

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC Semester: 1 Electrical Engineering

Subject Name Elements of Mechanical and Structural Engineering

Mechanical Engineering :

Sr.No	Course Content
1	Introduction: Prime movers, Sources of energy, Types of prime movers, Force and mass, Pressure, Work, Power, Energy, Heat, Temperature, Units of heat, Specific heat capacity, Interchange of heat, Change of state, Mechanical equivalent of heat, Internal energy, Enthalpy, Entropy, Efficiency, Statements of Zeroth Law, First law and Second Law of Thermodynamics.
2	Heat Engines : Thermal prime movers, Elementary heat engines, Sources of heat, Working substances, Converting machines, Classification of heat engines, Heat engine cycles, Carnot cycle, , Rankine cycle, Ottocycle, Diesel cycle.
3	Internal Combustion Engines : Introduction, Classification, Engine details, otto four-stroke cycle, Diesel-four-stroke cycle, Difference between otto cycle and Diesel cycle, Two-stroke cycle, Difference between two-stroke and four-stroke cycle, indicated power (ip), Brake Power (bp), Efficiencies.
4	Speed Control: Introduction, Governors, I.C. Engine governing, Fly wheel
5	Pumps : Introduction, Reciprocating pump, types and operation, Bucket pump, Air Chamber, Centrifugal pumps, Types and Priming, Rotary pumps.
6	Air Compressors: Introduction, Uses of Compressed air, Reciprocating compressors, Operation of a compressor, Work for compression, Power required, Reciprocating compressor efficiency, Multistage reciprocating compressors, Rotary compressors.
7	Refrigeration & Air Conditioning: Introduction, Refrigerant, Types of refrigerators, Vapour compression refrigerating system, Window and split air conditioners.

Structural Engineering:

Sr.No	Course Content
1	Physical & Mechanical properties of structural materials: Properties related to axial, bending, and torsional & shear loading, Toughness, hardness, proof stress, factor of safety, working stress, load factor
2	Simple stresses & strains: Elastic, homogeneous, isotropic materials; limits of elasticity and proportionality, yield limit, ultimate strength, strain hardening, section of composite materials, prismatic and non-prismatic sections.

	Strains: Linear, shear, lateral, thermal and volumetric, Poisson's ratio. Stresses: Normal stresses, axial – tensile & compressive, shear and complementary shear, thermal and hoop,. Applications to composite material stepped & tapered bars.
3	Beam: Types of loads, Types of supports, Types of beams, Support reactions for statically determinate beams. Bending moment and Shear force. Bending moment and shear force diagrams for statically determinate beams subjected to couples, concentrated forces, uniformly distributed loadings, relation between bending moment, shear force and rate of loading, point of contra- flexure.
4	Principal stresses and strains: Compound stresses, analysis of principal planes and principal stresses, principal strains, angle of obliquity of resultant stress, principal stresses in beams.
5	Torsion : Torsion of solid and hollow circular section shafts, shear stress and strain due to torsion, angle of twist, torsional moment of resistances, power transmitted by a shaft, keys and coupling, combined bending and torsion.
6	Strain energy : Resilience, strain energy in tension, compression, shears, bending and torsion, Proof resilience, modulus of resilience, Impact loads, resilience in case of compound stresses.

Reference Books:

I Elements of Mechanical Engineering by K.P.Roy and Prof.S.K . Hajra Chaudhary ,
Media Promoters and Publishers Pvt.Ltd.Bombay

II Introduction to Engineering Materials by B.K. Agrawal Tata McgrawHill
Publication New Delhi

III Thermal Science and Engineering by Dr. D.S. Kumar, S.K. Kataria & sons
Publication New Delhi

IV Fundamental of Mechanical Engineering by G.S. Sawhney, Prentice Hall
of India Publication New Delhi

V Thermal Engineering by R.K. Rajput ,S.Chand Publication New Delhi

VI Mechanics of Structures Vol. I S. B. Junnarkar & H. J. Shah

VII Mechanics of Materials E. P. Popov

VIII Strength of Materials G. H. Ryder

IX Mechanics of Materials Timoshenko & Gere