17HS038 RING THEORY & VECTOR CALCULUS

Course Description and Objectives:

This subject enables the students to acquire knowledge about various topics under ring theory and special classes of rings, vector spaces, subspaces bases, dimension and their properties. Moreover, from vector calculus, students can gain skills on linear transformation and ability to compute eigen values and eigen vectors of linear transformations, inner product spaces and determining orthogonality. To motivate the students to gain knowledge about adjoint of linear transformation and its canonical form.

Course Outcomes:

Upon completion of the course, the student will be able to achieve the following outcomes:

COs	Course Outcomes
1	Know the fundamental concepts in ring theory such as the concepts of ideals, quotient rings, integral domains, and fields.
2	Learn in detail about polynomial rings, fundamental properties of finite field extensions, and classification of finite fields.
3	Understand the concepts of vector spaces, subspaces, bases, dimension and their properties.
4	Relate matrices and linear transformations, compute eigen values and eigen vectors of linear transformations.
5	Learn properties of inner product spaces and determine orthogonality in inner product spaces.

UNIT – 1 RINGS - I
Definition of Ring and basic properties, Boolean Rings, divisors of zero and cancellation laws Rings, Integral Domains, Division Ring and Fields, The characteristic of a ring - The characteristic of an Integral Domain, The characteristic of a Field. Sub Rings, Ideals

UNIT – 2 RINGS - II
Definition of Homomorphism – Homomorphic Image – Elementary Properties of Homomorphism –Kernel of a Homomorphism – Fundamental theorem of Homomorhphism – Maximal Ideals – Prime Ideals.

UNIT –3 VECTOR DIFFERENTIATION
Vector Differentiation, Ordinary derivatives of vectors, Differentiability, Gradient, Divergence, Curl operators, Formulae Involving these operators.

UNIT – 4 VECTOR INTEGRATION
Line Integral, Surface Integral, Volume integral with examples.

UNIT – 5 VECTOR INTEGRATION APPLICATIONS

Theorems of Gauss and Stokes, Green's theorem in plane and applications of these theorems.

Reference Books

1. Abstract Algebra by J. Fralieh, Published by Narosa Publishing house.
2. Vector Calculus by Santhi Narayana, Published by S. Chand & Company Pvt. Ltd., New Delhi.
3. A text Book of B.Sc., Mathematics by B.V.S.S.Sarma and others, published by S. Chand &
   Company Pvt. Ltd., New Delhi.
4. Vector Calculus by R. Gupta, Published by Laxmi Publications.
5. Vector Calculus by P.C. Matthews, Published by Springer Verlag publicattions.
6. Rings and Linear Algebra by Pundir & Pundir, Published by Pragathi Prakashan.

Suggested Activities:

Seminar/ Quiz/ Assignments/ Project on Ring theory and its applications