

ENGINEERING MECHANICS

II Semester: AE / ME / CE									
Course Code	Category	Hours / Week			Credits	Maximum Marks			
AMEC01	Foundation	L	T	P	C	CIA	SEE	Total	
		3	-	-	3	30	70	100	
Contact Classes: 45		Tutorial Classes: Nil		Practical Classes: Nil		Total Classes: 45			
Prerequisite: Knowledge of Linear Algebra and Calculus									
I. COURSE OVERVIEW:									
<p>Engineering Mechanics is a branch of Physics that deals with the study of the system of forces acting on a particle which is at rest or in motion. The course emphasizes thorough understanding of theories and principles related to static and dynamic equilibrium of rigid bodies to acquire the analytical capability required for solving engineering problems and are one of the foundation courses that forms the basis of many of the traditional branches of engineering such as aerospace, civil and mechanical engineering.</p>									
II. COURSE OBJECTIVES:									
The student will try to learn:									
<p>I. The application of mathematics and science principles to represent the free body diagrams in the area of rigid body mechanics.</p> <p>II. The conditions of static and dynamic equilibrium of bodies subjected to a particular force system for solving the field problems.</p> <p>III. The effects of force and motion while carrying out the innovative design functions of engineering.</p>									
III. COURSE OUTCOMES:									
After successful completion of the course, students should be able to:									
CO 1	Identify	and unknown forces by free body diagrams to a given equilibrium force system through mechanics laws and derived laws.					Analyze		
CO 2	Interpret	the static and dynamic friction laws for the equilibrium state of a wedge, ladder and screw jack.					Understand		
CO 3	Identify	the centroid and centre of gravity for the simple and composite plane sections from the first principles.					Apply		
CO 4	Calculate	moment of inertia and mass moment of inertia of a circular plate, cylinder, cone and sphere from the first principles.					Apply		
CO 5	Apply	D'Alembert's principle to a dynamic equilibrium system by introducing the inertia force for knowing the acceleration and forces involved in the system.					Apply		
CO 6	Determine	the governing equation for momentum and vibrational phenomenon of mechanical system by using energy principles for obtaining co efficient and circular frequency.					Apply		
IV. SYLLABUS:									
MODULE-I: INTRODUCTION TO ENGINEERING MECHANICS (10)									
<p>Classification of Engineering Mechanics, Basic Terminologies in Mechanics, Laws of Mechanics, Derived Laws, Characteristics of a Force, System of Forces, Composition of Forces, Resolution of Forces, Composition of Forces by Method of Resolution, Resultant of Non-Concurrent Force System, Supports and Reactions, Free Body Diagrams, Equilibrium of Bodies, Equilibrant, Equilibrium of Connected Bodies, Moment of a Force, Varignon's Theorem, Couple, Resolution of a Force into a Force and a Couple.</p>									
MODULE –II: FRICTION (08)									
<p>Frictional Force, Laws of Friction, Angle of Friction, Angle of Repose and Cone of Friction, Types of friction, Limiting friction, Static and Dynamic Friction; Ladder friction, wedge friction, screw jack & differential screw jack.</p>									
MODULE –III: CENTROID, CENTRE OF GRAVITY AND MOMENT OF INERTIA (10)									
<p>Centre of Gravity, Centroid, Difference between Centre of gravity and Centroid, Determination of Centroid of Simple Figures from First Principle, Centroid of Composite Sections, Centre of Gravity from First Principles, Centre of Gravity of Composite Bodies.</p>									

Moment of Inertia, Polar Moment of Inertia, Radius of Gyration, Theorems of Moment of Inertia, Moment of Inertia from First Principle, Moment of Inertia of Standard Sections and Composite sections, Mass Moment of Inertia, Determination of Mass Moment of Inertia from First Principles, Parallel Axis Theorem/Transfer Formula, Mass Moment of Inertia of Composite Bodies.

MODULE –IV: PARTICLE DYNAMICS AND WORK ENERGY PRINCIPLE (09)

Kinetics of Rigid Bodies – Newton’s II law, D’Alembert’s principle and its applications in plane motion and connected bodies. Work, Work Done by a Varying Force, Energy, Power, Work Energy Equation for Translation, Work Done by a Spring.

MODULE –V: IMPULSE MOMENTUM AND MECHANICAL VIBRATIONS (08)

Linear Impulse and Momentum, Connected Bodies, Conservation of Momentum, Coefficient of restitution, Types of Impact. Vibrations - Basic terminology, free and forced vibrations, types of pendulum, Derivation for frequency and time period of simple, compound and torsion pendulums.

V. TEXT BOOKS:

1. Irving H. Shames (2006), “Engineering Mechanics”, Prentice Hall, 4th Edition, 2013
2. S.Bhavikatti, “A Text Book of Engineering Mechanics”, New Age International, 1st Edition, 2012.
3. R. C. Hibbler (2006), “Engineering Mechanics: Principles of Statics and Dynamics”, Pearson Press.

VI. REFERENCE BOOKS:

1. F. P. Beer and E. R. Johnston (2011), “Vector Mechanics for Engineers”, Vol I - Statics, Vol II, – Dynamics, Tata McGraw Hill, 9th Edition, 2013.
2. A.K.Tayal, “Engineering Mechanics”, Uma Publications, 14th Edition, 2013.
3. R. K. Bansal “Engineering Mechanics”, Laxmi Publication, 8th Edition, 2013.
4. Basudeb Bhattacharya, “Engineering Mechanics”, Oxford University Press, 2nd Edition, 2014.
5. K.Vijay Reddy, J. Suresh Kumar, “Singer’s Engineering Mechanics Statics and Dynamics”, B S Publishers, 1st Edition, 2013.

VII. WEB REFERENCES:

1. [https://en.wikipedia.org/wiki/Dynamics_\(mechanics\)](https://en.wikipedia.org/wiki/Dynamics_(mechanics))
2. https://www.youtube.com/playlist?list=PLU14u3cNGP62esZEwffjMAsEMW_YArxYC

VIII. E-TEXT BOOKS:

1. <http://www.freeengineeringbooks.com/Civil/Engineering-Mechanics-Books.php>
2. <http://www.textbooksonline.tn.nic.in/books/11/stdxi-voc-ema-em-2.pdf>
3. <http://www.faadooengineers.com/threads/17024-Engineering-mechanics-pdf-Free-Download>