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INTRODUCTION TO ENGINEERING



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Topics



100+

Lessons



Core Learning Objectives

Understand core concepts in electrical, civil, and mechanical engineering.

Apply laws of motion and forces in mechanical systems and machines.

Analyze and solve basic electric and AC/DC circuit problems.

Learn principles of energy, waves, & electromagnetism in physics.

Explore structural materials and their properties in civil engineering.

Develop systems thinking through modeling and control system analysis.

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JoVE Core: Mechanical Engineering

List of Chapters

- 1.1 An Introduction To Statics
- 1.2 Force Vectors
- 1.3 Equilibrium Of A Particle
- 1.4 Force System Resultants
- 1.5 Equilibrium Of A Rigid Body
- 1.6 Structural Analysis
- 1.7 Internal Forces
- 1.8 Friction
- 1.9 Center Of Gravity And Centroid
- 1.10 Moment Of Inertia
- 1.11 Virtual Work
- 1.12 Kinematics Of A Particle
- 1.13 Kinetics Of A Particle: Force And Acceleration
- 1.14 Kinetics Of A Particle: Impulse And Momentum
- 1.15 Planar Kinematics Of A Rigid Body
- 1.16 3-Dimensional Kinetics Of A Rigid Body
- 1.17 Concept Of Stress
- 1.18 Stress And Strain - Axial Loading
- 1.19 Torsion
- 1.20 Bending
- 1.21 Analysis And Design Of Beams For Bending
- 1.22 Shearing Stresses In Beams And Thin-Walled Members
- 1.23 Transformations Of Stress And Strain
- 1.24 Principal Stresses Under A Given Loading
- 1.25 Deflection Of Beams
- 1.26 Columns
- 1.27 Energy Methods

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JoVE Core: Civil Engineering

List of Chapters

- 2.1 Masonry Materials
- 2.2 Masonry
- 2.3 Wood
- 2.4 Introduction to Concrete
- 2.5 Aggregates and Water
- 2.6 Fresh Concrete
- 2.7 Strength of Concrete

- 2.8 Mixing, Placing and Curing Concrete
- 2.9 Admixtures
- 2.10 Elasticity, Creep, and Shrinkage in Concrete
- 2.11 Permeability of Concrete
- 2.12 Freezing and Thawing in Concrete
- 2.13 Design Examples

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JoVE Core: Electrical Engineering

List of Chapters

- 3.1 Basics of Electric Circuits
- 3.2 DC Circuit Analysis
- 3.3 Operational Amplifiers
- 3.4 Energy Storage Elements
- 3.5 First and Second-Order Circuits
- 3.6 AC Circuit Analysis
- 3.7 AC Steady State Power
- 3.8 Three-Phase Circuits
- 3.9 Frequency Response
- 3.10 Basics of Semiconductors
- 3.11 Diodes
- 3.12 Transistors
- 3.13 Introduction to Signals and Systems
- 3.14 Linear Time-Invariant Systems
- 3.15 The Laplace Transform
- 3.16 Fourier Series
- 3.17 The Fourier Transform
- 3.18 Sampling
- 3.19 z-Transform
- 3.20 Introduction to Control Systems
- 3.21 Modeling in Time and Frequency Domain
- 3.22 Diagrams and Signal Flow Graphs
- 3.23 Transient and Steady-state Response Analysis
- 3.24 Root-Locus Method
- 3.25 Design of Control Systems
- 3.26 Power Transformers
- 3.27 Transmission Line Parameters
- 3.28 Steady-State Transmission Lines and Power Flows
- 3.29 Symmetrical and Unsymmetrical Faults
- 3.30 System Protection
- 3.31 Transient Stability and System Controls
- 3.32 Transmission Lines: Transient Operation
- 3.33 Power Distributions

List of Chapters

- 4.1 Units, Dimensions, And Measurements
- 4.2 Vectors And Scalars
- 4.3 Motion Along A Straight Line
- 4.4 Motion In Two Or Three Dimensions
- 4.5 Newton's Laws Of Motion
- 4.6 Application Of Newton's Laws Of Motion
- 4.7 Work And Kinetic Energy
- 4.8 Potential Energy And Energy Conservation
- 4.9 Linear Momentum, Impulse And Collisions
- 4.10 Rotation And Rigid Bodies
- 4.11 Equilibrium And Elasticity
- 4.12 Fluid Mechanics
- 4.13 Gravitation
- 4.14 Oscillations
- 4.15 Waves
- 4.16 Sound
- 4.17 Temperature And Heat
- 4.18 The Kinetic Theory Of Gases
- 4.19 The First Law Of Thermodynamics
- 4.20 The Second Law Of Thermodynamics
- 4.21 Electric Charges And Fields
- 4.22 Gauss's Law
- 4.23 Electric Potential
- 4.24 Capacitance
- 4.25 Current And Resistance
- 4.26 Direct-Current Circuits
- 4.27 Magnetic Forces And Fields
- 4.28 Sources Of Magnetic Fields
- 4.29 Electromagnetic Induction
- 4.30 Inductance
- 4.31 Alternating-Current Circuits
- 4.32 Electromagnetic Waves
- 4.33 Synthetic Polymers

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Physics I

Foundations of Motion, Forces, and Energy in
Classical Mechanics

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Physics II

Electricity, Magnetism, and Waves in
Modern Physics

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