Course Syllabi: UES004 Thermodynamics (L : T : P :: 3 : 1 : 0)

1. **Course number and name:** UES004; Thermodynamics

2. **Credits and contact hours:** Credits: 3.5; Hours: 4

3. **Text book, title, author, and year**

   - *Sonntag, R.E., Borgnakke, C. and Van Wylen, G.J., Fundamentals of Thermodynamics, John Wiley (2007) 6th ed.*
   - *Nag, P.K., Engineering Thermodynamics, Tata McGraw Hill (2008) 3rd ed. Rao, Y.V.C., Thermodynamics, Universities Press (2004).*
   - *RathaKrishana, E., Fundamentals of Engineering Thermodynamics, Prentice Hall of India (2005) 2nd ed.*
   - *Cengel, Y. A. and Boles, M., Thermodynamics: An Engineeing Approach, Tata McGraw Hill (2008).*
   - *Rogers, G. and Mayhew, Y., Engineering Thermodynamics, Pearson Education (2007) 4th ed.*

   a. Other supplemental materials
      - Nil

4. **Specific course information**

   a. Brief description of the content of the course (catalog description)

   Basic Concepts: Concept of Continuum, Macroscopic approach, Thermodynamics system & properties, Various processes, Thermodynamic equilibrium, Ideal gas, Vander Walls equation of state, Compressibility chart, Process: Flow and non-flow process, Cycle concept of work and heat, Specific heats, Zeroth law, Energy and its form, Pure substance, Thermodynamic diagrams, Triple point, Steam tables and their use.
   First Law of Thermodynamics: Concept of internal energy & enthalpy, Energy equation as applied to a close and open system, PMM1, Transient flow processes.
   Second Law of Thermodynamics & its Corollaries: Kelvin Plank and Clausius statements, Reversible and Irreversible processes, Carnot cycle, Clausius theorem and concept of entropy, Principle of increase of entropy, PMM2, Thermodynamic Temperature scale, Second law analysis of control volume, Availability, Irreversibility, Availability function for open and closed system & second law efficiency.
   Thermodynamic Cycles: Rankine cycle, Vapour compression refrigeration cycle, Air standard cycles: Otto, Diesel, Dual and Brayton cycles.
   Non-Reacting Gas Mixtures: Properties of mixtures of gases and vapours, Adiabatic saturation, Properties of air.
   Thermodynamic Relations: Maxwell & T-ds equations.

5. **Specific goals for the course**

   After the completion of the course, the students will be able to:
   - Understand the basic principles of thermodynamics like conservation of mass, conservation of energy and the second law of thermodynamics.
   - Formulate and solve engineering problems involving closed and open systems for both steady state and transient processes.

- Analyze the performance of various power cycles and to identify methods for improving thermodynamic performance.

6. **Brief list of topics to be covered**
    - First Law of Thermodynamics
    - Second Law of Thermodynamics
    - Thermodynamic Cycle
    - Non-Reacting Gas Mixtures
    - Thermodynamic Reactions