SC421: Introduction to Modern Algebra **Course content**

DA-IICT, B.Tech,

Objective:
To introduce the rich field of groups, rings and fields in algebra. To look at the set of polynomials as rings and their roots in extensions of field. To get introduced to Galois Theory.

Pre-requisite
Number systems: Integers, rational numbers, Real numbers and Complex numbers.
Groups, Linear Algebra.
Evaluation:
Two Midsemester Test 20% + 20%
Endsemester Test 50%
Attendance 10%

Outcome:
Students learn the intersting process of creating a field through quotient rings of polynomial rings. The beautiful connection between roots of polynomials and the group of automotphisms on the fields. This is the essence of Galois theory.

P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
	X								X		X

Course Outline

1. Groups:
   Basic Definitions, Subgroups, Cosets, Normal Subgroups, Lagrange's Theorem, Isomorphism, Homomorphism, Quotient groups.

2. Rings:
   Definition, types of rings , zero divisors , integral domains, Fields, Characteristic of a field.

3. The number system:
   Examples of Rings and Fields in the number systems.

4. Polynomials:
   Definition, The division Algorithm, Factorization.

5. Quotient Rings:
   Homomorphisms, Ideals, Quotient rings, Quotient rings of Polynomial Rings, Factorization and Ideals.

6. Field Extensions:
   Simple Extensions, Degree of Extension, Splitting Fields, Finite Fields.

7. Galois Theory:
   Galois Group, Separability and Normality, Fundamental Theorem of Galois Theory, Solvability by radicals.

8. Geometric Constructions:
   Doubling of a cube, trisecting an angle, squaring a circle, constructible numbers.

Books

1. Topics in Algebra
   I.N. Herstein

2. Abstract Algebra, An Introduction
   Thomas W. Hungerford