Research Scholars' Day

Department of Mathematics

Indian Institute of Technology Bhilai

12TH FEBRUARY 2023

"Mathematics rightly viewed possesses not only truth but supreme beauty."

-- Bertrand Russell

Program Schedule

10:00-10:05 : Inauguration
10:05-10:10 : Welcome Address by the HoD, Mathematics
10:10-10:20 : Opening Remarks by Prof. V. D. Sharma
10:20-10:30 : Inaugural Address by the Director, IIT Bhilai
10:30-10:45 : Tea Break
10:45-11:30 : Keynote Address by Prof. V. D. Sharma, IIT Gandhinagar
11:30-12:15 : Talk by Prof. P. D. Srivastava, IIT Bhilai
12:15-12:40 : R/S Talk 1 (Mr. Pallab Maiti)

Lunch Break

14:00-14:25 : R/S Talk 2 (Mr. Shubhankar Mandal)
14:25-14:50 : R/S Talk 3 (Ms. Shivani Valecha)
14:50-15:15 : R/S Talk 4 (Mr. Vinayak Mani Tripathi)
15:15-15:40 : R/S Talk 5 (Ms. Jyoti Rani)
15:40-16:05 : R/S Talk 6 (Mr. Surender Kumar)
16:05-16:15 : Vote of Thanks
16:15 : High Tea

Organized
by
Department of Mathematics

Venue
B-204, Indian Institute of Technology Bhilai, GEC Campus, Sejbahar, Raipur – 492015 (Chhattisgarh)

RESEARCH SCHOLAR'S DAY
DEPARTMENT OF MATHEMATICS
INDIAN INSTITUTE OF TECHNOLOGY BHILAI
LIST OF ABSTRACTS

Keynote Address

Prof. V. D. Sharma (IIT Gandhinagar)

Abstract: In my lecture, I intend to briefly discuss 1st order ODEs; and then 1st order PDEs (linear and quasilinear) together with the breakdown of continuous solutions. Also I will see whether there is time for Cauchy and Riemann problems to be discussed.

* * *

Proper Bases in a complete linear metric space with application- an Unified approach

Prof. P. D. Srivastava (IIT Bhilai)

Abstract: The purpose of the present talk is to provide a unified approach to the study of the proper basis in a complete linear metric space (X, d) which includes as a particular case, the corresponding results of Alexiwicz & Arsove, Krishnamurthy, Iyer and others.

* * *

Common fixed points for set-valued generalized contractions on a metric space with graphical structure

Pallab Maiti (IIT Bhilai)
(Joint work with Dr. Asrifa Sultana (IIT Bhilai))

Abstract: We derive the existence of common fixed points and coincidence points for set-valued generalized f-contraction on a metric space equipped with graph. This result enables us to scrutinize the fixed points for set-valued generalized contractions on a metric space having directed graph. The main theorem generalizes and improves several results in the existing literature. An invariant best approximation result on a normed linear space is derived from our main result. As an application of our main result, we deduce the sufficient criteria for the occurrence of solution for the Caputo

fractional differential equation.

* * *

Nevanlinna Pick (NP) interpolation problem for $\Gamma_{E(3;3;1,1,1)}$

Shubhankar Mandal (IIT Bhilai)
(Joint work with Dr. Avijit Pal (IIT Bhilai) and Dr. Dinesh Kumar Keshari (NISER Bhubaneswar))

Abstract: We characterize a domain $\Gamma_{E(3;3;1,1,1)}$ in $\mathbb{C}^7$ that arises in connection with the μ-synthesis problem in H^∞ control theory. Moreover, we will observe that the Realization formula plays a crucial role in characterization. By using different characterization results, we proved the Nevanlinna Pick (NP) interpolation problem for $\Gamma_{E(3;3;1,1,1)}$.

* * *

A class of quasi-variational inequalities with unbounded constraint maps: Existence results and applications

Shivani Valecha (IIT Bhilai)
(Joint work with Dr. Asrifa Sultana (IIT Bhilai))

Abstract: The quasi-variational inequalities play a significant role in analyzing a wide range of real-world problems. However, these problems are more complicated to solve than variational inequalities as the constraint set is based on the current point. We study a class of quasi-variational inequality problems whose specific structure is beneficial in finding some of its solutions by solving a corresponding variational inequality problem. Based on the classical existence theorem for variational inequalities, our main results ensure the occurrence of solutions for the aforementioned class of quasi-variational inequalities in which the associated constraint maps are (possibly) unbounded. We employ a coercivity condition which plays a crucial role in obtaining these results. Finally, we apply our existence results to ensure the occurrence of equilibrium for the pure exchange economic problems and the convex generalized Nash games.

* * *

A study of extremal parameter for fractional singular Choquard problem

Vinayak Mani Tripathi (IIT Bhilai)
(Joint work with Dr. Pawan Kumar Mishra, (IIT Bhilai))

Abstract: In this work, we study the singular problem involving fractional Laplacian operator perturbed with a Choquard nonlinearity using the idea of constrained minimization based on Nehari manifold. Precisely, for some $\epsilon > 0$, we have proved the existence of two solutions when the the parameter $\lambda \in (0, \lambda^* + \epsilon)$ adding to the existing works dealing with multiplicity of solutions when the parameter λ strictly lies below λ^*. We have given a variational characterization of the parametric value λ^* which is an extremal value of the parameter λ involved in the problem upto which the Nehari manifold method can be applied successfully. The paper highlights a fine analysis via fibering maps even for $\lambda > \lambda^*$ to establish existence of two different positive solutions for the underlying problem.

* * *

Spectral properties of Jacobi-like band matrices on the sequence space ℓ_p

Jyoti Rani (IIT Bhilai)
(Joint work with Dr. Arnab Patra (IIT Bhilai))

Abstract: In this paper, the spectral properties of a class of Jacobi-like operators defined over the sequence space $\ell_p, (1 < p < \infty)$ which has a representation of infinite band matrix where the entries of each non-zero band form a sequence with two limit points, are investigated. The idea of compact perturbation is used to study the spectrum. Several spectral subdivisions are obtained. In addition, a few sufficient conditions on the absence of point spectrum over the essential spectrum are also discussed.

* * *

Common index divisor of the number fields defined by $x^5 + ax + b$

Surender Kumar (IIT Bhilai)
(Joint work with Dr. Anuj Jakhar (IIT Madras) and Sumandeep Kaur (Punjab University Chandigarh))

Abstract: Let $K = \mathbb{Q}(\theta)$ be an algebraic number field with θ a root of an irreducible polynomial $x^5 + ax + b \in \mathbb{Z}[x]$. In this lecture, for every rational prime p, we provide necessary and sufficient conditions on $a,\ b$ so that p is a common index divisor of K. In particular, we give sufficient conditions on $a,\ b$ for which K is non-monogenic. We illustrate our results through examples.