ST. ALOYSIUS COLLEGE(AUTONOMOUS), JABALPUR

Reaccredited 'A+ 'Grade by NAAC(CGPA:3.68/4.00)
College with Potential for Excellence by UGC
DST-FIST Supported & STAR College Scheme by DBT

Faculty of Science

Bachelor of Science (B.Sc.)
SUBJECT: MATHEMATICS
B.Sc. III Semester
Paper- Elective
Abstract Algebra and Linear Algebra

Course Outcomes

CO.No.	Course Outcomes	Cognitive Level
CO1	Recognize the algebraicstructures asa group, and classify them as abelian, cyclic and permutation groups, etc.	U
CO2	Link the fundamental concepts of groups and symmetrical figures.	Ap
CO3	Analyze the subgroups of cyclic groups.	U
CO4	Explain the significance of the notion of cosets, normal subgroups, and quotient groups.	E
CO5	The fundamental concept of rings, fields, subrings, integral domains and the corresponding morphisms	U
CO6	Analyze whether a finite set of vectors in a vector space is linearly independent. Explain the concepts of basis and dimension of a vector space.	U
CO7	Understand the linear transformations, rank and nullity, matrix of a linear transformation, algebra of transformations and change of basis.	U
CO8	Compute the characteristic polynomial, eigen values, eigen vectors,and eigen spaces, as well as the geometric and the algebraic multiplicities of an eigen value and apply the basic diagonalization result.	Ap

Credit and Marking Scheme

	Credits	Marks		Total Marks
		Internal	External	
Theory	4	40	60	100

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Total	4	100

Evaluation Scheme

	Marks	
	Internal	**External**
Theory	3 Internal Exams of 20 Marks (During the Semester) (Best 2 will be taken)	1 External Exams (At the End of Semester)

Content of the Course
Theory

No.of Lectures(in hours per week):4.5 Hrs.per week

Total No.of Lectures:60Hrs.   **Maximum Marks: 60**

Unit	Topics	No. of Lectures
I	1.1 Historical background: 1.1.1. A brief historical background of the Algebrain the context of India and Indian heritage and culture 1.1.2. A brief biography of Brahmagupta 1.2 Groups, Subgroups and their basic properties 1.3 Cyclic groups 1.4 Coset decomposition 1.5 Lagrange's and Fermat's theorem 1.6 Normal subgroups 1.7 Quotient groups	20
II	2.1 Homomorphism, Kernel of homomorphism and Isomorphism of groups 2.2 Fundamental theorem of homomorphism 2.3 Transformation and permutation groupSn(n<5) 2.4 Cayley's theorem 2.5 Group automorphism 2.6 Inner automorphism 2.7 Group of automorphisms	20
	3.1 Definition and basic properties of rings 3.2 Ring homomorphism 3.3 Sub ring 3.4 Ideals	20

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III	**3.5** Quotient ring **3.6** Polynomial ring **3.7** Integral domain **3.8** Field	

IV	**4.1** Definition and examples of Vector space
	4.2 Subspaces
	4.3 Sum and direct sum of subspaces
	4.4 Linear span, Linear dependence, linear independence and their basic properties
	4.5 Basis
	4.6 Finite dimensional vector space and dimension
	    4.6.1 Existence theorem
	    4.6.2 Extension theorem
	    4.6.3 Invariance of the number of elements
	  4.7 Dimension of sum of subspaces
	  4.8 Quotient space and its dimension
		10

References

Text Books:
1. I.N.Herstein:Topics in Algebra, Wiley Eastern Ltd. New Delhi.1977.
2. K. B. Datta: Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd. New Delhi. 2000.
3. Gerard G. Emch, R. Sridharan and M.D. Srinivas: Contributions to the History of Indian Mathematics, Hindustan Book Agency, Vol.3,2005.
4. मध्यप्रदेशहिंदीग्रंथअकादमीकीपुस्तके।

Reference Books:

1. Surjeet Singh and Qazi Zameeruddin: Modern Algebra,Vikas Publishing House Pvt Ltd; Eighth edition, 2006.
2. N. Jacobson: Basic Algebra. Vol. I and II,W. II Freeman,1980.
3. I.S. Luther and I.B.S. Passi: Algebra.Vol.I and II,Narosa Publishing House,1997.
4. Shanti Narayan: A text Book of Modern Abstract Algebra, S. Chand and Company. New Delhi, I967.
5. A.K.Vasishtha and A.R. Vasishtha: Modern Algebra, Krishna Publication; 68th edition,2015.
6. K.Hoffiman and R. Kunze: Linear Algebra. 2nd Edition, Prentice Hall Engle wood Cliffs, New Jersey,I971.
7. A.R. Vasishtha and J.N. Sharma: Linear Algebra, Krishna Prakashan Media (P)Ltd., 2019.
8. Bibhutibhusan Datta and Avadhesh Narayan Singh: History of Hindu Mathematics, Asia Publishing House, 1962.

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   Mathematics, Asia Publishing House, 1962.