APPLIED MECHANICS II (DYNAMICS)
BEG157CI

YEAR-I **SEMESTER-II**

Teaching Schedule Hours/ Week			Examination Scheme						Total Marks
			Final				Internal Assessments		
			Theory		Practical		Theory Marks	Practical Marks	
L	P	T	Duration	Marks	Duration	Marks			
3	-	3	3	80	-	-	20	-	100

Course Objective:

Course Content:

1. Introduction to Dynamics (1 hrs)

1.1 Definition, branches, importance of dynamics

2. Rectilinear Motion of Particles (3 hrs)

2.1 Position, Velocity and Acceleration
2.2 Determination of motion of particles
2.3 Uniform Rectangular Motion
2.4 Uniformly Accelerated Rectilinear Motion
2.5 Motion of several particles
2.6 Graphical Solution of Rectilinear Motion Problems

3. Curvilinear Motion of Particles (4 hrs)

3.1 Position vector, velocity and Acceleration
3.2 Derivative of vector function
3.3 Rectangular Components of Velocity and acceleration
3.4 Motion relative to a frame in Translation
3.5 Tangential and normal components of velocity and acceleration
3.6 Radial and transverse components of velocity and acceleration

4. Kinetics of particles: Newton's Second law (6 hrs)

4.1 Newton's second law of Motion
4.2 Linear Momentum and Rate of change
4.3 System of units
4.4 Equations of Motion and dynamic equilibrium
4.5 Angular momentum and rate of change
4.6 Equations of Motion-Radial and Transverse Components
4.7 Motion due to a central force-Conservation of Momentum
4.8 Newton's law of Gravitation
4.9 Applications to Space Mechanics

5. Kinetics of Particles: Energy and Momentum Methods (6 hrs)

5.1 Work done by a force
5.2 Kinetic energy of a particle
5.3 Principles of Work and energy: Application
5.4 Power and Efficiency
5.5 Potential Energy
5.6 Conservation of energy
5.7 Principle of Impulse and Momentum
5.8 Impulsive Motion and Impact

5.9 Direct Central Impact
5.10 Oblique Impact

6.0 Systems of Particles (6 hrs)

6.1 Newton's laws and a system of particles
6.2 Linear and Angular Moment for systems of particles
6.3 Motion of the mass centre
6.4 Conservation of momentum
6.5 Kinetic energy of a system of particles
6.6 Work energy principle; Conservation of Energy for a System of Particles
6.7 Principle of Impulse and Momentum for a system of particles
6.8 Steady stream of Particles, Systems with variable mass

7.0 Kinematics of Rigid Bodies (7 hrs)

7.1 Introduction
7.2 Translation
7.3 Rotation
7.4 General Plane Motion
7.5 Absolute and Relative Velocity in plane motion
7.6 Instantaneous Centre of Rotation
7.7 Absolute and Relative Frame; Coriolis acceleration in plane motion
7.8 Rate of Change of a General Vector with Respect to a Rotating Frame; Coriolis Acceleration
7.9 Motion about a fixed point
7.10 General motion
7.11 Three Dimensional Motion of a particle relative to a rotating frame: Coriolis Acceleration

8.0 Plane Motion of Rigid Bodies: Forces, Moments and Accelerations (4 hrs)

8.1 Equations of motion for a rigid body
8.2 Angular Momentum for a rigid Body in plane motion
8.3 Plane motion of a rigid Body; D. Alembert's Principle
8.4 Application of rigid Body Motion in the plane
8.5 Constrained Motion in the Plane

9.0 Plane Motion in Rigid Bodies: Energy and Momentum methods (5 hrs)

9.1 Principles of work and Energy for a rigid Body
9.2 Work done by external forces
9.3 Kinetic energy for a system
9.4 Conservative and Non-conservative system
9.5 Works-Energy Applications
9.6 Impulse and Momentum for systems of rigid Bodies
9.7 Conservation of Angular and Linear Momentum
9.8 Impulsive motion and Eccentric Impact

10.0 Mechanical Vibrations (3 hrs)

10.1 Undraped free vibrations of particles and Rigid Bodies: Simple harmonic motion, frequency and period of Oscillation
10.2 Steady Harmonic Forcing of Undraped Systems

References:

- "Engineering Mechanics -Static and Dynamic" Shames, P.H. 3rd Edition New Delhi, Prentice Hall of India, 1990

- "Mechanics for Engineers- Static and Dynamic" E.P. Beer and F.R. Johnston, Jr. 4th Edition, McGraw-Hall, 1987.

Tutorials 12 Assignment and 12 Quizzes