AE6301 AERO ENGINEERING THERMODYNAMICS

DETAILED SYLLABUS

UNIT I BASIC CONCEPT AND FIRST LAW

Concept of continuum, macroscopic approach, thermodynamic systems – closed, open and isolated. Property, state, path and process, quasi-static process, work, modes of work, Zeroth law of thermodynamics- concept of temperature and heat, internal energy, specific heat capacities, enthalpy- concept of ideal and real gases. First law of thermodynamics - applications to closed and open systems - steady flow processes with reference to various thermal equipment's.

UNIT II SECOND LAW AND ENTROPY

Second law of thermodynamics – kelvin planck and clausius statements of second law. Reversibility and irreversibility - carnot theorem. carnot cycle, reversed carnot cycle, efficiency, COP -thermodynamic temperature scale - clausius inequality, concept of entropy, entropy of ideal gas, principle of increase of entropy.

UNIT III THERMODYNAMIC AVAILABILITY AND AIR STANDARD CYCLES

Basics – energy in non-flow processes: expressions for the energy of a closed system – equivalence between mechanical energy forms and exergy – flow of energy associated with heat flow – exergy consumption and entropy generation - exergy in steady flow processes: expressions for exergy in steady flow processes – exergy dissipation and entropy generation - otto, diesel, dual and Brayton cycles - air standard efficiency - mean effective pressure.

UNIT IV PROPERTIES OF PURE SUBSTANCE AND POWER CYCLE

Properties of pure substances – thermodynamic properties of pure substances in solid, liquid and vapour phases, phase rule, P-V, P-T, T-V, T-S, H-S diagrams, PVT surfaces, thermodynamic properties of steam - calculations of work done and heat transfer in non-flow and flow processes - standard rankine cycle, reheat and regeneration cycle.

UNIT V BASICS OF PROPULSION AND HEAT TRANSFER

Classification of jet engines - simple jet propulsion system – thrust equation – specific impulse –ideal and non-ideal cycle analysis - conduction in parallel, radial and composite wall – basics of convective and radiation heat transfer.

TEXT BOOKS

1. Nag.P.K., “Engineering Thermodynamics”, Tata McGraw-Hill, New Delhi, 2007.

2. Rathakrishnan E., “Fundamentals of Engineering Thermodynamics”, Prentice-Hall India, 2005.

REFERENCES

1. Ramalingam K.K. “Thermodynamics”, Sci-Tech Publications, 2006.

2. Holman.J.P., “Thermodynamics”, 3rd Edition, McGraw-Hill, 2007.

3. Venwylen and Sontag, “Classical Thermodynamics”, Wiley Eastern, 1987.

4. Arora C.P, “ Thermodynamics”, Tata McGraw-Hill, New Delhi, 2003.

5. Merala C, Pother, Craig W, Somerton, “Thermodynamics for Engineers”, Schaum Outline Series, Tata McGraw-Hill, New Delhi, 2004.

OBJECTIVES

- To achieve an understanding of principles of thermodynamics and to be able to use it in accounting for the bulk behavior of the simple physical systems.
- To provide in-depth study of thermodynamic principles, thermodynamics of state, basic thermodynamic relations, Properties of pure substances.
- To enlighten the basic concepts of heat, transfer and propulsion cycles.