

NATIONAL INSTITUTE OF TECHNOLOGY- RAIPUR (CG)
DEPARTMENT OF APPLIED MECHANICS
SYLLABUS

Semester: 1st & 2nd Semester
Subject: Engineering Mechanics
L – T – P: (3-1-2)

Branch: Common to All
Scheme: NIT

UNIT - I : FORCE SYSTEMS

Introduction, Laws of Mechanics, Force Systems - Force, moment & couple, Varignon's theorem, Resultant of concurrent and non-concurrent forces, wrench, Free Body Diagram, Equilibrium conditions, Application to various problems.

UNIT – II : DISTRIBUTED FORCES & FRICTION
CENTROID & CENTRE OF GRAVITY

Introduction, Centre of gravity, Centroids of lines, Areas & Volumes, Theorems of Pappus, Centroid of Composite bodies.

MOMENT OF INERTIA:

Introduction, Moment of Inertia of Area, Polar Moment of Inertia, Radius of gyration, Parallel axis and Perpendicular axis theorem, Moment of inertia of composite areas, MOI about an arbitrary axis, Product of Inertia, Principal Axis and Principal moment of inertia, Mohr's circle for Moments and Products of Inertia, Moment of Inertia of masses, Moment of Inertia of Solids of Revolutions

FRICTION

Introduction, Laws of Dry Friction, Coefficients of Friction, Angle of Friction, Applications of Friction in Wedges, Ladder, Inclined Plane, Belt, Screw Threads, Wheel friction etc.

UNIT – III : ANALYSIS OF STRUCTURAL ELEMENTS:

BEAMS

Introduction, Various type of Beams, Various type of Supports, Reactions at supports, Shear force and bending moment at any section of a beam, Methods for determination of S.F. and B.M. diagrams of beams (simply supported, overhang and cantilever) subjected to various loads, Relation between Shear Force and Bending Moment, Point of contraflexure.

TRUSSES

Introduction, Various types of trusses, Tie and strut members, Analysis of forces in structural members by various methods.

UNIT – IV

PLANE KINETICS OF RIGID BODIES (Part – A)

Introduction, Equation of motion for a rigid body, Angular Motion of Rigid Bodies, D'Alembert's principle applied to bodies having linear and angular motion. Equation of dynamic equilibrium, Maximum acceleration and retardation of vehicles running on inclined planes.

Principle of Work and Energy: Applications, Virtual displacement.

Unit –V

PLANE KINETICS OF RIGID BODIES (Part – B)

Principle of Impulse and momentum, Linear and angular momentum, conservation of momentum, Applications.

VIBRATION & TIME RESPONSE

Introduction, Free Vibration of Particles, Forced Vibrations of particles, vibrations of rigid bodies, Damped Free & Damped Forced Vibrations, Derivation of Equation of motion & vibration frequency.

Text Books:

1. Meriam and Kraige: Engineering Mechanics (STATICS) by Wiley India Pvt Ltd, 2006.
2. Meriam and Kraige: Engineering Mechanics (DYNAMICS) by Wiley India Pvt Ltd.,2006.
3. F.P.Beer & E.R.Johnston,Jr.: Mechanics for Engineers, Statics & Dynamics, McGraw Hill, 2005.

Reference Books:

4. Irving Shames: Engg. Mechanics.
5. F.P. Beer & E. R. Johnston: VECTOR MECHANICS for ENGINEERS, TMH, 2008.
6. S.Timoshenko & D.H.Young: Engineering Mechanics
7. S.S. Bhavikatti & K.G. Rajashekarappa: Engineering Mechanics by NEW AGE International (P) Ltd.
8. A.K. Tayal: Engineering Mechanics (Statics and Dynamics) Umesh Pub. Delhi.
9. I.B.Prasad: A Text Book of Applied Mechanics, Khanna Pub. Delhi.

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List of Experiments:

1. To verify the polygon law of Forces
2. To verify the forces in member of a Jib Crane
3. To Find the coefficient of static friction between the Aluminum Block, Wooden Block & Iron Block respectively and wooden plane
4. To determine the coefficient of Friction between the Belt and Pulley
5. To Study the Single Purchase winch crab and draw the following diagrams (i) Load-Effort diagram; (ii) Load- ideal effort diagram; (iii) Load – efficiency diagram. Also state the law of Machine and determine the maximum efficiency of the machine.
6. To Study the Double Purchase winch crab and draw the following diagrams (i) Load-Effort diagram; (ii) Load- ideal effort diagram; (iii) Load – efficiency diagram. Also state the law of Machine and determine the maximum efficiency of the machine.
7. To Study the Differential Wheel & Axle and draw the following diagrams (i) Load-Effort diagram; (ii) Load- ideal effort diagram; (iii) Load – efficiency diagram. Also state the law of Machine and determine the maximum efficiency of the machine.
8. To Study the Pulley Blocks and draw the following diagrams (i) Load-Effort diagram; (ii) Load- ideal effort diagram; (iii) Load – efficiency diagram. Also state the law of Machine and determine the maximum efficiency of the machine
9. To Study the Geared Jib & Crane and draw the following diagrams (i) Load-Effort diagram; (ii) Load- ideal effort diagram; (iii) Load – efficiency diagram. Also state the law of Machine and determine the maximum efficiency of the machine
10. To Study the Modified Screw Jack and draw the following diagrams (i) Load-Effort diagram; (ii) Load- ideal effort diagram; (iii) Load – efficiency diagram. Also state the law of Machine and determine the maximum efficiency of the machine
11. To determine the reaction of simply supported beam subjected to concentrated loads.
12. To draw the variation of bending moment at a section of a simply supported beam under moving load.
13. To determine the stiffness of a Helical Compression Spring and to plot the graph between Load and Deflection
14. To verify the law of lever in case of a simple lever and compound lever.

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