NPTEL Video Course - Physics - NOC:Newtonian Mechanics With Examples

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Co-ordinating Institute - IIT - Roorkee

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Scalars vectors, and tensors - basic definitions
Lecture 2 - Scalars, vectors and tensors - most general definition
Lecture 3 - Elementary vector algebra - I (unit vector, dot product)
Lecture 4 - Elementary vector algebra - II (cross product, triple product)
Lecture 5 - Review of Newtonâ s laws of motion - tools for analysis
Lecture 6 - Newtonâ s laws of motion - third and second law
Lecture 7 - Newtonâ s laws of motion - first law
Lecture 8 - Solving mechanics problems - how to draw free body diagram correctly
Lecture 9 - Mechanical equilibrium (statics) using force and torque balance
Lecture 10 - Mechanical equilibrium (statics) using force and torque balance - more examples
Lecture 11 - Mechanical equilibrium of rope like structures, nature of tension force
Lecture 12 - Massless, flexible suspension cable in mechanical equilibrium
Lecture 13 - Massive flexible suspension cable in mechanical equilibrium
Lecture 14 - Mechanical equilibrium of truss (framework) - nature of internal forces
Lecture 15 - Mechanical equilibrium of truss (framework) - examples
Lecture 16 - Mechanical equilibrium of truss - uniqueness of solution, beam with distributed load
Lecture 17 - Mechanical equilibrium of truss - more on beam with distributed load
Lecture 18 - Mechanical equilibrium - more examples, principle of virtual work, constrained motion
Lecture 19 - Mechanical equilibrium: constraints, degrees of freedom, work done by constrained force
Lecture 20 - d'Alembert - Lagrange principle of virtual work - statement and examples
Lecture 21 - Equivalence of principles of force, torque balance and virtual work, stability analysis
Lecture 22 - Mechanical equilibrium: stability analysis, energy diagram technique
Lecture 23 - Friction between solids - Amonton-Coulomb laws, common misconceptions
Lecture 24 - Friction between solids - worked out examples
Lecture 25 - Friction between solid and fluid - drag force
Lecture 26 - Friction examples - projectile motion with drag force, tying a rope
Lecture 27 - Work-energy theorem in one dimension, importance of conservation laws
Lecture 28 - Work-energy theorem in higher dimensions, conservative forces
Lecture 29 - Momentum balance principle, critical review: projectile motion in real-life

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Lecture 30 - Projectile motion - effect of lift and thrust force by examples
Lecture 31 - More on rocket motion - comparing effect of thrust in deep space and at lift off
Lecture 32 - Collisions in daily life - application of energy and momentum balance principles
Lecture 33 - Collision at micro-meter, atomic and sub-atomic scales - Brownian motion, Compton effect
Lecture 34 - Concepts necessary for translation and rotation of rigid bodies - centre of mass
Lecture 35 - Centre of mass of composite objects
Lecture 36 - Concepts necessary for translation and rotation of rigid bodies - moment of inertia
Lecture 37 - More on moment of inertia - 3D objects, composite objects, engineering applications
Lecture 38 - Symmetry of mass distribution - product of inertia
Lecture 39 - Determining the principal axes of rotation and moment of inertia about them
Lecture 40 - Example of finding principal axes, introduction to rotation, the angular velocity vector
Lecture 41 - Rotation of rigid bodies - the angular momentum vector
Lecture 42 - Rotation of rigid bodies - torque
Lecture 43 - Translation and rotation of rigid bodies - computing rules
Lecture 44 - Translation and rotation of rigid bodies - examples (rolling, collision with rotation)
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