

# 10 ME 301 BASIC THERMODYNAMICS (SI UNITS)

## II B.Tech I Semester

(with effect from the academic year 2011-2012)

Credits: 4

Lectures/Week : 4 hrs

Sessional marks:40

University Exam:3hrs End Examination Marks: 60

### UNIT – I

Basic Concepts Scope of Thermodynamics – Macroscopic and Microscopic properties  
Thermodynamic system – Control Volume – Thermodynamic Properties – Processes and cycles  
– Thermodynamic Equilibrium – Quasi static process – Zeroth Law Of Thermodynamics –  
Measurement of temperature – Thermocouple – Work transfer – pdv work – Network done by a  
system – Specific heats and latent heat.

**First Law of Thermodynamics:**Energy – Different forms of stored energy – closed  
systems and steady flow systems – First law applied to flow process – Mass balance and energy  
balance in steady flow process – Perpetual motion machine of first kind.

### UNIT – II

Boyle's Law – Charles Law – Characteristic equation of gas – Avagadro's Law – Joule's  
Law – First Law and non flow Processes Constant volume – Constant Pressure – Isothermal –  
Hyperbolic – Adiabatic – free expansion and polytropic processes – Real gases Dalton's Law of  
pressures – Avogadro's Law – Gibb's – Dalton's Law of mixture of gases.

**Second Law of Thermodynamics:**Limitations of first law – Heat engines and Heat  
reservoirs – Kelvin Planks statement of second law – Clausius inequality – refrigeration and heat  
pump reversibility and irreversibility – Carnot cycle – Reversible heat engine – Carnot Theorem  
– Corollaries – Efficiency of reversed heat engine.

### UNIT – III

**Entropy and availability:**Claussiu's theorem – The property of entropy – temperature  
entropy plot – Principle of increase of entropy – Entropy changes in various thermodynamic  
processes.

**Availability:** Availability energy referred to a cycle – The Helmholtz function and  
Gibb's functions – Availability in steady flow combined first law and second laws – Tds  
equations – energy equation – Joules Kelvin effect – Claussius – Clapeyrm equation – Gibbs  
phase rule.

## UNIT – IV

**Internal Combustion Engines:** classifications – principles of operation – SI and CI engines – methods of fuel supply – ignition – cooling – lubrication and method of governing .

**Performance of IC Engines:** Valve and port time diagrams – indicator diagrams – testing of engines – indicated power – Brake power – efficiencies – air fuel ratio – volumetric efficiency and heat balance.

## UNIT – V

**Gas Power cycles:** Carnot cycle – Stirling cycle – Eriksson cycle – Air standard cycles – Otto cycle – Diesel cycle – limited pressure cycle Mixed cycle or duel cycle – Comparison of cycles – Brayton cycle.

### TEXT BOOKS:

1. Engineering Thermodynamics: Nag. P.K.
2. Heat Engineering : Vasandani V.P. and Kumar D.S.
3. Heat Engines : Ballaney P.L.

### REFERENCE:

1. Applied Thermodynamics : Eastop and Mckankey.