



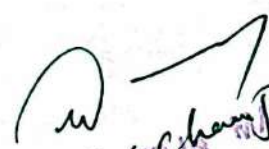
SRI VENKATESWARA UNIVERSITY - TIRUPATI
Syllabus for 4-Year UG Honors in B.Sc. (Mathematics) as Major
in consonance with Curriculum framework
w. e. f. AY 2025-26

COURSE STRUCTURE (for Semester I to VI)

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
I	I	1 ✓	Differential Equations	5	4
		2 ✓	Solid Geometry	5	4
	II	3 ✓	Group Theory	5	4
		4 ✓	Elementary Real Analysis	5	4
II	III	5	Ring Theory	5	4
		6	Advanced Real Analysis	5	4
		7	Theory of Matrices	5	4
	IV	8	Linear algebra	5	4
		9 ✓	Vector Calculus	5	4
		10	Linear Programming Problems	5	4
III	V	11 ✓	Special Functions	5	4
		12 A ✓	Laplace Transforms	5	4
		OR			
		12 B ✓	Foundations of Automata Theory	5	4
		13 A ✓	Numerical Methods	5	4
		OR			
		13 B ✓	Mathematical Methods using MATLAB	5	4

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
	VI	14 A ✓	Integral Transforms	5	4
		OR			
		14 B ✓	Statistical Analysis using R	5	4
		15 A	Advanced Numerical Methods	5	4
		OR			
		15 B	Mathematical Computations using Python	5	4

Note: In the III Year (during the V and VI Semesters), students are required to select a pair of electives from one of the **Two** specified domains. **For example: if set 'A' is chosen, courses 12 to 15 to be chosen as 12 A, 13 A, 14 A and 15 A.** To ensure in-depth understanding and skill development in the chosen domain, students must continue with the same domain electives in both the V and VI Semesters.


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Course Objectives

1. To introduce students to the foundational concepts of algebraic structures with a focus on groups.
2. To develop an understanding of subgroups, cosets, and their relevance in group theory.
3. To explore the properties and significance of normal subgroups and their role in constructing quotient groups.
4. To study and apply the concepts of group homomorphisms, isomorphisms, and the fundamental theorem of homomorphism.
5. To examine the structure and properties of permutation and cyclic groups, including their role in group classification.

Course Outcomes

After successful completion of this course, the student will be able to

1. Understand the definition and basic properties of groups, including finite and infinite groups, and construct composition tables.
2. Analyze subgroups and cosets, apply Lagrange's Theorem, and understand the structure of a group through its subgroups.
3. Identify and verify normal subgroups, and understand their role in forming quotient groups.
4. Understand and apply homomorphisms and isomorphisms, including the fundamental homomorphism theorem and its applications.
5. Work with permutations, transpositions, and cyclic groups, and understand their properties and significance in group theory, including Cayley's Theorem.

Course Content

Unit – 1

Binary Operation – Algebraic structure – Semi group - Monoid – Group definition and its elementary properties - Finite and Infinite groups – examples – order of a group - Composition tables with examples.

Unit – 2

Definition of Complex – Multiplication of two complexes- Inverse of a complex- Definition of Subgroup - examples-Criterion for a complex to be a subgroup- Criterion for the product of two subgroups to be a subgroup-Union and Intersection of subgroups – Definition of Cosets – Properties of Cosets – Index of a subgroup of a finite group – Lagrange's Theorem.

Unit – 3

Normal Subgroups - Definition of normal subgroup – Proper and improper normal subgroups
Hamilton group- Criterion for a subgroup to be a normal subgroup – Intersection of two normal subgroups - Sub group of index 2 is a normal sub group

Unit– 4

Quotient groups - Definition of homomorphism – Image of a homomorphism- Elementary properties of homomorphisms – Isomorphism – Automorphism- Definitions and elementary properties–Kernel of a homomorphism – Fundamental theorem of Homomorphism and applications.

Unit – 5

Definition of permutation –Multiplication of Permutations– Inverse of a permutation – Cyclic permutations – Transposition – Even and odd permutations – Cayley's theorem- Cyclic Groups - Definition of cyclic group – Elementary properties

Activities

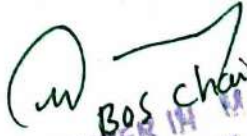
The activities include quizzes, assignments, seminars, and student presentations. Additional tasks involve mini projects, concept flowcharts, operator method charts, peer teaching, LMS-based quizzes, board work challenges, poster presentations, and visual aids like chalk talks to enhance learning and engagement.

Text Book

Modern Algebra by A.R.Vasishtha and A.K. Vasishtha, Krishna Prakashan Media Pvt. Ltd., Meerut.

Reference Books

1. Abstract Algebra by J.B. Fraleigh, Published by Narosa publishing house.
2. Modern Algebra by M.L. Khanna, Jai Prakash and Co. Printing Press, Meerut
3. Rings and Linear Algebra by Pundir & Pundir, published by Pragathi Prakashan


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S.V UNIVERSITY, MODEL PAPER
THREE YEAR B.A./B.Sc. DEGREE EXAMINATIONS
II SEMESTER

Subject: MATHEMATICS

Time:3 Hours

Paper: GROUP THEORY

Max Marks:75

SECTION-A

I. Answer any "Five" of the following questions **5X3=15M**

1. Prove that in a group G , inverse of every element is unique.
2. Show that the fourth roots of unity form an abelian group w.r.to Multiplication.
3. Prove that Intersection of two subgroups of a group is also a subgroup
4. If H is any subgroup of G , then $H.H=H$.
5. Prove that Every subgroup of an abelian group is normal.
6. If N, M are normal subgroup of G , then NM is also normal subgroup of G .
7. If $f: G \rightarrow G^1$ is a homomorphism onto and $K=\text{Ker}f$ then f is a Isomorphism
Iff $K=\{e\}$.
8. Show that the group $(G= \{1,2,3,4,5,6\}, X_7)$ is cyclic, also write down all its Generators.
9. Find the regular permutation group isomorphic to the multiplicative group $\{1, -1, i, -i\}$.
10. Prove that Every cyclic group is an abelian group.

SECTION-B

II. Answer any "Five" of the following questions **5X12=60M**

- 11 a) Show that a semigroup $(G,.)$ is a group if and only if the equations $ax=b, ya=b$ have unique solution in G .

(OR)

b) Show that a finite semigroup satisfying the cancellation law is a group.

12 a) If H, K are two subgroups of group G then HK is a subgroup of G if and only if $HK=KH$.

(OR)

b) State and prove Lagrange's Theorem.

13 a) If M, N are 2 Normal Sub Groups of G such that $M \cap N = \{e\}$. Then every element of M commutes with every element of N .

(OR)

b) A subgroup H of a group G is a normal subgroup of G iff each left coset of H in G is a right coset of H in G .

14 a) If f is a homomorphism of a group G into a group G' , then the kernel of f is a normal subgroup of G .

(OR)

b) State and prove Fundamental Theorem of homomorphism.

15 a) State and prove Cayley's Theorem.

(OR)

b) Prove that Every subgroup of cyclic group is cyclic.


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