



**Course Title:** Engineering Mechanics  
**Course Level:** UG

**Credit Units:** 04  
**Course Code:** ES101

| L | T | P/S | SW/F<br>W | TOTAL<br>CREDIT<br>UNITS |
|---|---|-----|-----------|--------------------------|
| 3 | - | 2   | -         | 4                        |

**Course Objectives:** Objective of this course is to provide fundamental knowledge of force system and its effect on the behaviour of the bodies that may be in dynamic or in static state. It includes the equilibrium of different structures like beams, frames, truss etc and the force transfer mechanism in the different components of a body under given loading condition.

**Pre-requisites:** The Basic Concepts of Physics and Mathematics (especially Trigonometry, Geometry and Calculus).

**Course Contents/Syllabus:**

|   | Weightage (%) |
|---|---------------|
| <b>Module I: Force system &amp; Structure</b>   | <b>20%</b>    |
| <b>Descriptors/Topics</b><br>1. Free body diagram,<br>2. Equilibrium equations and applications.<br>3. Plane truss, perfect and imperfect truss, assumption in the truss analysis,<br>4. analysis of perfect plane trusses by the method of joints, method of section |               |
| <b>Module II</b>  | <b>20%</b>    |
| <b>Friction</b><br>1. Static and Kinetic friction, laws of dry friction, co-efficient of friction,<br>2. angle of friction, angle of repose, cone of friction, friction lock,<br>3. efficiency of screw jack, transmission of power through belt                      |               |
| <b>Module III</b>   | <b>40%</b>    |

|  |            |
|--|------------|
| <b>Distributed Force</b> <ol style="list-style-type: none"> <li>1. Determination of center of gravity, center of mass and centroid by direct integration and by the method of composite bodies,</li> <li>2. mass moment of inertia and area moment of inertia by direct integration and composite bodies method,</li> <li>3. radius of gyration, parallel axis theorem,</li> <li>4. Pappus theorems and its application, polar moment of inertia.</li> </ol> |            |
| <b>Module IV</b>   | <b>20%</b> |
| <b>Work -Energy</b> <ol style="list-style-type: none"> <li>1. Work energy equation, conservation of energy,</li> <li>2. Virtual work, impulse, momentum conservation, impact of bodies, co-efficient of restitution,</li> <li>3. loss of energy during impact,</li> <li>4. D’alembert principle</li> </ol>   |            |

**Student Learning Outcomes:**

**On completion of the course the student will be able to:**

1. Demonstrate knowledge of fundamental concepts of Mechanics.
2. Identify various components of Trusses and mechanism.
3. Design and analyze problems relating to real world kinematics.

**Pedagogy for Course Delivery:**

The course pedagogy will include lectures, numerical practice, case studies, seminars and presentations.

**Lab/ Practicals details, if applicable:**

**List of Experiments:**

1. To verify the law of Force Polygon.
2. To verify the law of Moments using Parallel Force apparatus. (Simply supported type)
3. To determine the co-efficient of friction between wood and various surface (like Leather, Wood, Aluminum) on an inclined plane.
4. To find the forces in the members of Jib Crane.
5. To determine the mechanical advantage, Velocity ratio and efficiency of a screw jack.
6. To determine the mechanical advantage, Velocity ratio and Mechanical efficiency of the Wheel and Axle

7. To determine the MA, VR,  $\eta$  of Worm Wheel (2-start)
8. Verification of force transmitted by members of given truss.
9. To verify the law of moments using Bell crank lever
10. To find CG and moment of Inertia of an irregular body using Computation method

**Assessment/ Examination Scheme:**

| Theory L/T (%) | Lab/Practical/Studio (%) | Total |
|----------------|--------------------------|-------|
| 75%            | 25%                      | 100%  |

**Theory Assessment (L&T):**

|                        | Continuous Assessment/Internal Assessment |    |       |    | End Term Examination |
|------------------------|---|----|-------|----|----------------------|
| Components (Drop down) | A   | CT | S/V/Q | HA | EE                   |
| Weightage (%)          | 5   | 10 | 8     | 7  | 70                   |

**Lab/ Practical/ Studio Assessment:**

|                        | Continuous Assessment/Internal Assessment |    |    |   | End Term Examination |    |
|------------------------|---|----|----|---|----------------------|----|
| Components (Drop down) | A   | PR | LR | V | PR                   | V  |
| Weightage (%)          | 5   | 10 | 10 | 5 | 35                   | 35 |

**Text Books:**

- S.S. Bhavikatti, Engineering Mechanics, New Age International Ltd
- Sadhu Singh, Engineering Mechanics, Umesh Publication
- R. S. Khurmi, Engineering Mechanics, S. Chand Publication
- Engineering Mechanics Lab Manual

**Reference Books:**

- H. Shames & G. K. M. Rao, Engineering Mechanics, Pearson Education, 2006
- Timoshenko, Engineering Mechanics, McGraw Hill