Practical

To determine the quality of check of two different aggregates through impact test; To perform the tensile test of steel specimen - to observe the behaviour of materials under load - to calculate the value of e- ultimate stress, permissible stress, percentage elongation etc. And to study its fracture; To prepare mortar specimen of different cement, demoulding of the specimen next day for compression and tension test after 2nd and 4th week; To prepare concrete specimen to perform the compression, bending test and to measure elasticity - concrete cylinders, cubes and beams to test after 2nd and 4th week; To perform compression and tension test on mortar specimen prepared 2 weeks before; To perform compression and bending test of the concrete specimen prepared 2 weeks before; To perform compression and tension test on mortar specimen prepared 4 weeks before; To perform compression and bending test of the concrete specimen prepared 4 weeks before; To determine young's modulus of elasticity of beam with the help of deflection produced at centre due to loads placed at centre and quarter points; To perform Brinell's hardness tests on a given specimen; To study the behaviour of materials under torsion and to evaluate various elastic constants; To study load deflection and other physical properties of closely coiled helical spring in tension and compression; To write detail report emphasizing engineering importance of performing tension, compression, bending, torsion, impact and hardness tests on the materials.

Suggested Readings

1. Junarkar, S. B. 2001. *Mechanics of Structures* (Vo-I). Choratar Publishing House, Anand.
2. Khurmi, R. S. 2006. *Strength of Materials*. S. Chand Publishing, New Delhi.
3. Lehri, R. S. and Leheri, R. S. 2006. *Strength of Materials*. S.K. Kataria & Sons, New Delhi.
4. Ramamrutham, S. and Narayanan, R. 2003. *Strengths of Materials*. Dhanpat Rai and Sons, Nai Sarak, New Delhi.
5. Vazirani, V. N., Ratawani, M. M. and Duggal, S. K. 2012. *Analysis of Structures*. Khanna Publishers, New Delhi.

Theory of Machines 2 (2+0)

Objective

1. To enable the students to analyse the relative motion between various parts of machine and forces which act on them
2. To apply the theories in designing the various parts of the machine

Theory

Simple mechanism: Elements, links, pairs, kinematics chain, and mechanisms; classification of pairs and mechanisms; lower and higher pairs; four bar chain, slider crank chain and their inversions; Velocity mechanism: determination of velocity and acceleration using graphical (instantaneous centres) method.

Types of gears, law of gearing, velocity of sliding between two teeth in mesh; Involute and cycloidal profile for gear teeth; Spur gear, nomenclature; Introduction to helical, spiral, bevel and worm gear; Simple, compound, reverted, and epicyclic trains; determining velocity ratio by tabular method.

Turning moment diagrams, coefficient of fluctuation of speed and energy, weight of flywheel, flywheel applications.

Belt drives: Types of drives, belt materials, length of belt, transmitted power, velocity ratio, belt size for flat and V belts; effect of centrifugal tension, creep and slip on power transmission; chain drives, classification of chain drive, terms used in chain drive.

Types of friction, laws of dry friction; friction of pivots and collars; single disc, multiple disc, and cone clutches, rolling friction; Types of governors, constructional details and analysis of Watt, Porter, Proell governors, effect of friction, controlling force curves. sensitiveness, stability, hunting, iso-chronism, power and effort of a governor.

Static and dynamic balancing, balancing of rotating masses in one and different planes.

Suggested Readings

1. Ballaney, P. L. 2016. *A Text Book of Theory of Machines*. Khanna Publishers, New Delhi.
2. Bansal, R. K. 2009. *A Text Book of Theory of Machines*. Laxmi Publications (P) Ltd., New Delhi.
3. Khurmi, R. S. and Gupta, J. K. 2010. *A Text Book of Theory of Machines*. Euresia Publishing House (P) Ltd, New Delhi.
4. Ratan, S. S. 2010. *A Text Book of Theory of Machines*. Tata McGraw Hill Publishing Company Ltd, New Delhi.

Thermodynamics and Heat Transfer 3 (3+0)

Objective

1. To make the students acquainted with principles of thermodynamics and heat transfer
2. To make them understand the mathematical and practical aspects of heat exchangers

Theory

Basic concepts and definitions of thermodynamics, statistical and classical thermodynamics, microscopic and macroscopic point of view; Thermodynamic systems- thermodynamic equilibrium, properties of systems; state, path, process, cycle; point function, path function; temperature and zeroth law of thermodynamics; pressure, specific volume, density, energy, work and heat.

First law of thermodynamics: internal energy, law of conservation of energy, first law of thermodynamics, application of first law to a process; energy-a property of system, perpetual motion machine of the first kind-PMM1; characteristic equation of state, specific heats; application of first law of thermodynamics to non-flow or closed system; free expansion and throttling process; Second law of thermodynamics: limitations of first law of thermodynamics and introduction to second law, statements of second law of thermodynamics; Clausius statement, Kelvin-Planck statement; perpetual motion machine of the second kind-PMM2; Clausius inequality; Carnot Cycle, Carnot's Theorem, entropy, entropy changes for a closed system.

Concept, modes of heat transfer, thermal conductivity of materials, measurement, general differential equation of conduction, one dimensional steady state conduction through plane and composite walls, tubes and spheres without heat generation, electrical analogy, insulation materials and fins; Free and forced convection, Newton's law of cooling, heat transfer coefficient in convection,