Part A: Introduction

Program: Certificate Course	Class: B.Sc. Sem II		Year: 2023	Session:2023-2024
1	Course Code		MSC-2	
2	Course Title		Algebra	
3	Course Type		Theory	
4	Course Learning Outcome (CLO)	This Course will enable the students to: • Learn about the fundamental concepts of groups, subgroups, normal subgroups, isomorphism theorems, cyclic and permutation groups. • Learn about Rings, Integral domain and field. • Understand Ideals and Modules.		
5	Credit Value	Theory & Tutorial: 4		
6	Total Marks	Maximum Marks : 100 (Ext. 80 + Int. 20)		Minimum Passing Marks : 40

Part B: Content of the Course

Module	Topics	No. of Hours
I	**Set Theory and Theory of Equations:** Sets, Relations, Equivalence relations, Equivalence classes; The division algorithm, Divisibility and the Euclidean algorithm, Modular arithmetic and basic properties of congruences, Elementary theorems on the roots of polynomial equations, Imaginary roots, The fundamental theorem of algebra (statement only); Transformation of equations. Descarte's rule of signs. Solutions of cubic equations (Cardons method), Bi-quadratic equation.	15
II	**Groups, Subgroups, Normal Subgroups and Isomorphism Theorems:** Definition and properties of a group, Abelian groups, Examples of groups, Subgroups and examples, Cosets and their properties, Lagrange's theorem and its applications, Normal subgroups and their properties, Simple groups, Factors groups; Group homomorphism and isomorphism with properties; First, second and third isomorphism theorems for groups.	15
III	**Cyclic and Permutation Groups :** Cyclic groups and properties, Classifications of subgroup of cyclic groups, Cauchy theorem for finite Abelian groups; Centralizer, Normalizer, Center of a group, Product of two subgroups, Permutation group and properties, Even and odd permutations, Cayley's theorem.	15
IV	**Ring, Field and Integral Doman, Ideals and Modules:** Definition and properties of a ring, example of rings, Subrings, Integral domain and fields, characteristic of ring and field. Ring Homomorphism, Ideals and Quotient Rings. Field of Quotients of an Integral Domain, Euclidean Rings, Polynomial Rings, Polynomials over the Rational Field. The Eisenstein Criterion, Polynomial Rings over Commutative Rings, Unique factorization domain. R unique factorization domain implies so is R [x1, x2 ..... xn], Modules, Submodules, Quotient modules homomorphism and isomorphism theorems.	15

Part C - Learning Resource
Text Books, Reference Books, Other Resources

1. Michael Artin (2014). *Algebra* (2nd edition). Pearson.
2. John B. Fraleigh (2007). *A First Course in Abstract Algebra* (7th edition). Pearson.
3. Stephen H. Friedberg, Arnold J.Insel& Lawrence E. Spence (2003). *Linear Algebra* (4thedition). Prentice-Hall of India Pvt. Ltd.
4. Joseph A. Gallian (2017). *Contemporary Abstract Algebra* (9th edition). Cengage.
5. Kenneth Hoffman & Ray Kunze (2015). *Linear Algebra* (2nd edition). Prentice-Hall.
6. I. N. Herstein (2006). *Topics in Algebra* (2nd edition). Wiley India.
7. Nathan Jacobson (2009). *Basic Algebra* I (2nd edition). Dover Publications.
8. Ramji Lal (2017). *Algebra 1: Groups, Rings, Fields and Arithmetic*. Springer.
9. I.S. Luthar & I.B.S. Passi (2013). *Algebra: Volume 1: Groups*. Narosa.
   Suggested Equivalent **online** courses: Web link NPTEL/SWAYAM/ MOOCs

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks:	**100 Marks**
Continuous Comprehensive Evaluation (CCE):	**20 Marks**
Semester End Exam (SEE):	**80 Marks**

Internal Assessment: Continuous Comprehensive Evaluation(CCE)	Internal Test -02 of 10 Marks each Assignment/Seminar-01 0f 10 Marks	Sum of best of two test and assignment marks
Semester End Exam (SEE)	Paper-Two Section-A&B Section-A: Objective and short answer type question-1x10+3x10= 40 Marks Section-B: Descriptive answer type question Module wise- 10x4 =40 Marks	

Amendment or Modification shall may be made by course coordinator as per situation or directed by the department/Examination cell/NEP-20 Scheme coordinator

Name and signature of convener & member of BOS:

(Dr. U.K. Shrivastava)