

**Course Title: Mathematics B-I [Vectors & Mechanics (I)]**

**Course Rating: 4 Cr. Hours**

**Vector Algebra**

- Introduction to vector algebra
- Scalar and vector product
- Scalar triple product and vector triple product
- Applications to geometry

**Vector Calculus**

- Limit, continuity and differentiability of vector point functions
- Partial derivatives of vector point functions
- Scalar and vector fields
- The gradient, divergence and curl
- Expansion formulas.

**Forces**

- Fundamental concepts and principles
- Inertial-non-inertial frames, Newton's laws
- Resultant of several concurrent forces
- The parallelogram law of forces
- Resolution of a forces, triangle of forces
- Lamy's theorem, polygon of forces
- Conditions of equilibrium for a particle
- External and internal forces, principle of transmissibility
- Resultant of like and unlike parallel forces
- Moment of forces about a point, Varignon's theorem
- Moment of a couple, equivalent couples, composition of couples
- Reduction of coplanar forces to a force or a couple

**Friction**

- Dry friction and fluid friction
- Laws of dry friction, coefficients of friction, angle of friction
- Equilibrium of a particle on a rough inclined plane
- Particle on a rough inclined plane acted on by an external force
- Conditions for sliding or titling

**Virtual Work**

- Principle of virtual work
- Problems involving tensions and thrust

**Recommended Books**

1. Thomas, *Calculus*, 11<sup>th</sup> Edition. Addison Wesley publishing company, 2005
2. Jafferson, B. Beadsdworth, T. *Further Mechanics*, Oxford University Press, 2001
3. Joseph F, Shelley. *Vector Mechanics*, Mc-Graw Hill Company, 1990

4. Murray R. Spiegel, *Theoretical Mechanics*, Schaum's Outline Series, McGraw Hill Book Company
5. Hwei P. HSU, *Applied Vector Analysis*, San Diego, New York, 1984.
7. Murray R. Spiegel, *Vector Analysis*, Schaum's Outline Series, McGraw Hill Book Company, 1959
6. D.K. Anand and P.F. Cunnif, *Statics and Dynamics*, Allyn and Becon, Inc. 1984