ENGINEERING MECHANICS

II Semester: AE / ME / CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AMEC01	Foundation	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:

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 is one of the foundation courses that forms the basis of many of the traditional branches of engineering such as aerospace, civil and mechanical engineering.

II. COURSE OBJECTIVES:

The student will try to learn:

I. The application of mathematics and science principles to represent the free body diagrams in the area of rigid body mechanics.
II. The conditions of static and dynamic equilibrium of bodies subjected to a particular force system for solving the field problems.
III. The effects of force and motion while carrying out the innovative design functions of engineering.

III. COURSE SYLLABUS:

MODULE-I: INTRODUCTION TO ENGINEERING MECHANICS (10)

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.

MODULE –II: FRICTION (08)

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.

MODULE –III: CENTROID, CENTRE OF GRAVITY AND MOMENT OF INERTIA (10)

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.

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.

IV. 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.

V. 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.

VI. WEB REFERENCES:

1. https://en.wikipedia.org/wiki/Dynamics_(mechanics)
2. https://www.youtube.com/playlist?list=PLUl4u3cNGP62esZEwffjMAsEMW_YArxYC

VII. 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