

FOUR YEAR UNDER GRADUATE PROGRAM(2024-25)
DEPARTMENT OF MATHEMATICS
COURSE CURRICULUM

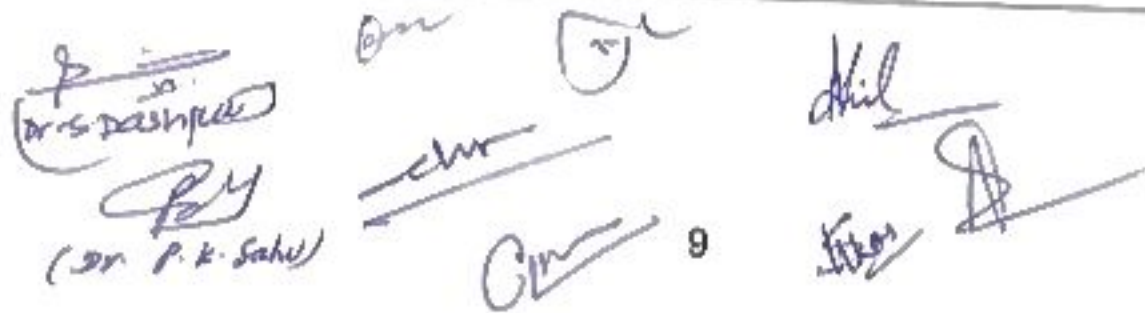
Part A: Introduction

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| Program: Bachelor in Science (Diploma/Degree/Honors) | | Semester - IV | Session:2024-2025 |
| 1 | Course Code | MASC-04 | |
| 2 | Course Title | Abstract Algebra | |
| 3 | Course Type | Discipline Specific Course (DSC) | |
| 4 | Pre-requisite(if any) | Knowledge of algebra, vector space and inner product space. | |
| 5 | Course Learning Outcome (CLO) | <ul style="list-style-type: none"> ➤ Understand of Homomorphism, Isomorphism of Group ➤ Understand Cyclic and Permutation Groups. ➤ Understand vector spaces, subspaces, basis, dimension and their properties. ➤ Learn about properties of linear transformation and isomorphism theorems. ➤ Understand the concept of linear transformations. | |
| 6 | Credit Value | 4 C | 1Credit = 15 hours- Learning and Observation |
| 7 | Total Marks | Maximum Marks : 100 | Minimum Passing Marks:40 |

Part B: Content of the Course

Total no of teaching – learning period =60 Periods (60 Hours)

| UNIT | Topics | No of Periods |
|------|---|---------------|
| I | Isomorphism Theorems , Cyclic and Permutation Groups : Group homomorphism and isomorphism with properties; First, second and third isomorphism theorems for groups, Cyclic groups and properties, Classifications of subgroup of cyclic groups, Permutation group and properties, Even and odd permutations, Cayley's theorem. | 15 |
| II | Ring, Field and Integral Domain, Ideals: 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 $R[x_1, x_2, \dots, x_n]$. | 15 |
| III | Vector Spaces: Definition and examples of vector spaces. Subspaces. Sum and direct sum of subspaces, Linear span. Linear dependence, independence and their basic properties. Basis. Finite dimensional vector spaces. Existence theorem for bases. Invariance of the number of elements of a basis set. Dimension. Existence of complementary subspace of a subspace of a finite dimensional vector space. Dimension of sums of subspaces. Quotient space and its dimension. | 15 |



 (Dr. P. K. Sahu)



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| IV | Linear Transformation: Linear transformations and their representation as matrices. The Algebra of linear transformations. The rank nullity theorem. Change of basis. Dual space. Bi-dual space and natural isomorphism. Adjoint of a linear transformation. | 15 |
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Part C - Learning Resource

Text Books, Reference Books, Other Resources

Text Books Recommended-

1. Nathan Jacobson (2009). *Basic Algebra I* (2nd edition). Dover Publications.
2. Nathan Jacobson (2009). *Basic Algebra II* (2nd edition). Dover Publications.

Reference Books Recommended-

3. I. M. Gel'fand (1989). *Lectures on Linear Algebra*. Dover Publications.
4. Kenneth Hoffman & Ray Kunze (2015). *Linear Algebra* (2nd edition). Prentice-Hall.
5. Serge Lang (2005). *Introduction to Linear Algebra* (2nd edition). Springer India.
6. Gilbert Strang (2014). *Linear Algebra and its Applications* (2nd edition). Elsevier

E-resources: <https://onlinecourses.nptel.ac.in>
<https://cpqp.inflibnet.aci.in>
<https://swayam.gov.in>
<https://www.mooc.org>

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

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| Maximum Marks: | 100 Marks |
| Continuous Internal Assessment (CIA): | 30 Marks |
| End Semester Examination (ESE): | 70 Marks |

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| Continuous Internal Assessment (CIA) (Conducted by course teacher) | Test /Quiz – 20+20 Marks Assignment/Seminar- 10 Marks | Better marks out of two test/quiz + obtained marks in Assignment shall be considered against 30 marks |
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| End Semester Examination (ESE) | Two Section-A&B Section-A: Q1.Objective- 10x1=10 marks Q2. Short answer type question-5x4=20marks Section-B: Descriptive answer type question, 1 out of 2 from each unit- 10x4= 40 Marks |
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Name and signature of convener & members of CBOS-


 (Dr. S. Kashyap)


 (Dr. P. K. Sahu)


 Dr. Anil Kumar


 Dr. Arun


 Dr. Hil


 M. Hitesh


 Dr. Chiranjeev


 Dr. Anurag


 Dr. A