



St. Mira's College for Girls, Pune  
(SY B.SC(CS) 2021-2024)

**Mathematics Paper-I**  
**Groups and Coding Theory**  
**[CORE COURSE]**

<b>Semester: III</b>	<b>Credits: 2</b>	<b>Subject Code: BS32103</b>	<b>Lectures: 36</b>
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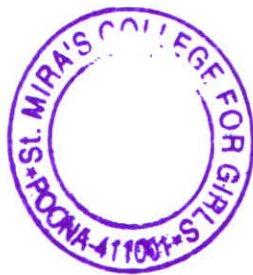
<b>Course Outcomes:</b>
<b>After completion of the course, the learner will be able to</b>
<ul style="list-style-type: none"> <li>• relate and describe the basic algebraic structure like Group and its type.</li> <li>• solve arithmetic problems in finite groups.</li> <li>• apply and analyze the linear block codes for error detection and correction.</li> <li>• describe and explain the basics of Cryptography and Network Security.</li> </ul>

<b>Unit 1: Groups</b>	<b>3</b>
<ul style="list-style-type: none"> <li>• Binary Operation Details Line 1</li> <li>• Group: Definition and Examples</li> <li>• Elementary Properties of Groups</li> </ul>	

<b>Unit 2: Finite Groups and Subgroups</b>	<b>10</b>
<ul style="list-style-type: none"> <li>• Order of a group, order of an element</li> <li>• Examples <math>(\mathbb{Z}_n, +)</math> and <math>(U(n), *)</math></li> <li>• Subgroup definition, Finite subgroup test, subgroups of <math>\mathbb{Z}_n</math></li> <li>• Generator, cyclic group, finding generators of <math>\mathbb{Z}_n</math> (Corollary 3,4 without proof)</li> <li>• Permutation group, definition, composition of two permutations,</li> <li>• Representation, Caley's theorem with proof</li> <li>• Permutation as product of disjoint cycles, inverse and order of a permutation, even/ odd permutation</li> <li>• Cosets: Definition, Examples and Properties, Lagrange Theorem with Proof.</li> </ul>	

<b>Unit 3: Groups and Coding Theory</b>	<b>10</b>
<ul style="list-style-type: none"> <li>• Coding of Binary Information and Error detection</li> <li>• Decoding and Error Correction</li> </ul>	

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<b>Unit 4: Cryptography</b>	<b>13</b>
<ul style="list-style-type: none"><li>• Symmetric Cryptography<ul style="list-style-type: none"><li>○ Ceaser cipher</li><li>○ Transposition cipher</li></ul></li><li>• Asymmetric<ul style="list-style-type: none"><li>○ RSA Encryption and Decryption</li></ul></li></ul>	

No of Lectures=36 + 12(Contact Hours)=48(Total)

<b>Recommended Text Books:</b>
<ul style="list-style-type: none"><li>• Bernard Kolman, Robert C. Busby and Sharon Ross, <i>Discrete Mathematical Structure</i>, Pearson Education Publication (6th Edition)<ul style="list-style-type: none"><li>○ Unit 3: Chapter 11</li></ul></li><li>• J. A, Gallian , <i>Contemporary Abstract Algebra</i> , Seventh Edition Unit 1:Chapter 0, Unit 2: Chapter 2, Unit 3: Chapter 3 ,4, 5 and 7</li><li>• Koblitz, Neal, <i>A Course in Number Theory and Cryptography</i>, Second Edition.</li></ul>

<b>Reference Books:</b>
<ul style="list-style-type: none"><li>• I.N.Herstein , <i>Abstract Algebra</i>, Wiley, Third Edition</li><li>• John B. Fraleigh. <i>A First Course in Abstract Algebra</i>.</li></ul>

<b>E-Resources:</b>
<ul style="list-style-type: none"><li>• <a href="https://nptel.ac.in/courses/111/106/111106113/">https://nptel.ac.in/courses/111/106/111106113/</a></li><li>• <a href="https://swayam.gov.in">https://swayam.gov.in</a></li><li>• <a href="https://cosmolearning.org/courses/abstract-algebra-groups-rings-fields/video-lectures/">https://cosmolearning.org/courses/abstract-algebra-groups-rings-fields/video-lectures/</a></li></ul>

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Board Of Studies	Name	Signature(In white cell)	
Chairman (HoD)	Gitanjali Phadnis	<i>G.M. Phadnis</i> 20/3/2021	
Faculty	Vrushali Paranjpe		<i>V. Paranjpe</i> 20/3/2021
Subject Expert (Outside SPPU)	Dr. Machchhindra Gophane	<i>M. Gophane</i> 20/3/2021	
Subject Expert (Outside SPPU)	Dr. Prashant Malavadkar		<i>P. Malavadkar</i> 20-03-2021
VC Nominee (SPPU)	Dr. Vinayak Joshi	<i>V. Joshi</i> 20/3/2021	
Industry Expert	Mr. Anup Manakeshwar		<i>A. Manakeshwar</i> 20-03-2021
Alumni	Ms. Jyoti Sharma	<i>Jyoti</i> 20/03/2021	

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