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| Name of Subject | Engineering Mechanics | |
| L-T-P | 3-1-0 | |
| Credits | 4 | |
| Name of the Department | Civil Engineering | |
| Status of the subject | (a) Semester: Autumn<br>(b) Level of Subject: 1st year UG<br>(c) Nature of Subject: Core<br>(d) Semester to be offered: 1st<br>(e) Programme in which the course is included: B.Tech. (H) in Civil Engineering | |
| Prerequisites | None | |
| Objectives | Civil Engineering is one of the oldest engineering disciplines. It builds and maintains the infrastructure necessary for the human civilization to progress. At the core of Civil Engineering lies the concepts of mechanics - statics, dynamics, and equilibrium. This course sets the foundation by introducing some of these essential concepts to the first year Civil Engineering students. | |
| Names of the faculty members of the department who have the necessary expertise to teach the course | All Structural Engineering Faculty | |
| Any overlap with existing subjects | NONE | |
| Recommended Text Books | 1. Engineering Mechanics: Statics and Dynamics by RC Hibbeler, Pearson<br>2. Vector Mechanics for Engineers: Statics and Dynamics by FP Beer, ER Johnston, DF Mazurek, PJ Cornwell and ER Eisenberg, 9th Edition, Mc Graw Hill | |
| Topics to be Covered | **Name of the Topic** | **Hourly Breakup** |
| | Introduction to Mechanics – Fundamental Concepts and Principles, Concepts of Rigid and Deformable Bodies, Fundamentals of Vectors, Dot and Cross Products, Scalar Triple Products, Force Vectors, Resultant Force Vectors | 2 hours |
| | Statics of Particles – Free body Diagrams, Coplanar Force Systems, Rectangular Components of Force, Three-Dimensional Force Systems, Addition of Concurrent Forces in Space, Equilibrium of a Particle | 2 hours |
| | Force System Resultants – Moment of a Force, Varignon's Theorem, Moment of a Force about a Specific Axis, Moment of a Couple, Equivalent Couples, Addition of Couples, Simplification of a Force and Couple System, Equivalent System of Forces, Reduction of a Simple Distributed Loading | 4 hours |

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| | Equilibrium of Rigid Bodies – Conditions for Rigid Body Equilibrium, Free-Body Diagrams, Equations of Equilibrium, Two and Three Force Members, Constraints and Statical Determinacy | 6 hours |
| | Analysis of Simple Structures – Simple Trusses, Method of Joints, Method of Sections, Zero Force Members, Simple Frames | 6 hours |
| | Friction – Characteristics of Dry Friction, Wedges, Belt Friction, Rolling Resistance | 4 hours |
| | Properties of Areas – Centroid and Center of Mass, Pappus-Guldinus Theorem, Moments of Inertia, Parallel Axis Theorem, Radius of Gyration, Moments of Inertia for Composite Areas | 4 hours |
| | Virtual Work – Definition of Work, Principle of Virtual Work, Conservative Forces, Potential Energy, Stability of Equilibrium Configurations | 4 hours |
| | Kinetics of Particles – Equations of Motion in Rectangular, Normal-Tangential, and Cylindrical Coordinates, Central Force Problem, Principle of Work and Energy, Conservation of Energy, Impulse Momentum Relationship, Angular Momentum, Conservation of Linear and Angular Momentum | 4 hours |
| | Planar Kinetics of a Rigid Body – Mass moment of Inertia, Planar Kinetic Equations of Motion, Equations of Motion for Translation and Rotation about a Fixed Axis, General Motion, Kinetic Energy, Work done by a Force and a Couple, Principle of Conservation of Energy, Linear and Angular Momentum, Conservation of Momentum | 6 hours |
| | Vibrations – Undamped free vibrations, simple harmonic motion, simple pendulum, free vibration of rigid bodies, Application of the Principle of Conservation of Energy, Forced Vibrations, Damped Free Vibrations | 6 hours |