

Lesson Plan

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| Name of Institute | : Ambala College of Engineering and Applied Research |
| Name of the Faculty member | : Dr. Ashwani Verma (Assistant Professor) |
| Discipline | : Mechanical Engineering |
| Semester | : 3 rd |
| Subject | : Mechanics of Solids-I (MEC-203 A) |
| Lesson Plan Duration | : 15 weeks (from October 2021 to January 2022) |
| Work Load | : L-3 T-1 P-2 |

| Week | Theory | | Practical | |
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| | Lecture day | Topic (including assignment/test) | Practical day | Topic |
| 1 st | 1 st | UNIT I Introduction: Force, types of forces, Characteristics of a force, System of forces, Composition and resolution of forces, forces in equilibrium. | 1 st | To study the Impact testing machine and perform the Impact tests (Izod & Charpy). |
| | 2 nd | Principle and laws of equilibrium, Free body diagrams, Lami's Theorem, equations of equilibrium. | | |
| | 3 rd | Numerical on resolution of forces and Lami's theorem. | | |
| | 4 th | Concept of center of gravity and centroid, centroid of various shapes: Triangle, circle, semicircle and trapezium. | | |
| 2 nd | 5 th | Theorem of parallel and perpendicular axes, moment of inertia of simple geometrical figures. | 2 nd | -do- |
| | 6 th | Polar moment of inertia. | | |
| | 7 th | Numerical. | | |
| | 8 th | Numerical | | |
| 3 rd | 9 th | Simple Stresses & Strains: Concept & types of Stresses and strains, Poisson's ratio, stresses and strain in simple and compound bars under axial loading. | 3 rd | To study the Brinell hardness testing machine & perform the Brinell hardness test. |
| | 10 th | Stress strain diagrams, Hook's law, elastic constants & their relationships. | | |
| | 11 th | Temperature stress & strain in simple & compound bars under axial loading. | | |
| | 12 th | Numerical. | | |
| 4 th | 13 th | Numerical. | 4 th | -do- |
| | 14 th | Numerical. | | |
| | 15 th | Numerical. | | |
| | 16 th | UNIT II Principle Stresses: Two dimensional systems, stress at a point on a plane, | | |
| 5 th | 17 th | Principal stresses and principal planes. | 5 th | To study the Rockwell hardness testing machine & perform the Rockwell hardness test. |
| | 18 th | Mohr's circle of stresses. | | |
| | 19 th | Numerical. | | |
| | 20 th | Numerical. | | |
| 6 th | 21 st | Numerical. | 6 th | -do- |
| | 22 nd | Shear Force & Bending Moments: Definitions, SF & BM diagrams for cantilevers. | | |
| | 23 rd | Simply supported beams with or without over-hang and calculation of maximum BM & SF and the point of contraflexure under (i) concentrated loads. | | |
| | 24 th | Simply supported beams with or without over-hang and calculation of maximum BM & SF and the point of contraflexure under (ii) uniformly distributed loads over whole span or a part of it. | | |
| 7 th | 25 th | Simply supported beams with or without over-hang and calculation of maximum BM & SF and the point of | 7 th | To study the Erichsen sheet metal testing machine & |

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| | | contraflexure under (iii) combination of concentrated loads and uniformly distributed loads. | | perform the Erichsen sheet metal test. |
| | 26 th | Simply supported beams with or without over-hang and calculation of maximum BM & SF and the point of contraflexure under (iv) uniformly varying loads. | | |
| | 27 th | Simply supported beams with or without over-hang and calculation of maximum BM & SF and the point of contraflexure under (v) application of moments. | | |
| | 28 th | Relation between the rate of loading, the shear force and the bending moments. | | |
| 8 th | 29 th | Numerical | 8 th | -do- |
| | 30 th | Numerical | | |
| | 31 st | UNIT III Torsion of Circular Members: Derivation of equation of torsion, Solid and hollow circular shafts. | | |
| | 32 nd | Numerical. | | |
| 9 th | 33 rd | Tapered shaft, Numerical. | 9 th | To study the Universal testing machine and perform the tensile, compression & bending tests. |
| | 34 th | Combined bending and torsion, equivalent torque, Numerical. | | |
| | 35 th | Stepped shaft & composite circular shafts. | | |
| | 36 th | Numerical | | |
| 10 th | 37 th | Flexural & Shear Stresses: Theory of simple bending, Assumptions, derivation of equation of bending, neutral axis. | 10 th | -do- |
| | 38 th | Determination of bending stresses, section modulus of rectangular & circular (solid & hollow). | | |
| | 39 th | Numerical. | | |
| | 40 th | I, T, Angle, channel sections. | | |
| 11 th | 41 st | Numerical. | 11 th | To draw shear Force, Bending Moment Diagrams for a simply Supported Beam under point and distributed Loads. |
| | 42 nd | Composite beams, Numerical. | | |
| | 43 rd | Shear stresses in beams with derivation, shear stress distribution across various beam sections like rectangular, circular, triangular, I, T, angle sections. | | |
| | 44 th | Numerical. | | |
| 12 th | 45 th | Numerical. | 12 th | -do- |
| | 46 | UNIT IV Columns & Struts: Column under axial load, concept of instability and buckling, slenderness ratio. | | |
| | 47 | Derivation of Euler's formula for crippling load for columns of different ends. | | |
| | 48 | Numerical. | | |
| 13 th | 49 | Concept of equivalent length, eccentric loading. | 13 th | To study the torsion testing machine and perform the torsion test. |
| | 50 | Rankine formulae and other empirical relations, Numerical. | | |
| | 51 | Numerical. | | |
| | 52 | Numerical. | | |
| 14 th | 53 | Slope & Deflection: Relationship between bending moment, slope & deflection. | 14 th | -do- |
| | 54 | Moment area method, method of integration. | | |
| | 55 | Macaulay's method. | | |
| | 56 | Calculations for slope and deflection of (i) cantilevers beams with or without overhang under concentrated load, Uniformly distributed loads or combination of concentrated and uniformly distributed loads. | | |
| 15 th | 57 | Numerical. | 15 th | To perform the shear test |

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| | 58 | Calculations for slope and deflection of (ii) simply supported beams with or without overhang under concentrated load, Uniformly distributed loads or combination of concentrated and uniformly distributed loads, Numerical problems. | | on UTM. |
| | 59 | Numerical. | | |
| | 60 | Numerical. | | |

(Signature of the teacher concerned with date)