**Lesson Plan**

**Subject : Mechanics of Solids**

**Lesson plan Duration : 15 Weeks**

Work load (lecture/Tutorial/Practical) per week: Lectures:3 hrs., Tutorials:2 hrs., Practical:4 hrs.

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| **Lecture No** | **Theory** | **Practical** | |
| **Practical Day** | **Topic** |
| 1 | Introduction to mechanics force, types of forces, Characteristics of a force, System of forces | 1 | To study the Brinell hardness testing machine & perform the Brinell hardness test. |
| 2 | Composition and resolution of forces, forces in equilibrium, principle and laws of equilibrium, Free body diagrams |
| 3 | Lami's Theorem, equations of equilibrium, Concept of center of gravity and centroid |
| 4 | Centroid of various shapes such as triangle, circle, semicircle, trapezium |
| 5 | Theorem of parallel and perpendicular axes | To study the Rockwell hardness testing machine & perform the Rockwell hardness test |
| 6 | Moment of inertia of simple geometrical figures, polar moment of inertia. | 2 |
| 7 | Introduction to stress and strain, types of Stresses and strains, Poisson’s ratio |
| 8 | Stresses and strain in simple and compound bars under axial loading |
| 9 | Stress strain diagrams, Hook’s law | 3 | To study the Vickers hardness testing machine & perform the Vickers hardness test. |
| 10 | Elastic constants & their relationships |
| 11 | Temperature stress & strain in simple & compound bars under axial loading |
| 12 | Introduction to Principle Stresses: Two dimensional systems. |
| 13 | Stress at a point on a plane, principal stresses and principal planes | 4 | To study the Impact testing machine and perform the Impact tests (Izod&Charpy). |
| 14 | Introduction to Mohr’s circle of stresses |
| 15 | Introduction to shear force and bending moments |
| 16 | SF & BM diagrams for cantilevers, simply supported beams with or without over-hang |
| 17 | Calculation of maximum BM & SF and the point of contraflexture | 5 | To study the Universal testing machine and perform the tensile, compression & bending tests |
| 18 | Point of contraflexture on under (i) concentrated loads, (ii) uniformly distributed loads over whole span or a part of it, (iii)combination of concentrated loads and uniformly distributed loads, |
| 19 | Numerical uniformly varying loads |
| 20 | Application of moments, relation between the rates of loading. | 6 | To perform the shear test on UTM. |
| 21 | Introduction to torsion of circular members |
| 22 | Derivation of equation of torsion, Solid and hollow circular shafts |
| 23 | Derivation of equation of torsion for tapered shaft |
| 24 | Derivation of equation of torsion stepped shaft & composite circular shafts | 7 | To study the torsion testing machine and perform the torsion test. |
| 25 | Theory of simple bending, Assumptions, derivation of equation of bending. |
| 26 | Concept of neutral axis, determination of bending stresses |
| 27 | Concept of Section modulus of rectangular & circular (solid & hollow) sections |
| 28 | Section modulus of I,T, Angle, channel sections, composite beams, | 8 | To draw shear Force, Bending Moment Diagrams for a simply Supported Beam under point and distributed Loads |
| 29 | Shear stresses in beams with derivation |
| 30 | Shear stress distribution across rectangular and circular, triangular. |
| 31 | Shear stress distribution across, I, T, angle sections |
| 32 | Introduction to Column and struts, column under axial load concept of instability and buckling, slenderness ratio, |  |  |
| 33 | Derivation of Euler’s formula for crippling load for columns of different ends |  |  |
| 34 | Concept of equivalent length, eccentric loading, |  |  |
|  | Rankine formulae and other empirical relations |  |  |
| 35 | Introduction to slope and deflection, Relationship between bending moment |  |  |
| 36 | Concept of slope & deflection, moment area method, method of integration |  |  |
| 37 | Macaulay’s method |  |  |
| 38 | Calculations for slope and deflection of cantilevers |  |  |
| 39 | Calculations for slope and deflection of simply supported beam with or without overhang under concentrated load |  |  |
| 40 | Calculations for slope and deflection of uniformly distributed load |  |  |
| 41 | Calculations for slope and deflection of combination of concentrated load and uniformly distributed loads |  |  |