Programme: Class: B.Sc.	Year:II	Semester: IV

Subject: Mathematics

Course Code: **Course Title: Vector Calculus and Mechanics**

Course Outcome	CO1: By applying the principles of Vector Calculus, the student learns to solve a variety of practical problems in science and engineering. Exposing the foundations of mechanics which will be useful in understanding various physical phenomenon. CO2: Knowledge of basic mechanics such as simple harmonic motion, cycloid, projectiles, virtual works and equilibrium. CO3: The student, after completing the course can go for higher problems in mechanics such as hydrodynamics, this will be helpful in getting employment in industry.

Unit No.	Course Content	Hours
I	Vector Calculus : Vector identities, Differential operators, Vector differentiation, Vector integration, Gradient of a vector point function, Directional derivatives of a scalar point function, Divergence and curl of a vector point function, Theorems of Gauss, Green and Stokes.	8
II	Simple Harmonic Motion: Definition of simple harmonic motion (SHM) and examples, Equation of simple harmonic motion, Hook's law for horizontal and vertical strings with solved problems	8
III	Projectiles: Definitions of projectile (Trajectory, Velocity of projection, Angle of projection, Point of projection, Range, Time of flight and greatest height), Position of projectile at any time, Equation of trajectory, Maximum height, Maximum horizontal range of the projectile, Range and time of flight up an inclined plane and solved problems.	8
IV	Virtual Work : Definitions of virtual displacement and virtual work done, Difference between work done and virtual work done with examples, The principle of virtual work, Work done by the tension and thrust of an extensible string during a small displacement, Some solved problems.	8
V	Equilibrium : Stable and unstable equilibrium, Moments and couples and Varignon's theorem of moments and some solved problems.	8

Suggested Readings:

1. P.C. Matthew: Vector Calculus, springer Verlag London Limited, 1998.
2. R.C. Hibbeler: Engineering Mechanics-Statics, Prentics Hall Publishers
3. R.C. Hibbeler: Engineering Mechanics-Dynamics, Prentics Hall Publishers
4. M. Ray: A Textbook on Dynamics, S. Chand.
5. M. Ray: A Textbook on Statics, S. Chand.
6. A. Nelson: Engineering Mechanics Statics and Dynamics, Tata McGraw Hill
7. J.L. Synge & B.A. Griffith: Principles of Mechanics, Tata McGraw Hill
8. S. L. Loney: Dynamics of a particle and of rigid bodies, Cambridge University Press
9. Suggested digital plateform:NPTEL/SWAYAM/MOOCs

Mapping of course outcomes with program outcomes & program specific outcomes

CO's No.	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	1	2	3	3	3
CO2	3	3	3	3	2	2	2	3	3
CO3	3	3	3	3	1	2	3	2	3