Code	Subject Title	Cr. Hrs	Semester
MATH-310	Mechanics	3	VI
Year	Discipline		
3	Mathematics-I,II		

Non Inertial Reference Systems
- Accelerated coordinate systems and inertial forces
- Rotating coordinate systems
- Velocity and acceleration in moving system: coriolis, centripetal and transverse acceleration
- Dynamics of a particle in a rotating coordinate system

Planar Motion of Rigid Bodies
- Introduction to rigid and elastic bodies, degrees of freedom, translations, rotations, instantaneous axis and center of rotation, motion of the center of mass
- Euler's theorem and Chasle's theorem
- Rotation of a rigid body about a fixed axis: moments and products of inertia, hoop or cylindrical shell, circular cylinder, spherical shell
- Parallel and perpendicular axis theorem
- Radius of gyration of various bodies

Motion of Rigid Bodies in Three Dimensions
- General motion of rigid bodies in space: Moments and products of inertia, inertia matrix
- The momental ellipsoid and equimomental systems
- Angular momentum vector and rotational kinetic energy
- Principal axes and principal moments of inertia
- Determination of principal axes by diagonalizing the inertia matrix

Euler Equations of Motion of a Rigid Body
- Force free motion
- Free rotation of a rigid body with an axis of symmetry
- Free rotation of a rigid body with three different principal moments
- The Eulerian angles, angular velocity and kinetic energy in terms of Euler angles, space cone
- Motion of a spinning top and gyroscopes- steady precession, sleeping top

Recommended Books
1. G. R. Fowles and G. L. Cassiday, *Analytical Mechanics*, 7th edition, (Thomson Brooks/Coley, USA, 2005)
2. M. R. Spiegel, *Theoratical Mechanics*, (McGraw Hill Book Company, Singapore, 1980)
3. F. P. Beer and E. Russell Johnston, Jr., *Vector Mechanics for Engineers –Statics and Dynamics*, (McGraw Hill Inc., 1977)
4. H. Goldstein, *Classical Mechanics*, (Addison-Wesley Publisihng Co., 1980)
5. C. F. Chorlton, *Text Book of Dynamics*, (Ellis Horwood, 1983).