UNIVERSITY OF MADRAS

B.Sc. DEGREE PROGRAMME IN MATHEMATICS

SYLLABUS WITH EFFECT FROM 2023-2024

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">MECHANICS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">CORE M15</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">334C6C</td></tr>
<tr><td>Semester</td><td>VI</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td>Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">4</td><td colspan="2">1</td><td>--</td><td>5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">• Equilibrium of a particle under the action of given forces
• Simple Harmonic Motion
• Projectiles</td></tr>
<tr><td colspan="2" rowspan="3">Course Outline</td><td colspan="6">UNIT-I: Force: Newton’s laws of motion – Resultant of two forces ona particle - Equilibrium of a Particle: Equilibrium of a particle – Limiting equilibrium of a particle on an inclined plane.
Chapter 2 : Sections:2.1 and 2.2 ,
Chapter 3 : Sections:3.1 and 3.2. Hours:15</td></tr>
<tr><td colspan="6">UNIT-II: Forces on a Rigid Body: Moment of a Force – General motion of a body – Equivalent systems of forces- ParallelForces – Couples.
A Specific reduction of Forces: Reduction of coplanar forces into a force and couple – Problems involving frictional forces.
Chapter 4 : Sections 4.1 to 4.4, 4.6 (Omit Sections 4.5, 4.7 to 4.9)
Chapter 5 : Sections 5.1 to 5.2. Hours:15</td></tr>
<tr><td colspan="6">UNIT-III: Work, Energy and Power: Work – Conservative field of force – Power. Rectilinear Motion under Varying Force: Simple Harmonic Motion - along a horizontal line – along a vertical line.
Chapter 11 : Sections:11.1 and 11.2. Hours :15
Chapter 12 : Sections – 12.1 to 12.3 (Omit Section 12.4)</td></tr>
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	UNIT – IV: Projectiles: Forces on a projectile – Projectile projected on an inclined plane. **Hours:15** **Chapter 13: Sections – 13.1 , 13.2 (Omit Section 13.3)**
	UNIT-V: Central Orbits: General orbits – Central orbit – Conic as a centered orbit **Chapter 16: Sections:16.1 –16.3. Hours:15**
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	**Total Hours:75** Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1. Mechanics, by P.Duraipandian, Lakmi Duraipandian and Muthamizh Jayapragasam, S.Chand and company private limited Reprint 2016.
Reference Books	1. Engineering Mechanics: Statics, J.L. Meriam and L. G. Kraige, Seventh Edition,Wiley and sons Pvt ltd., New York, 2012. 2. Engineering Mechanics: Dynamics, J.L. Meriam, L. G. Kraige, and J.N. Bolton, 8thedn, Wiley and sons Pvt ltd., New York, 2015. 3. Engineering Mechanics (Statics and Dynamics)A. K. Dhiman, P.Dhinam and D. Kulshreshtha, ,McGraw Hill Education(India) Private Limited, New Delhi, 2015. 4. Introduction to Statics and Dynamics , A. Ruina and R. Pratap, Oxford University Press, 2014. 5. The Elements of Statics and Dynamics, S.L. Loney, Cambridge University Press, 1904.
Website and e-Learning Source	https://nptel.ac.in https://www.mathhelp.com/

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Course Learning Outcome (for Mapping with POs and PSOs)

Students will able to

CLO 1: Define Resultant, Component of a Force, Coplanar forces, like and unlike parallel forces, Equilibrium of a Particle, Limiting equilibrium of a particle on an inclined plane.

CLO 2: Define Moment of a force and Couple with examples. Define Parallel Forces and Forces acting along a Triangle, Solve problems on frictional forces

CLO 3: Define work, energy, power, rectilinear motions under varying forces. Define Simple Harmonic Motion and find its Geometrical representation.

CLO 4: Define Projectile, impulse, impact and laws of impact. Prove that the path of a projectile is a parabola. Find the direct and oblique impact of smooth elastic spheres

CLO 5: Define central orbits, explain conic as centered orbits and solve problems related to central orbits

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO 1	3	2	3	2	1	1	3	3	2
CLO 2	3	2	3	2	1	1	3	3	2
CLO 3	3	2	3	2	1	1	3	3	2
CLO 4	3	2	3	2	1	1	3	3	2
CLO 5	3	2	3	2	1	1	3	3	2