INFINITY INSIGHT

Quarterly Newsletter

Department of Mathematics & Statistics
School of Physical and Bio Sciences
Faculty of Science, Technology and Architecture

INSIDE THIS ISSUE....

Editorial Note

"MATHEMATICS COMPARES THE MOST DIVERSE PHENOMENA AND DISCOVERS THE SECRET ANALOGIES THAT UNITE THEM"

Dear Readers,

We are pleased to present the fourth edition of **Infinity Insight,** quarterly newsletter of the Department of Mathematics & Statistics, which highlights the achievements and activities from **October to December 2024.** This edition recognizes the exceptional achievements of our members, particularly their incredible research, impactful contributions to community service and their commitment to personal & professional development.

As we conclude the year, this final edition offers an opportunity to reflect on the significant milestones and accomplishments attained throughout the year 2024. These successes are a direct result of the dedication, passion, and tireless efforts of our entire department.

We extend our sincere gratitude to our leadership, faculty members, students, and alumni for their continued contributions to the growth and success of the department.

Hope this edition will provide valuable insights and keep you engaged.

Looking forward to another incredible year together in 2025!

Best Regards,
Dr. Reema Jain

Link for Previous Editions:
Infinity Insight_1.0 : https://flipbookpdf.net/web/site/d1fabb836f9aebc3f930a3afa58b8b1ccadb6120202403.pdf.html
Infinity Insight_1.1 : https://www.flipbookpdf.net/web/site/0f818b331ddb9cc3b5872d810a1873afc9be3456202407.pdf.html
Infinity Insight_1.2 : https://www.flipbookpdf.net/web/site/18001b7e91a276f2954c6440442add71ab8db845202410.pdf.html

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Dr Reema Jain

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Student Editors

Mr. Surya Prakash	Mr. Atreya Ghoshal
(VI Sem. B.Sc. (Hons.) Mathematics)	(IV Sem. B.Sc. (Hons.) Mathematics)

Vision & Mission

VISION

To be a global hub for academic excellence, innovation, and human development in mathematics

MISSION

- Develop competent professionals in mathematics and statistics.

- Foster interdisciplinary collaboration for holistic problem-solving.

- Instill good human values for ethical and responsible research.

- Contribute to societal well-being through data-driven solutions.

- Cultivate leaders with a strong sense of social responsibility.

GUEST LECTURE

Department of Mathematics & Statistics has organized a guest lecture on November 25, 2024. Prof. Gopal Chandra Shit from Jadavpur University, Kolkata (India) was invited, and he delivered an enlightening session on "Enhancing targeted drug delivery with magnetic nano particles and MPI-guided hyperthermia." He shared the information about magnetic nano particles and the properties of particles in biomedical applications.

Convener : Dr Reema Jain

NATIONAL MATHEMATICS DAY CELEBRATION

Convener : Dr Giriraj Methi

December 22, is celebrated every year as National Mathematics Day to mark the birth anniversary of legendary Indian mathematician, Srinivasa Ramanujan. The celebrations aim at spreading awareness about the importance of mathematics and the contributions made by Srinivasa Ramanujan, in the field of mathematics. Department of Mathematics & Statistics organized a lecture series with esteemed mathematicians Prof. A. K. Nandakumaran, Chairman, Department of Mathematics, Indian Institute of Science, Bengaluru and Prof. Milan Tvrdý, Mathematical Institute, Czech Academy of Sciences, Czech Republic.

Effective community engagement is essential for fostering strong relationships, building trust, and ensuring long-term success in any organization. Department of Mathematics & Statistics is committed to molding the students to be sensitive to emerging social and environmental issues and respond to them accordingly. One of the main mandates of the department is to respond to the concerns of the community and work in a collaborative approach to set the precedence as academics is closely linked to the social needs of people in the neighbourhood.

The following outreach initiatives have been taken by the department:

- **Donation Drive Donate Today, Brighten Tomorrow**

- **Mathematics Teaching- Learning Camp by Tractrix Club Matri Chaya Bal Grah Orphanage, Vaishali Nagar, Jaipur.**

ACTIVITY UNDER MoU
JOINT RESEARCH SUPERVISION

S. No.	Name of Research Scholar	Name of Supervisor	Title of Thesis	Date of Submission
1	Feda Zahor (NM-AIST)	Dr Verdiana Grace Masanja Dr Reema Jain Dr Ahmada Omar Ali	Modeling and Analysis of Moving Particle Effects on Blood Flow in a Stenosed Artery with Presence of Thermal Radiation	December 30, 2024

FACULTY PUBLICATIONS

S. No.	Name of Faculty	Title of Publication	Journal	Month of Publication
		Q1 Journal Publications		
1	Dr Reema Jain	Entropy Generation Analysis of Unsteady MHD Nanofluid Flow in a Porous Pipe	International Journal of Thermofluids	October, 2024
2	Dr Giriraj Methi	Application of Generalized Haar Wavelet Technique on Simultaneous Delay Differential Equations	Journal of Computational and Applied Mathematics	October, 2024
3	Dr Giriraj Methi	Application of Fractional Differential Transform Method and Bell Polynomial for Solving System of Fractional Delay Differential Equations	Partial Differential Equations in Applied Mathematics	October, 2024
4	Dr Alok Bhargava	A New Solution Approach to Proportion Delayed and Heat Like Fractional Partial Differential Equations	Partial Differential Equations in Applied Mathematics	October, 2024
5	Dr Anamika Jain	Efficiency of Retrial Queueing System under N-Threshold During Vacation	International Journal of Information Technology	October, 2024
6	Dr Parvin Kumari	An Effective Numerical Approach for Solving a System of Singularly Perturbed Differential Difference Equations in Biology and Physiology	Mathematics and Computers in Simulation	October, 2024
7	Dr Kalpna Sharma	Effect of Cattaneo Christov Heat Flux Mode and Elastic Deformation on Walters'B Viscoelastic Fluid Flow with Porosity	International Journal of Thermofluids	November, 2024
8	Dr Kalpna Sharma	Optimal Homotopy Analysis of Unsteady Second-Grade Tri-Hybrid Nanofluid Flow with Radiative Impact Between Parallel Disks	International Journal of Thermofluids	November, 2024
9	Dr Kalpna Sharma	Rotating Micropolar Hybrid Nanofluid: Exothermic/Endothermic Effects and Waste Discharge on Exponential Sheet	Mathematical Methods in the Applied Sciences	November 2024

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10	Dr Loganathan Karuppusamy	Computational Heat Transfer Analysis of Ternary Hybrid Nanofluid Flow over a Rotating Disk using Cattaneo - Christov Model: Application of the Lobatto-III Formula	International Journal of Thermofluids	November, 2024
11	Dr Loganathan Karuppusamy	Numerical Simulation of Rotating Flow of CNT Nanofluids with Thermal Radiation, Ohmic Heating, and Autocatalytic Chemical Reactions	Alexandria Engineering Journal	November, 2024
12	Dr Ashok Kumar Pal	Analysis of Radiation Pressure and Albedo Effect in the Generalized CR3BP with Oblateness	Communications in Nonlinear Science and Numerical Simulation	November, 2024
13	Dr Parvin Kumari	An P uniformly Convergent Technique for Singularly Perturbed Problems, with an Interior Turning Point Occurring in Chemical Processes	Journal of Mathematical Chemistry	November, 2024
14	Dr Indeewar Kumar	Warranty Driven Reliability Analysis: A Stochastic Model for Continuous Solar Power Supply System with Two Photovoltaic Cells and an Inverter	International Journal of Information Technology	November, 2024
15	Dr Kalpna Sharma	Computational Study on Torsional Casson Fluid Flow through Concentric Cylinders in a Porous Medium	Alexandria Engineering Journal	December, 2024
16	Dr Alok Bhargava	A New Solution Approach to Proportion Delayed and Heat Like Fractional Partial Differential Equations	Partial Differential Equations in Applied Mathematics	December, 2024
17	Dr Reema Jain	Entropy Framework of the Bioconvective Williamson Nanofluid Flow over aRiga Plate with Radiation, Triple Stratification and Swimming Microorganisms	International Journal of Thermofluids	December, 2024
18	Dr Loganathan Karuppusamy	A Finite Source Retrial Queueing Inventory System with Stock Dependent Arrival and Heterogeneous Servers	Scientific Reports	December, 2024
19	Dr Anil Ahlawat	Entropy Generation and Heat Convection Analysis of Second-Grade Viscoelastic Nanofluid Flow in a Tilted Lid-Driven Square Enclosure: A Finite Difference Approach	International Journal of Thermofluids	December, 2024
20	Dr Ashutosh Pandey	A Characterization of B-Generalized Skew Derivations on aLie Ideal in a Prime Ring	AIMS Mathematics	December, 2024

21	Dr Virendra Singh Chouhan	Zika Virus Model with the Caputo Fabrizio Fractional Derivative	Symmetry	December, 2024
22	Dr Loganathan Karuppusamy	Two-Phase MHD Peristaltic Flow of Non - Newtonian Casson Fluid through the Renal Tube in the Presence of Microliths	Mathematical Modelling and Numerical Simulation with Applications	December, 2024

Other Journal Publications

S. No.	Name of Faculty	Title of Publication	Journal	Month of Publication
1	Dr Mohd Rizwanullah	Optimization of Chinese Postman Problem Using Fuzzy-Based Priority Weighted Graph	Inquietud Empresarial	October, 2024
2	Dr Monika Saini Dr Ashish Kumar	Mathematical Modeling and Transient Analysis of Boiler System in Thermal Power Plant	Life Cycle Reliability and Safety Engineering	October, 2024
3	Dr Indeewar Kumar	Cost Analysis of Fuzzy Discrete (S, S) Queueing Inventory System with Positive Lead Time and Optimization Using Genetic Algorithm	Inquietud Empresarial	October, 2024
4	Dr. Loganathan Karuppusamy	Impact of Thermal Energy on Water and Ethylene Glycol (50:50) Based Rotating Hybrid Nanofluid Past a Riga Surface with Radiation, Homogeneous and Heterogeneous Reactions	Nano	October, 2024
5	Dr Loganathan Karuppusamy	An Innovative Perspective on Bipolar Fuzzy Fantastic Ideals in BCK/BCI-Algebras	European Journal of Pure and Applied Mathematics	October, 2024
6	Dr Loganathan Karuppusamy	Quadripolar Fuzzy Fantastic Ideals in BCI-Algebras: A Topsis Framework and Application	European Journal of Pure and Applied Mathematics	October, 2024
7	Dr Ashish Kumar Dr Monika Saini	Performance Modeling of Crystallization System in Sugar Plant Using RAMD Approach	Reliability: Theory and Applications	December, 2024

Book Chapter/Conference Publications

S. No.	Name of Faculty	Title of Publication	Book/Conference	Month of Publication
1	Dr Ashish Kumar Dr Monika Saini	Investigation of Mean Time to System Failure of Fuzzy Semi-Markovian Repairable Redundant System	Lecture Notes in Networks and Systems (**Book Series**)	October, 2024
2	Dr Garima Agarwal	Some New Application of Laplace Integral Transforms	Recent Research Trends in Mathematics (**Book Chapter**)	December, 2024
3	Dr Loganathan Karuppusamy	Impact of Casson Fluid Flow Past a Heated Cylinder Statured with Darcy Forchheimer Porous Medium with Radiation	Proceedings of the 1st International Conference on Recent Advancements in Materials Science and Technology (**Conference Paper**)	December, 2024
4	Dr Ashish Kumar Dr Monika Saini	Reliability and Availability Investigation of Microprocessor Systems Using Markovian Approach	Lecture Notes in Networks and Systems (**Book Series**)	December, 2024
5	Dr Pooja Sharma	Thermal Analysis of Chemically Reactive MHD Flow through Rotating Horizontal Channel in the Existence of Hall Current and Radiation	Journal of Physics: Conference Series (**Conference Paper**)	December, 2024
6	Dr Kalpna Sharma	Numerical Analysis of Heat and Mass Transport of Hybrid Nanofluid over a Nonlinear Stretchable Sheet with Magnetic Field in Presence of Soret and Dufour Effect	Journal of Physics: Conference Series (**Conference Paper**)	December, 2024

RESEARCH HIGHLIGHTS OF 2024
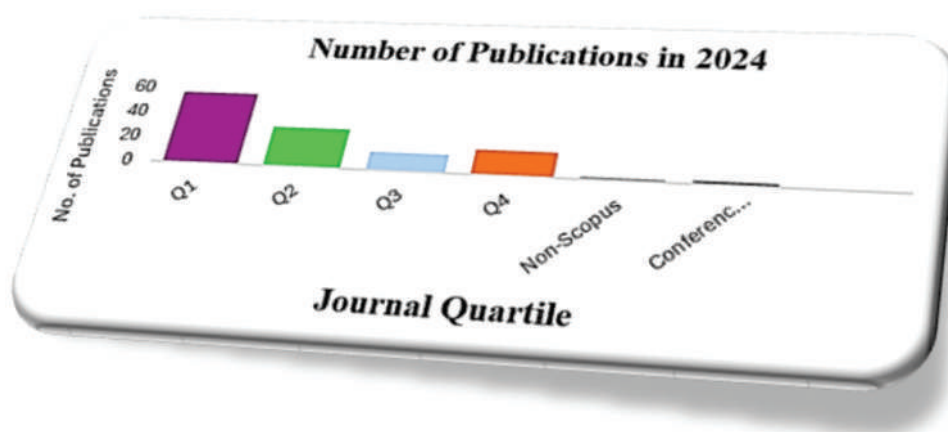
Ph.D. AWARDED

S.No.	Name of Research Scholar	Name of Supervisor	Title of Thesis	Date of Award
1	Loganathan Karuppusamy	Dr Reema Jain	Heat and Mass Transfer Analysis for Bioconvective Non-Newtonian Nanofluid Flow over a Riga Plate Using Homotopy Analysis Method	November 25, 2024
2	Priyanka Gupta	Dr Sunil Joshi	A Study of Extended Special Functions and Fractional Differ-Integral Operators	December 27, 2024

STUDENT ACHIEVEMENTS

S.No.	Name of Student	Program	Achievement	Date
1	Drashti Tailor	IV Sem. B.Sc. (Hons.) Mathematics	Excellence in Academics (Deans List)	October, 2024
2	Atreya Ghoshal	IV Sem. B.Sc. (Hons.) Mathematics	Appreciation Certificate	November 29, 2024

PROJECT COMPLETION (UNDERGRADUATE)

S. No.	Name of Student	Project Guide	Title of the Project	Date
1	Mandeep	Dr Virendra Singh Chouhan	Sequence of Real Numbers	December, 2024
2	Poorvi Makhija	Dr Indeewar Kumar	Differential Equations	December, 2024
3	Surya Prakash	Dr Ankur Jain	Enhancing Paper Cup Recycling Systems using Graph Theoretic Approach	December, 2024
4	Tanay	Dr Mahesh Kumar Dubey	Fuzzy Sets with Applications	December, 2024

WORKSHOP/SHORT TERM COURSE ATTENDED

S. No.	Name of Student	Program	Workshop/School/STC	Venue	Date
1	Drashti Tailor	IV Sem. B.Sc. (Hons.) Mathematics	IWM Winter School for Young Women in Mathematics	Department of Mathematics, Sardar Patel University, Anand, Gujrat	December 09-19, 2024
2	Atreya Ghoshal	IV Sem. B.Sc. (Hons.) Mathematics	Course on Fibonacci Series and Golden Ratio	The HONG KONG University of Science and Technology (Online)	December 31, 2024

FACULTY AWARDS

S. No.	Name of Faculty	Award	Society	Date
1	Dr Reema Jain	Dr. Ramdas M Pai Award for Professional Excellence	Manipal University Jaipur	November15, 2024
2	Dr Ashish Kumar	Dr. Ramdas M Pai Award for Professional Excellence	Manipal University Jaipur	November15, 2024
3	Dr Monika Saini	Dr. Ramdas M Pai Award for Professional Excellence	Manipal University Jaipur	November15, 2024
4	Dr Pooja Sharma	Dr. Ramdas M Pai Award for Professional Excellence	Manipal University Jaipur	November15, 2024
5	Dr. Dasari Nagaraju	Dr. Ramdas M Pai Award for Professional Excellence	Manipal University Jaipur	November15, 2024
6	Dr Kalpna Sharma	Prof P R Sharma Memorial Lecture Award	International Academy of Physical Sciences	December 20-21, 2024

ACADEMIC VISITS

S. No.	Name of Faculty	Institute/University	Purpose	Date
1	Dr Mohd Rizwanullah	Manipal Institute of Technology, MAHE	Research Paper Presentation during an International Conference on Augmented Reality, Intelligent Systems, and Industrial Automation (ARIIA-2024)	December 20-21, 2024
2	Dr Kalpna Sharma	Pt. Ravishankar Shukla University, Raipur (C.G.)	Invited Talk during 31st International Conference of International Academy of Physical Sciences (CONIAPS XXXI) on Emerging Trends in Physical Sciences	December 20-21, 2024

ANNOUNCEMENTS

WELCOME ANNOUNCEMENT

Dr Loganathan Karuppusamy, has been appointed as an Assistant Professor (Research Track) in the Department of Mathematics & Statistics. He has just completed his Ph.D. from the same department under the supervision of Dr Reema Jain. We wish him all the success and hope he will be a great asset to the department and the University as well.

SEND OFF ANNOUNCEMENT

Dr Anamika Jain, Assistant Professor (Selection Grade),has resigned from her position in the month of November 2024.Having served the department for a long duration of 10 yrs., she has now moved to Munger University, Bihar which is a state university. Her contribution to our department during her tenure is greatly appreciated, and we wish her all the best in her future endeavors.

THE FIBONACCI SERIES AND THE MYSTERY OF THE MISSING SQUARE
- By Atreya Ghoshal

The Fibonacci series is one of the most fascinating patterns in mathematics. Starting with 0 and 1, each number is the sum of the two preceding it: 0,1,1,2,3,5,8,13,21…. These numbers appear everywhere, from the spirals of shells to the arrangement of leaves and even inspire brain-teasing puzzles like the Missing Square Puzzle. Here's how the puzzle works: Imagine a square, giving an area of 64. Now cut it into four oddly shaped pieces as shown in the figure. Rearrange them, and somehow, they form a rectangle with an area of 65. Magic? Not quite.
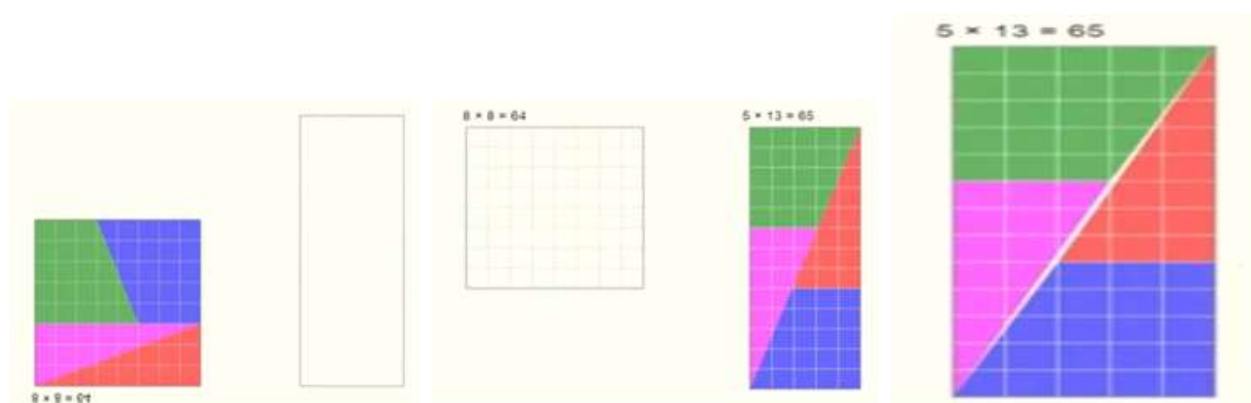
The "missing square" isn't magic but an illusion. When the pieces are rearranged, their edges don't fit perfectly. The cuts are based on Fibonacci numbers, which create slopes that look aligned but aren't. This tiny misalignment causes an almost invisible gap or overlap. The result? An extra square unit seems to appear out of nowhere. This puzzle can also made with dimensions of rectangle and squares being other numbers from the Fibonacci series following Cassini's identity:

$$F_{n-1} \times F_{n+1} - (F_n)^2 = (-1)^n,$$

where F_n is the nth of the Fibonacci series. For this puzzle, the dimensions of the rectangle are F_{n-1} and F_{n-1} and the side of the square is F_n and n is an even integer.

What's incredible about this puzzle is how it plays with our perception. It uses the beauty of Fibonacci proportions to trick the eye, reminding us that math isn't just about numbers, it's about seeing patterns, solving mysteries, and finding joy in the unexpected. The Missing Square Puzzle is a delightful reminder of how even simple shapes can hold big surprises.

REFERENCE
https://youtu.be/g8Tselp1B9w?si=1LR-8guAOzHS-GM7

UNTANGLING WHY KNOTS ARE IMPORTANT
-By Drashti Tailor

We all know what knots are. They are the kind that you tie in your shoelaces. If you fuse the ends together, then the knot will be locked in there, trapped in the loop. Then the question comes, can you somehow remove that knot in the loop, without cutting the string, by just cleverly manipulating the loop somehow or wiggling it? That's not much of a knot at all. It's just a circle, something equivalent to a simple loop. Turns out, there's lots of real-world applications for this branch of math, now called knot theory.

When scientists were eagerly trying to figure out what could possibly account for all the different kinds of matter, the Scottish mathematician and physicist Peter Guthrie Tait showed his friend and compatriot Sir William Thomson his device for generating smoke rings and proposed in 1869 that atoms might consist of knotted vortex tubes of the ether, with different elements corresponding to different knots.
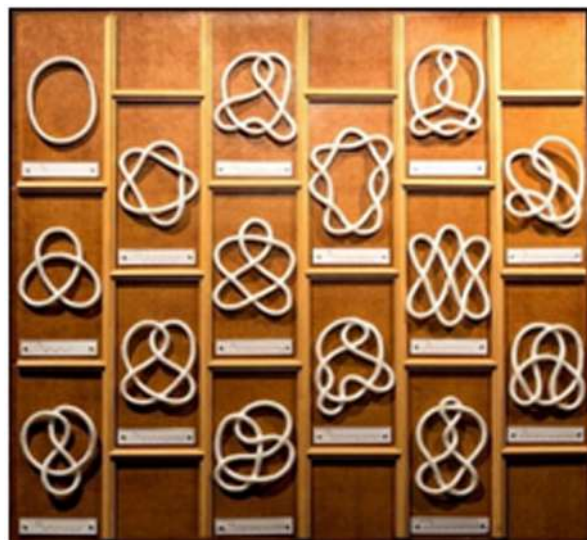
Knot theory started out as an effort to comprehend the universe's basic composition. We have found the first 352,152,252 knots thus far. Every one of them has unique characteristics and attributes. Knot theory has diverse applications across various fields. It helps to understand DNA structure and protein folding and aids in designing molecular knots and studying polymer behaviour. Its roots can be found in early atomic physics and the mathematical theory of electricity. There are also indications of potential new uses in several areas of chemistry today.

To put it simply, it is a circle that is interwoven. The study of closed curves in three dimensions and their potential deformations without one portion piercing another is known as knot theory in mathematics. A knot can be thought of as created by looping and interlacing a length of string in any way, then uniting the ends or it is a mathematical representation of the circle (S1) embedded in three-dimensional Euclidean space (R3; sometimes called E3). But you can also think about knotted spheres in four-space, knotted three-dimensional spheres in five-space, knotted four-dimensional spheres in six-space. And so, you can go up dimension, dimension, dimension. Projecting each knot onto a plane, imagine the knot's shadow under a light and counting how many times the projection crosses itself noting which direction travels "over" and which goes "under" at each crossing, is the fundamental method for classifying knots. The fewest crossings that happen when the knot is moved in every feasible direction serve as a gauge of the knot's complexity.

REFERENCES

https://www.quantamagazine.org/why-mathematicians-study-knots-20221031/

https://youtu.be/8DBhTXM_Br4?si=FLBLBrI7gEUPx7eR

https://en.wikipedia.org/wiki/Knot_theory

INSPIRED BY LIFE