

Thermodynamics
S.E. Sem. III [MECH/AUTO]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical Exam	–	–
Oral Exam	–	25
Term Work	–	25

SYLLABUS

- 1. Thermodynamic concepts :** System, surrounding, state, path, property, Reversible and irreversible process, thermodynamic work, heat, temperature, thermal equilibrium. Zeroth law of thermodynamics.
First of Thermodynamics : Statement, First law applied to non-cyclic process, Internal energy, Application non-flow processes viz. Constant volume, constant pressure and constant temperature, adiabatic and polytropic processes. Heat and work calculation. Application of First law to open systems, flow work, Steady flow energy equation, Work done in steady flow processes in terms of pressure and volume. Throttling process, Joule's porous plug experiment. Joule-Thompson coefficient, SFEE applied to boiler, nozzle, condenser, etc.
 - 2. Second law of thermodynamics :** Limitations of first law of Thermodynamics. Heat engine, thermal efficiency, reversed heat engine, coefficient of performance, Kelvin-Planck and Clausius statements and their equivalence Carnot cycle, Carnot's theorem, Thermodynamic temperature scale.
 - 3. Entropy-Clausius inequality,** Entropy changes for an ideal gas during reversible process, Entropy of isolated system in real processes. Principle of increase of entropy.
Introduction to Availability : Available and unavailable energy. AE when heat is withdrawn from a finite reservoir and when heat is withdrawn from an infinite reservoir. Irreversibility.
 - 4. Properties of steam :** Dryness fraction, enthalpy, internal energy and entropy. Steam table and Mollier chart, First law applied to steam processes.
 - 5. Power Cycles :** Vapour power-Rankine cycle Modified Rankine cycle for improved performance (Reheat, regenerative)
Gas power Thermodynamics of Otto, Diesel, semi-Diesel and Brayton cycle. Comparison and representation on P-V, T-S diagram.
 - 6. Thermodynamics of Fluid flow (one dimensional) :** Propagation of sound waves through compressible fluids. Sonic velocity and Mach number. Application of continuity, momentum and energy equations for steady state conditions. Steady flow energy equation applied to nozzle. Isentropic flow through ducts of varying cross-sectional area. Effect of varying backpressure on nozzle performance. Area ratio, Critical pressure ratio, Normal shock, basic equations of normal shock, change of properties across normal shocks. Rayleigh and Fanno lines. Adiabatic flow through constant area duct with friction.
-

Reference :

1. Thermodynamics (*W.C. Raynold, McGraw Hill and NY*).
2. Engineering Thermodynamics (*Mayhew, Y.R. Rogers GFC*) Orient Longman.
3. Engineering Thermodynamics (*M. Achutan*) PHI.
4. Engineering Thermodynamics (*J.B. Jones and Dugan*) PHI.
5. Thermal Engineering (*Ballaney*).
6. Thermodynamics and Engg. Approach (*Yunus and Cengel*) McGraw Hill Inc.
7. Engineering Thermodynamics (*Lyndd Russell, George A. Adebisi*) Oxford Press.

