# Ch. Ranbir Singh State Institute of Engineering & Technology, Jhajjar

**DEPARTMENT OF MECHANICAL ENGINEERING**

II Yr. III Semester (Electrical Engineering)

### LESSON PLAN

Program : **B. Tech**

Year & Sem. :  **II/ III**

Course No : **ESE-202-G**

Course Title : **EM**

Max Marks **: 75**

No. of Total Lecture **: 46**

Schedule : **3L+1T=4**

Lecturer : **Satyapal Yadav**

**Recommended Books:**

1. Mechanics by R.C. Hibbler, Pearson Publication
2. J. L. Meriam and L. G. Kraige, “Engineering Mechanics: Dynamics”, Wiley, 2011.
3. M. F. Beatty, “Principles of Engineering Mechanics”, Springer Science & Business Media, 1986.Elements of Mechanical Engineering- R.K. Rajput LAkmi Pub.,Delhi.
4. Engineering Mechanics By RS Khurmi

**Lesson Plan:**

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| **Lect. No(s)** | **Ref. No.** | **Topics to be covered** |
|  |  | **UNIT II Kinematics & Kinetics of Rigid Body** |
| 1 | 2.1 | Concept of rigid body, velocity and acceleration, relative velocity |
| 2 | 2.2 | translation and rotation of rigid bodies, |
| 3 | 2.3 | equations of motion for translation and rotation, problem |
| 4 | 2.4 | Centroid, Centre of mass and Centre of gravity |
| 5-6 | 2.5 | Determination of centroid, center of mass and center of gravity by integration method of regular and composite figures and solid objects, Problems. |
| 7 | 2.6 | Kinetics of rigid bodies: Angular momentum about a point |
| 8 | 2.7 | Inertia tensor: Dentition and computation |
| 9 | 2.8 | Principal moments and axes of inertia |
| 10 | 2.9 | Parallel and perpendicular axes theorems |
| 11 | 2.10 | Mass moment of inertia of symmetrical bodies |
| 12 | 2.11 | cylinder, sphere, cone etc |
| 13 | 2.12 | Area moment of inertia and Polar moment of inertia |
| 14 | 2.13 | Forces and moments |
| 15 | 2.14 | Newton-Euler’s laws of rigid body motion |
|  |  | **Unit III Free Body Diagram & General** |
| 16 | 3.1 | Free body diagrams |
| 17 | 3.2 | Examples on modelling of typical supports and joints |
| 18 | 3.3 | discussion on the kinematic and kinetic constraints that they impose |
| 19 | 3.4 | Examples and problems |
| 20 | 3.5 | General planar motions |
| 21 | 3.6 | General 3-D motions |
| 22 | 3.7 | Free precession |
| 23 | 3.8 | Gyroscopes, |
| 24 | 3.9 | Rolling coin. |
|  |  | **Unit IV Bending Moment, Torsional Motion & Friction** |
| 25 | 4.1 | Transverse loading on beams |
| 26 | 4.2 | shear force and bending moment in beams |  |
| 27-29 | 4.3 | analysis of cantilevers, simply supported beams and overhanging beams |
| 30 | 4.4 | relationships between loading, shear force and bending moment |
| 31-32 | 4.5 | shear force and bending moment diagrams. |
| 33-34 | 4.6 | Torsion of circular shafts, derivation of torsion equation |
| 35-36 | 4.7 | stress and deformation in circular and hollow shafts |
| 37 | 4.8 | Concept of Friction |
| 38 | 4.9 | Laws of Coulomb friction |
| 39-40 | 4.10 | Angle of Repose & Numericals |
|  |  | **Unit I Introduction to vectors and tensors and co-ordinate systems** |
| 41-42 | 1.1 | Introduction to vectors and tensors and coordinate systems |
| 43-44 | 1.2 | Vector and tensor algebra |
| 45 | 1.3 | Symmetric and anti-symmetric tensors |
| 46 | 1.4 | Eigen values and Principal axes |
| 47 | 1.5 | Three-dimensional rotation: Euler’s theorem |
| 48 | 1.6 | Axis-angle formulation and Euler angles |
| 49 | 1.7 | Coordinate transformation of vectors and tensors. |
| 50 | 1.8 | Numerical Problems |
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**(Satyapal Yadav)**

Department of ME

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