

Workshop on “Group Theory and Related Areas”

(November 14, 2022 - November 16, 2022)

Titles and Abstracts



DEPARTMENT OF APPLIED SCIENCES
INDIAN INSTITUTE OF INFORMATION TECHNOLOGY ALLAHABAD
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Schur - Weyl duality in Representation Theory
Prof. Ramji Lal, IIIT Allahabad

Abstract: In this talk, we introduce basic language of representation theory. Then we shall try to describe Schur-Weyl duality relating the representation of the symmetric group S_n and that of the general linear group $GL(n, C)$.

Galois's Last Theorem
Prof. C. S. Dalawat, HRI Allahabad

Abstract: We will first review how Galois determined which polynomials are solvable by radicals in terms of a certain group of permutations of the roots of that polynomial. We will then recall his characterisation of polynomials of prime degree which are solvable by radicals. Finally, we will mention how he generalised this result to primitive polynomials in his Second Memoir.

Skew braces and solutions of the Yang Baxter Equation
Prof. Manoj Kumar Yadav, HRI Allahabad

Abstract: Set theoretic solutions of Yang Baxter Equations have connections with many algebraic structures; among those one is the concept of skew braces. I have plans to give a pedagogical talk on the topic with pointers to future research directions.

Initiation into Coding Theory
Prof. Ashish Kumar Upadhyay, BHU Varanasi

Abstract: Starting with basics of coding theory we present an overview of connection between topology and coding theory via describing Homological Quantum Codes. We then proceed to present some work done in this area. This is a joint work with Dipendu Maity and Debashis Bhowmick.

Group based cryptographic protocols
Prof. Shiv Datt Kumar, MNNIT Allahabad

Abstract: In this talk, we will discuss different cryptosystems and amalgamated free product of Braid group and Thomson group as a platform group.

The group of inner product preserving operators
Dr. Ritumoni Sarma, IIT Delhi

Abstract: We shall discuss the group of inner product preserving operators of R^3 and C^3 and how they are related.

On the Whitehead Group K_1
Dr. Rabeya Basu, IISER Pune

Abstract: TBA

Sudoku and Groups
Dr. Vipul Kakkar, Central University of Rajasthan

Abstract: Sudoku is a popular puzzle which appears in newspapers and magazines. In this talk, we will show a relation between Sudoku and a finite group.

Orthomorphism Graphs of Groups
Dr. Vivek Jain, Central University of Bihar

Abstract: Let G be a group. A bijection $\theta : G \rightarrow G$ is called an orthomorphism of G if the map $\theta : x \mapsto x^{-1}\theta(x)$ is also a bijection on G . Orthomorphism which fixes the identity element of the group is called normalized orthomorphism. Two orthomorphism θ_1 and θ_2 are called orthogonal if $\theta_1\theta_2^{-1}$ is also an orthomorphism of G . A graph in which vertices are normalized orthomorphisms of G and adjacency being synonymous with orthogonality is called orthomorphism graph of G denoted as $Orth(G)$. In this talk, we will discuss the results and problems related to the orthomorphism graph of finite groups.

Classification of Non F-Pure Rings in Characteristic two
Dr. Jyoti Singh, VNIT Nagpur

Abstract: In this talk, we provide the classification, up to isomorphism, of the set of all finitely generated graded algebras of fixed characteristic p that are non F-pure. In particular, we discuss when cubic surfaces are Frobenius split or equivalently, when their homogeneous coordinate rings are F-pure. We show that the vast majority of cubic surfaces in characteristic two are Frobenius split.

Projective dimension of module over Laurent polynomial ring
Dr. Ratnesh Mishra, NIT Jamshedpur

Abstract: In this talk we discuss an algorithm to compute the projective dimension of a module.

Properties of linear type of an ideal
Dr. Priti Singh, Patna Science College

Abstract: We introduce the syzygies, Rees algebra and presentation of an ideal in a Noetherian ring. We also define linear type of an ideal. In particular if an ideal is linear, then an ideal is itself a reduction.

Projective modules and Unimodular rows
Dr. Sumit Kumar Upadhyay, IIIT Allahabad

Abstract: In this talk, we will discuss the fundamentals of a projective module and a unimodular row over a commutative ring with identity.

Properties of algebraic fundamental group
Dr. Sumit Kumar Upadhyay, IIIT Allahabad

Abstract: In this talk, we will explore the properties of the algebraic fundamental group of a commutative ring with identity.

Group actions and the Farey graph
Dr. Seema Kushwaha, IIIT Allahabad

Abstract: A group action of a group on a set is a representation of elements of the group as permutations on the set. The modular group $PSL(2, Z)$ acts naturally on the complex upper-half plane. We are interested in the action of $PSL(2, Z)$ on the extended set of rational numbers. This action turns out to be a transitive action. We will relate this action with the Farey graph. We will also discuss the relation of continued fractions and the Farey graph.

Properties of a multiplicative Lie algebra
Dr. Mani Shankar Pandey, IMSc Chennai

Abstract: In this talk, we give a precise characterization of the group homomorphisms $G \wedge G \rightarrow G$ which determine a multiplicative Lie product on the group G . For certain finite groups, we also determine the number of possible images (up to isomorphism) of such structure-defining maps.

Extension theory of gyrogroups
Mr. Akshay Kumar, IIIT Allahabad

Abstract: In this talk, we will discuss extension theory and semi cross product of gyrogroups.