoric process, adiabatic process, and polytropic process, properties of gas mixtures	08	Students will understand behaviour of gases, liquids and solids and related process using fluid mixtures
4	**Second and Third Law of Thermodynamics:** Statements of second law, heat engines, heat pumps, refrigerators, Carnot cycle and Carnot's theorem, statement of the third law of thermodynamics, concept of entropy, entropy balance, application of entropy principle	09	Define 2nd and 3rd law of thermodynamics and concept of entropy and their applications in engineering fields.
5	**Thermodynamic Properties of Fluids**: Fundamental property relations, residual properties, general relations for internal energy, enthalpy, and entropy changes of ideal and real gases, Maxwell's equations, temperature dependence of the vapor pressure of liquids, two-phase liquid/vapor systems, property tables and diagrams	08	Familiarization of fundamental property relations, residual properties, tables and diagrams for pure substance
6	**Applications of thermodynamics**: Vapor and gas power cycles, refrigeration and liquefaction processes	07	Learn about various thermodynamic cyclic processes and their applications

Textbooks:
1. Nag, P. K. (2018). Engineering Thermodynamics, 6th Ed., McGraw Hill Education (India) Pvt. Ltd.
2. Cengel, Y. A. and Boles, M. A. (2017). Thermodynamics: An Engineering Approach, 8th Ed., McGraw Hill Education (India) Pvt. Ltd.

Reference books:

1. Smith, J. M., van Nees, H.C., Abbott and Swihart. M. T. (2017). Introduction to Chemical Engineering Thermodynamics, 8th Ed., McGraw Hill Education (India) Pvt. Ltd.