COURSE CODE	COURSE NAME	L	T	P	CREDIT	YEAR OF INTRODUCTION
101908/CE900C	ENGINEERING MECHANICS	2	1	0	3	2021

1. Preamble: Goal of this course is to expose the students to the fundamental concepts of mechanics and enhance their problem-solving skills. It introduces students to the influence of applied force system and the geometrical properties of the rigid bodies while stationary or in motion. After this course students will be able to recognize similar problems in real-world situations and respond accordingly.

2. Prerequisite: NIL

3. Syllabus

Module 1

Introduction to Engineering Mechanics-statics-basic principles of statics Parallelogram law, equilibrium law, principles of superposition and transmissibility, law of action and reaction(review) free body diagrams.

Concurrent coplanar forces-composition and resolution of forces-resultant and equilibrium equations – methods of projections – methods of moments – Varignon's Theorem of moments. Demonstration of parallelogram law.

Module 2

Parallel coplanar forces – couple - resultant of parallel forces – centre of parallel forces – equilibrium of parallel forces – Simply supported, cantilevered and overhanging beams subjected to concentrated vertical load, uniformly distributed load and uniformly varying load. General coplanar force system - resultant and equilibrium equations.

Friction – sliding friction - Coulomb's laws of friction – analysis of single bodies – wedges. ladder- analysis of connected bodies. Demonstration of reactions in a simply supported beam and the determination of coefficient of friction.

Module 3

Centroid of composite areas- moment of inertia-parallel axis and perpendicular axis theorems. Polar moment of inertia, radius of gyration, mass moment of inertia- ring, cylinder and disc, Product of Inertia

Theorem of Pappus Guldinus.

Forces in space - vectorial representation of forces -moments and couples – resultant and equilibrium equations - concurrent forces in space .Demonstration of concept of moment of inertia of solid disc, solid cylinder and hollow cylinder by studying their rolling motion in an inclined plane. Demonstration and determination of centre of gravity of an irregular lamina.

Module 4

Dynamics – rectilinear translation - equations of kinematics(review)

kinetics – equation of motion – D'Alembert's principle. – motion on horizontal and inclined surfaces, motion of connected bodies. Impulse momentum equation and work energy equation .

Curvilinear translation - equations of kinematics – projectile motion, kinetics – equation of motion. Moment of momentum.

Module 5

Rotation – kinematics of rotation- equation of motion for a rigid body rotating about a fixed axis – rotation under a constant moment.

Plane motion of rigid body – instantaneous centre of rotation.

Simple harmonic motion – free vibration – degree of freedom- undamped free vibration of spring mass system.

4. Text Books

1. Timoshenko and Young, *Engineering Mechanics*, McGraw Hill Publishers, 5th edition, 2017.
2. Tayal A K, *Engineering Mechanics – Statics and Dynamics*, Umesh Publications, 14th edition, 2008.

5. References

1. Merriam J. L and Kraige L. G., *Engineering Mechanics - Vols. 1 and 2*, John Wiley,5th edition, 2016.
2. Bhavikkatti, S.S., *Engineering Mechanics*, New Age International Publishers, 8th edition, 2021.
3. F.P.Beer abd E.R.Johnston (2011), *Vector Mechanics for Engineers*, Vol.I- Statics, Vol.II-Dynamics, 9th Ed, Tata McGraw Hill
4. Rajasekaran S and Sankarasubramanian G, *Engineering Mechanics - Statics and Dynamics*, Vikas Publishing House Pvt Ltd, 3rd edition, 2005.
5. Shames, I. H., *Engineering Mechanics - Statics and Dynamics*, Prentice Hall of India, 4th edition,2005.

6. R. C. Hibbeler and Ashok Gupta, *Engineering Mechanics*, Vol. I statics, Vol II Dynamics, Pearson Education 11th edition,2014.

6. Course Outcomes:

After the completion of the course the student will be able to

CO1: Recall principles and theorems related to rigid body mechanics

CO2: Identify and describe the components of system of forces acting on the rigid body

CO3: Apply the conditions of equilibrium to various practical problems involving different force system.

CO4: Choose appropriate theorems, principles or formulae to solve problems of mechanics.

CO5: Solve problems involving rigid bodies, applying the properties of distributed areas and masses

7.Mapping of course outcomes with program outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	2	2											1		
CO2	3	3											1		
CO3	3	3											1		
CO4	3	3											1		
CO5	3	3											1		

8. Assessment Pattern

Learning Objectives	Continuous Internal Evaluation (CIE)		End Semester Examination (ESEout of 100)
	Internal Examination1 (50)	Internal Examination 2 (50)	
Remember	10	10	15
Understand	10	10	15
Apply	30	30	70

9.Mark Distribution

Total	CIE				ESE
	Attendance	Internal Examination	Assignment/Quiz/Course Project	Total	
150	10	25 (Average of two scores)	15	50	100

10.End Semester Examination Pattern

There will be two parts; Part A and Part B. Part A contains 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question may have 2 sub-divisions (7 marks each) and carry 14 marks.

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