



RAGHU ENGINEERING COLLEGE

Autonomous

(Approved by ACTIE, New Delhi, Accredited by NBA (CIV, ECE, MECH, CSE), NAAC with 'A+' grade & Permanently Affiliated to JNTU-GV Vizianagaram)

Dakamarri, Bheemunipatnam Mandal, Visakhapatnam Dist. – 531 162 (A.P.)

Ph: +91-8922-248001, 248002 Fax: + 91-8922-248011

e-mail: principal@raghuenggcollege.com website: www.raghuenggcollege.com

I Year-II Semester

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3	0	0	3

2303101: ENGINEERING MECHANICS

Course Objectives:

- To get familiarized with different types of force systems.
- To draw accurate free body diagrams representing forces and moments acting on a body to analyze the equilibrium of system of forces.
- To teach the basic principles of center of gravity, centroid and moment of inertia and determine them for different simple and composite bodies.
- To apply the Work-Energy method to particle motion.
- To understand the kinematics and kinetics of translational and rotational motion of rigid bodies.

COURSE OUTCOMES- STATEMENT	
COs	At the end of Course, student will be able to
CO1	Understand the fundamental concepts in mechanics and Analyze different force systems such as concurrent, coplanar and spatial systems and calculate their resultant forces and moments
CO2	Analyze the plane trusses using Method of Joints & Method of Sections and to determine the frictional forces
CO3	Determine the centroids, centre of gravity and moment of inertia of different geometrical shapes.
CO4	Apply the principles of work-energy and impulse-momentum to solve the problems of rectilinear and curvilinear motion of a particle.
CO5	Apply the principles of work-energy and impulse-momentum to solve the problems of rectilinear and curvilinear motion of a particle.

UNIT I

Introduction to Engineering Mechanics– Basic Concepts. Scope and Applications. **Systems of Forces:** Coplanar Concurrent Forces– Components in Space–Resultant–Moment of Force and its Application –Couples and Resultant of Force Systems.

Equilibrium of Systems of Forces: Free Body Diagrams, Lami's Theorem, Equations of Equilibrium of Coplanar Systems, Graphical method for the equilibrium, Triangle law of forces, converse of the law of polygon of forces condition of equilibrium, Equations of Equilibrium for Spatial System of forces, Numerical examples on spatial system of forces.

UNIT II

Analysis of plane trusses: Method of Joints, Method of Sections.

Friction: Introduction, limiting friction and impending motion, Coulomb's laws of dry friction, coefficient of friction, Cone of Static friction. Ladder friction and Wedge friction, Principle of virtual work with simple examples

UNIT III

Centroid: Centroids of simple figures (from basic principles)–Centroids of Composite Figures. **Centre of Gravity:** Centre of gravity of simple body (from basic principles), Centre of gravity of composite bodies, Pappus theorems.

Area Moments of Inertia: Definition– Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia.

Mass Moment of Inertia: Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, Mass Moment of Inertia of composite bodies.

UNIT IV

Rectilinear and Curvilinear motion of a particle: Kinematics and Kinetics –D'Alembert's Principle - Work Energy method and applications to particle motion-Impulse Momentum method.

UNIT V

Rigid body Motion: Kinematics and Kinetics of translation, Rotation about fixed axis and plane motion, Work Energy method and Impulse Momentum method.

CO-PO Mapping

COURSE OUTCOMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2									2
CO2	3	2	2									2
CO3	2	2	1									2
CO4	3	2	1									2
CO5	3	2	1									2

Textbooks:

1. Engineering Mechanics, S. Timoshenko, D. H. Young, J.V. Rao, S. Pati., , McGraw Hill Education 2017. 5th Edition.
2. Engineering Mechanics, P.C.Dumir- S.Sengupta and Srinivas V veeravalli , University press. 2020. First Edition.
3. A Textbook of Engineering Mechanics, S.S Bhavikatti. New age international publications 2018. 4th Edition.

Reference Books:

1. Engineering Mechanics, Statics and Dynamics, Rogers and M A. Nelson., McGraw Hill Education. 2017. First Edition.
2. Engineering Mechanics, Statics and Dynamics, I.H. Shames., PHI, 2002. 4th Edition.
3. Engineering Mechanics, Volume-I: Statics, Volume-II: Dynamics, J. L. Meriam and L. G. Kraige., John Wiley, 2008. 6th Edition.
4. Introduction to Statics and Dynamics, Basudev Battachatia, Oxford University Press, 2014. Second Edition
5. Engineering Mechanics: Statics and Dynamics, Hibbeler R.C., Pearson Education, Inc., New Delhi, 2022, 14th Edition