Open House

January 24 and January 25, 2015

Program

Department of Mathematics and Statistics
Indian Institute of Technology Kanpur

January 24, 2015

Inauguration: *9:00 am - 9:15 am*

Session 1: *9:15 am - 11:00 am*

Chair: **Dr. Shobha Madan**

Speakers: **Dr. M. G. Nadkarni: 9:15 am - 10:00 am**
Did Cantor sow the seed of Measure and Integral?
Dr. T. Muthukumar: 10:00 am - 10:30 am
Capacity of an Euclidean set
Dr. Abhijit Pal: 10:30 am - 11:00 am
Mapping Class Group is finitely generated

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TEA: *11:00 am - 11:30 am*

Session 2: *11:30 am - 1:00 pm*

Chair: **Dr. Mohua Banerjee**

Speakers: **Dr. Debasis Sen: 11:30 am - 12:00 noon**
Realizing Homotopy Group Actions
Mr. Arun Kumar: 12:00 noon - 12:30 pm
The algebraic aspects of rough set theory
Mr. Aneesh M.: 12:30 pm - 1:00 pm
Frequent Hypercyclicity in Banach Algebras of Operators

Lunch: *1:00 pm - 2:30 pm*

Session 3: *2:30 pm - 4:00 pm*

Chair: **Dr. Akash Anand**

Speakers: **Dr. B.V. Ratish Kumar: 2:30 pm - 3:00 pm**
HiPC in CVMS
Mr. Ambuj Pandey: 3:00 pm - 3:30 pm
An overview of Acoustic Scattering by Penetrable Inhomogeneous Media
Mr. Jagabandhu Paul: 3:30 pm - 4:00 pm
Integral Equation Representations for an Electromagnetic Wave Scattering Problem

Tea:	*4:00 pm - 4:30 pm*
Session 4:	*4:30 pm - 6:00 pm*
Chair:	**Dr. Debasis Kundu**
Speakers:	**Dr. Malay Banerjee: 4:30 pm - 5:00 pm** *Spatio-temporal pattern formation in ecology: current trend* **Ms. Divya Khurana: 5:00 pm - 5:30 pm** *Sidon sets in Cantor group and thin copies of Hilbert space* **Mr. Lok Pati Tripathi: 5:30 pm - 6:00 pm** *Some numerical methods for solving PDEs arising in finance*

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January 25, 2015

Session 5:	*9:00 am - 10:30 am*
Chair:	**Dr. Sudipta Dutta**
Speakers:	**Dr. Sanjoy Pusti: 9:00 am - 9:30 am** *Around Roe's theorem* **Mr. Peeyush Singh: 9:30 am - 10:00 am** *Elastohydroynamic lubrication study using discontinuous finite volume method* **Ms. Rani Kumari: 10:00 am - 10:30 am** *Aversons theorem for graded submodules of $H(k_\nu)(\nu > 1)$*
Tea:	*10:30 am - 11:00 am*
Session 6:	*11:00 am - 12:30 pm*
Chair:	**Dr. Sameer Chavan**
Speakers:	**Dr. S.S. Dhar: 11:00 am - 11:30 am** *Robust Statistics: An Overview and Some Questions* **Mr. Gopal Priyadarshi: 11:30 am - 12:00 noon** *On the existence and approximate solution of Fredholm integral equation of the first kind by band limited scaling function* **Mr. Arnab Kolay: 12:00 noon - 12:30 pm** *Analysis of Type-II Hybrid Censored Competing Risks Data*

Abstract

TITLE: Did Cantor sow the seed of Measure and Integral?

SPEAKER: M.G. Nadkarni, Visiting Professor, IIT Kanpur

ABSTRACT:

I will discuss Cantor's ideas on Measure and Integral, and show how his work set the stage for the work of Borel and Lebesgue who followed him.

TITLE: Capacity of an Euclidean set

SPEAKER: T. Muthukumar, IIT Kanpur

ABSTRACT:

The notion of capacity originated in potential theory. It appeared as a physical concept to describe the electrostatic capacity of an electrical condenser. From the mathematics point of view , the notion of capacity was first effectively used in the Wieners criterion. This criterion gives the necessary and sufficient condition for the regularity of boundary point which is directly related, by Perrons method, to the existence of a harmonic function with inhomogeneous Dirichlet boundary condition. The capacity, as a measure, turns out to be a better alternative for Lebesgue measure while studying the point-wise behaviour of Sobolev functions. For instance, the capacity measure is an ideal replacement for Lebesgue measure in Luzins and Egorovs result for Sobolev functions leading to the theory of quasi-topology.

TITLE: Mapping Class Group is finitely generated

SPEAKER: Abhijit Pal

ABSTRACT: For a surface S, the mapping class group MCG(S) of S is isotopy classes of self homeomorphisms of S. In this lecture, we prove that the mapping class group of an orientable surface is finitely generated. This theorem is primarily due to Max Dehn.

TITLE: Realizing Homotopy Group Actions.

SPEAKER: Debasis Sen

ABSTRACT:

A homotopy action of a group G on a topological space X is a group homomorphism from G to the group of homotopy classes of self-homotopy equivalences of X. George Cooke described an obstruction theory for realizing a homotopy action of a finite group G on a space X by strict action. However, the resulting G-space is only determined up to a homotopy equivalence which is a G-map (Borel equivalence), and in this sense every G-space is equivalent to a free one. So the more delicate aspects of equivariant topology are not visible in this way.

A more informative approach to equivariant homotopy theory, due to Bredon, studies G-spaces X up to G-homotopy equivalence, that is, G-maps having G-homotopy inverses. The purpose of this talk is to define a notion of homotopy action of a finite group in Bredon equivariant homotopy theory, and describe an associated inductive procedure for realizing such an action by a strict one. (This is a joint work with Prof. David Blanc)

TITLE: The algebraic aspects of rough set theory

SPEAKER: Arun Kumar

ABSTRACT:

Collection of rough sets provides various examples of algebras. Some algebras emerged after the existence of rough set theory. In this talk, we discuss some algebras and their representation in the language of rough set theory. Outline of the talk is:

1. Some notions from Universal algebra.

2. Algebras of classical rough set theory.

3. Algebras of generalized rough set theory.

TITLE: Frequent Hypercyclicity in Banach Algebras of Operators

SPEAKER: Aneesh M.

ABSTRACT:

After a brief introduction to linear dynamics, we look at some sufficient criteria for the linear map $C_{A:B}(V) = AVB$ to be frequently hyper cyclic on certain Banach algebras of operators. Our special attention is on multiplication operators on the Hardy space and shift operators on l^p spaces.

TITLE: HPC in CVMS

SPEAKER: B.V. Ratish Kumar

Abstract: An overview of the theory, computation and applications related to Cardio-Vascular Modeling and Simulations (CVMS) will be briefly discussed. In particular the significance and role of High Performance Computing will be highlighted in dealing with patient specific data.

TITLE: An Overview of Acoustic Scattering By Penetrable Inhomogeneous Media

SPEAKER: Ambuj Pandey

ABSTRACT:

In this talk, we will discuss acoustic scattering by inhomogeneous penetrable media in two and three dimensions. We will present the PDE formulation of this problem and give a brief sketch of the derivation of an equivalent formulation in terms of Lippmann- Schwinger integral equation. We will further highlight the importance of integral equation formulations in the numerical solution of scattering problems. Finally, we will present highlights of an efficient high order solver for computation of approximate solutions and show some relevant numerical experiments.

TITLE:Integral Equation Representations for an Electromagnetic Wave Scattering Problem

SPEAKER: Jagabandhu Paul

ABSTRACT:

We begin the talk with the mathematical formulation of a general PDE model for scattering of electromagnetic waves by isotropic inhomogeneous media. We then review some integral equation based approaches for solution of this problem and highlight underlying mathematical and computational difficulties in their numerical treatment. We finally present a detailed derivation of an alternate equivalent integral equation formulation that compares favourably, from a computational perspective, and conclude the talk by listing main algorithmic components of a numerical method based on this formulation for obtaining accurate approximations to the scattering problem.

TITLE: Spatio-temporal pattern formation in ecology: current trend

SPEAKER: Malay Banerjee

ABSTRACT:

Reaction-diffusion models of interacting populations with the specific choice of boundary conditions are capable to produce a wide variety of spatial patterns representing the distribution of population over their habitats and some of the resulting distributions are not comparable with the dynamics produced by the temporal counterpart. Depending upon the spatial and temporal time scales, we can find a wide variety of self organizing spatial patterns produced by the spatio-temporal models of interacting populations. Main objective of this talk is to discuss the influence of temporal and spatio-temporal bifurcations on the resulting patterns and to understand the complete variety of self-organized spatial patterns can be generated by the spatio-temporal models of two interacting populations and how local and global bifurcations observed for the temporal model can influence the spatio-temporal dynamics.

TITLE: Sidon sets in Cantor group and thin copies of Hilbert space.

SPEAKER: Divya Khurana

ABSTRACT:

We will discuss a method to construct Sidon sets in Cantor group G. Using this method we will explain that $L_p(G)$, $1 \leq p < \infty$, contains thin copies of Hilbert space.

TITLE: Some numerical methods for solving PDE's arising in finance

SPEAKER: Lok Pati Tripathi

ABSTRACT:

This talk deals with some numerical methods for solving partial differential equations arising in option pricing theory. Under the minimal regularity assumption, the stability and convergence of the proposed methods will also be discussed.

TITLE: Around Roe's theorem

SPEAKER: Sanjoy Pusti

ABSTRACT:

J. Roe characterizes sine function in terms of size of their derivaties and antiderivatives. More precisely, let $\{f_n\}_{n=-\infty}^{\infty}$ be a two way infinite sequence of real valued functions on $\mathcal{R}$ such that $|f_n(x)| \leq M$ for all $x \in \mathbf{R}$, $n \in \mathbf{Z}$ and $f_{n+1}(x) = \frac{d}{dx} f_n(x)$. Then $f_0(x) = a \sin(x+\phi)$ for some real constants a and ϕ.

In this talk, we shall discuss about the variations of this theorem.

TITLE: Elastohydrodynamic Lubrication study using Discontinuous Finite volume method

SPEAKER: Peeyush Singh

ABSTRACT:

We develop and analyse a new discontinuous finite volume method (DVM) for 2-D point contact Elastohydrodynamic Lubrication (EHL) problem. A complete algorithm have been presented in this article for solving EHL problem.Method is robust and easily paralleled in MPI architecture. GMRES technique is implemented to solve the matrix obtained after the formulation. A new approach followed in which discontinuous piecewise polynomials are used for the trail functions. It is natural to assume that the advantages of using discontinuous functions in finite element methods should apply to finite volume methods.The nature of the discontinuity of the trail function is such that the elements in the corresponding dual partition have the smallest support, as compared with the cases when conforming (Classical finite volume methods).Film thickness calculation is done using singular quadrature approach.Few results have been presented and discussed in brief. Method is well suited for solving EHL point contact problem and can be used as commercial software.

TITLE: Arveson's Theorem For Graded Submodules of $H(k_\nu)(\nu > 1)$

SPEAKER: Rani Kumari

ABSTRACT:

This talk is mainly motivated by Arveson's work on graded sub modules of finite rank of Drury-Arveson space. A basic result of Arveson in this context says that any graded sub modules of the Drury-Arveson space of finite rank is of finite co dimension. All known proofs of this result relies on the fact that the Drury-Arveson kernel is a complete NP kernel. In this talk, we provide an alternative approach to Arveson's Theorem. Interestingly, our approach yields Arveson-type results for a family of reproducing kernels which includes in particular the Drury-Arveson kernel.

TITLE: Robust Statistics: An Overview and Some Questions.

SPEAKER: Subhra Shankar Dhar

ABSTRACT:

In this talk, I shall discuss the measures of robustness, namely, the breakdown point and the influence function. I shall also discuss some relevant problems regarding the breakdown point and the influence function.

TITLE:On the existence and approximate solution of Fredholm integral equation of the first kind by band-limited scaling function

SPEAKER: Gopal Priyadarshi

ABSTRACT:

Integral equations appear in various fields of science and engineering. These equations mainly arise from the study of potential theory and mathematical physics. In this paper we consider Fredholm integral equation of the first kind with convolution type kernel. We prove the existence and uniqueness of the approximate solution by band-limited scaling function generated by a class of band-limited wavelets.

TITLE: Analysis of Type-II Hybrid censoring under competing risk

SPEAKER: Arnab Koley

ABSTRACT:

In this presentation we consider the estimation of the unknown parameters of competing risk model for Type-II Hybrid censored data. It is assumed that the latent lifetime distributions of the competing causes follow independent exponential distributions with different scale parameters. We obtain maximum likelihood estimators of the unknown parameters and find the exact distributions of the estimators. Exact, asymptotic and bootstrap confi-

dence intervals of the parameters are obtained. We further consider the Bayesian inference of unknown parameters under a very flexible Beta-Gamma prior on the unknown parameters. Bayes estimators and associated credible intervals of the parameters are obtained using Markov Chain Monte Carlo method. Monte Carlo simulations are performed to see the effectiveness of the proposed estimators, and one real data set is used for the illustration purpose.