

## Department's 101<sup>th</sup> Annual Report (1<sup>st</sup> April 2023 to 31<sup>st</sup> March 2024): Mathematics

### **Name of the Department**

**Mathematics**

### **Name of the Faculty**

Mathematical Sciences

### **Major Activities and Achievements**

The Department of Mathematics at the University of Delhi was established in 1947 and ever since its inception, department has always strived to be amongst the best mathematics departments in the country. The department currently offers M.Sc. and Ph.D. programs in Mathematics. The Department has been receiving various supports and grants including UGC's SAP-DRS, SAP-DSA, DST-FIST, DST-PURSE, NBHM and DAE, India. The Department of Mathematics QS World ranking 2024 is 251-300 and the subjectwise QS ranking 2024 within India is 10th. The Faculty members of the department have Research Projects of approx. Rs. 132.55 Lacs and have published around 77 Research papers in journals of international repute. Department placement cell organized many webinars and workshops for students to develop skills. Approximately 31 companies like Atria, Cognition, Courseleap, Saarthee, Collzy etc visited and selected 34 students with the highest package offered in 2023-24 is 13.5 LPA.

### **Honours/Distinctions**

Tarun Das is Visiting Professor in Mathematics at University of Ladakh since 2022.

Tarun Das is a Member in Screening and Selection committee of CSIR for SRF and RA in Mathematical Sciences.

Tarun Das is Honorary Treasure in Indian Society for History of Mathematics since 2020.

Tarun Das is Member of Academic Council at University of Allahabad.

Tarun Das is Member of Board of Studies in Mathematics at Kurukshetra University.

Tarun Das is Member of Board of Studies in Mathematics at University of Ladakh.

Tarun Das is Member of Faculty Board at MDU, Rohtak.

C S Lalitha is Member (VC nominee) of Departmental Research Council, Department of Statistics, University of Delhi.

C S Lalitha is Member of Board of Studies of Department of Mathematics, Delhi Technological University.

Ruchi Das is Member of Board of Studies in Mathematics, H.P. University, Shimla.

Ruchi Das is Member of Board of Studies of Department of Mathematics, Faculty of Science , A.M.U. Aligarh.

Ruchi Das is Distinguished External Member of the Board of Studies of the University School of Basic and Applied Sciences, Guru Gobind Singh Indraprastha University.

Ruchi Das is Member of Editorial Board in Journal of Dynamical Systems and Geometric Theories.

Ruchi Das is Member of Editorial Board in Asian-European Journal of Mathematics.

Ruchi Das was Distinguished Guest in the inaugural Session of International Conference on Advances in Pure and Applied Mathematics Vision India@2047, 8-10 February, 2024 at Shyam Lal College, University of Delhi, Delhi on 8th February, 2024.

Ruchi Das was Guest of Honour in the inaugural Session of International Conference on Pure and Applied Mathematics, February 22-23, 2024, at JDMC, University of Delhi, Delhi on 22nd February, 2024.

Sachin Kumar is Associate Editor of the journal Partial Differential Equations in Applied Mathematics (Elsevier's Publisher).

## Publications

### (a.) Research Articles

#### Scopus

**SN. Title Author List Year Issue Volume Page nos. Digital Object Identifier (DOI) Publisher**

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#### UGC

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#### Web Scienc

SN.	Title	Author List	Year	Issue	Volume	Page nos.	Digital Object Identifier (DOI)	Publisher
1	Bi-asymptotic c-expansivity	T. Das, R. Nageshwar , A.G. Khan	2024	127955(1)	532	12pp	<a href="https://doi.org/10.1016/j.jmaa.2023.127955">https://doi.org/10.1016/j.jmaa.2023.127955</a>	ELSEVIER
2	Topologically stable and persistent points of group actions	T. Das, A.G. Khan	2023	1	129	60-71	<a href="https://doi.org/10.7146/math.scand.a-134098">https://doi.org/10.7146/math.scand.a-134098</a>	JSTOTR
3	Persistence and CW-topological stability for set valued maps	T. Das, Ramesh Kumar and A. G. Khan	2023	.	29	369-380	<a href="https://kmc.du.ac.in/kmcerp/public/facpublication/PUP14116911424628110.pdf">https://kmc.du.ac.in/kmcerp/public/facpublication/PUP14116911424628110.pdf</a>	University of Houston
4	Nonlinear scalarization in set optimization based on the concept of null set	Anveksha Moar, Pradeep Kumar Sharma & C. S. Lalitha	2024	-	-	21pp	<a href="https://doi.org/10.1007/s10898-024-01385-1">https://doi.org/10.1007/s10898-024-01385-1</a>	Springer Netherlands

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5	Topological Sensitivity and its stronger forms on semiflows	Ruchi Das , Devender Kumar and Mohammad Salman	2024	1	61	247-262	<a href="https://doi.org/10.4134/BKMS.b230092">https://doi.org/10.4134/BKMS.b230092</a>	KoreaScience
6	Dynamics of Multi-sensitive Non-autonomous Systems with Respect to a Vector	Mohammad Salman & Ruchi Das	2024	.	47	16pp	<a href="https://doi.org/10.1007/s40840-023-01644-6">https://doi.org/10.1007/s40840-023-01644-6</a>	SpringerLink
7	Sensitivity and unpredictability in semiflows on topological spaces	Arpit Mahajan a, Rahul Thakur b, Ruchi Das	2024	107949	133	7pp	<a href="https://doi.org/10.1016/j.cnsns.2024.107949">https://doi.org/10.1016/j.cnsns.2024.107949</a>	ELSEVIER
8	Topological Pseudo Orbit Tracing Property, Topological Sensitivity and Topological Entropy	Ruchi Das, Devender Kumar	2024	.	.	.	Accepted	Filomat (Universitet of Nis)
9	Domination of semigroups on standard forms of von Neumann algebras	Sahiba Arora, Ralph Chill & Sachi Srivastava	2023	.	121	715-729	<a href="https://doi.org/10.1007/s00013-023-01946-y">https://doi.org/10.1007/s00013-023-01946-y</a>	Birkhauser Verlag Basel
10	On Hilbert-Schmidt frames for operators and Riesz bases	Jyoti, Lalit Kumar Vashisht	2023	.	19	799-821	<a href="https://doi.org/10.15407/mag19.03.799">https://doi.org/10.15407/mag19.03.799</a>	ILTPE-B. Verkin Institute for Low Temperature Physics and Engineering
11	On matrix-valued Gabor frames over locally compact abelian groups	Uttam Kumar Sinha, Lalit Kumar Vashisht, and Pankaj Kumar Das	2023	4	26	1-20	<a href="https://doi.org/10.1142/S0219025723500236">https://doi.org/10.1142/S0219025723500236</a>	World Scientific Publishing Co. Pte Ltd
12	Nonstationary matrix-valued	D. Jindal & L. K. Vashisht	2024	.	.	.	Accepted <a href="https://doi.org/10.1007/s10476-024-00004-1">https://doi.org/10.1007/s10476-024-00004-1</a>	Analysis Mathematica

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	multiresolution analysis from the extended affine group							(Akademai Kiado)
13	Heat and mass transfer under MHD mixed convection in a four-sided lid-driven square cavity	Arvind Patel, Manoj Kumar, Shobha Bagai	2024	4	53	1220-1266	<a href="https://doi.org/10.1002/htj.22993">https://doi.org/10.1002/htj.22993</a>	John Wiley & Sons Inc.
14	Dynamical behaviour of solitons and modulation instability analysis of a nonautonomous -dimensional nonlinear Schrödinger equation	Vineesh Kumar a, Arvind Patel	2023	171412	293	1-15	<a href="https://doi.org/10.1016/j.ijleo.2023.171412">https://doi.org/10.1016/j.ijleo.2023.171412</a>	ELSEVIER
15	A note on maximal non- $\lambda$ -rings	Rahul Kumar, Anant Singh, and Atul Gaur	2023	10	16	7pp	<a href="https://doi.org/10.1142/S1793557123501747">https://doi.org/10.1142/S1793557123501747</a>	World Scientific
16	On minimal ring extensions	Rahul Kumar, Atul Gaur	2023	.	12	73-78	<a href="https://pjm.ppu.edu/paper/1458-minimal-ring-extensions">https://pjm.ppu.edu/paper/1458-minimal-ring-extensions</a>	Palestine Polytechnic University
17	Construction of highly non-linear permutations on $Z_{2p}$ with differential uniformity at most 8	P.R. Mishra a, Prachi Gupta b, Atul Gaur	2023	.	92	1-14	<a href="https://doi.org/10.1016/j.ffa.2023.102305">https://doi.org/10.1016/j.ffa.2023.102305</a>	ELSEVIER
18	Fixed point sets and orbit spaces of wedge of three spheres	Dimpi, Hemant Kumar Singh	2024	108856 (1)	346	17pp	<a href="https://doi.org/10.1016/j.topol.2024.108856">https://doi.org/10.1016/j.topol.2024.108856</a>	Elsevier B.V.
19	Orbit spaces of free involutions on the product of three spheres	Dimpi, Hemant Kumar Singh	2023	47(1)	.	1-26	<a href="https://doi.org/10.2989/16073606.2023.2288707">https://doi.org/10.2989/16073606.2023.2288707</a>	Taylor and Francis Ltd.

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20	Analyzing Specific Waves and Various Dynamics of Multi-Peakons in (3+1)-Dimensional p-Type Equation Using a Newly Created Methodology	Shubham Kumar Dhiman and Sachin Kumar	2024	.	.	1-14	<a href="https://doi.org/10.1007/s11071-024-09588-7">https://doi.org/10.1007/s11071-024-09588-7</a>	Springer Netherlands
21	Exploring Localized Waves and Different Dynamics of Solitons in (2+1)-dimensional Hirota Bilinear Equation: A Multivariate Generalized Exponential Rational Integral Function Approach	Monika Niwas, Sachin Kumar	2024	.	.	1-14	<a href="https://doi.org/10.1007/s11071-024-09555-2">https://doi.org/10.1007/s11071-024-09555-2</a>	Springer Netherlands
22	Novel closed-form analytical solutions and modulation instability spectrum induced by the Salerno equation describing nonlinear discrete electrical lattice via symbolic computation	Nikita Mann, Setu Rani, Sachin Kumar, Raj Kumar	2024	.	219	473-490	<a href="https://doi.org/10.1016/j.matcom.2023.12.031">https://doi.org/10.1016/j.matcom.2023.12.031</a>	ELSEVIER
23	Dynamic study of qualitative analysis, traveling waves, solitons,	Sachin Kumar and Nikita Mann	2024	.	56	1-24	<a href="https://doi.org/10.1007/s11082-024-06701-3">https://doi.org/10.1007/s11082-024-06701-3</a>	Springer New York

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24	bifurcation, quasiperiodic, and chaotic behavior of integrable Kuralay equations Newly constructed closed-form soliton solutions, conservation laws and modulation instability for a (2+1)-dimensional cubic nonlinear Schrödinger's equation using optimal system of Lie subalgebra	Setu Rani, Shubham Kumar, Dhiman and Sachin Kumar	2024	.	56	1-32	<a href="https://doi.org/10.1007/s11082-023-06085-w">https://doi.org/10.1007/s11082-023-06085-w</a>	Springer
25	New abundant analytical solutions of coupled nonlinear Schrödinger (FNSE) equation in fractal order arising in quantum mechanics	M. Alshahrani, L. Ouahid, M.A. Abdou, Sachin Kumar, J.S. Al Shahrani	2024	.	56	1-34	<a href="https://doi.org/10.1007/s11082-024-06378-8">https://doi.org/10.1007/s11082-024-06378-8</a>	Springer
26	Exploring cone-shaped solitons, breather, and lump-forms solutions using the lie symmetry method and unified approach to a coupled breaking soliton model	Sachin Kumar and Shubham Kumar, Dhiman	2024	2	99	1-20	<a href="https://doi.org/10.1088/1402-4896/ad1d9e">https://doi.org/10.1088/1402-4896/ad1d9e</a>	IOP Publishing Ltd.

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27	Analyzing multi-peak and lump solutions of the variable-coefficient Boiti–Leon–Manna–Pempinelli equation: a comparative study of the Lie classical method and unified method with applications	Sachin Kumar and Monika Niwas	2023 .		111	22457-22475	<a href="https://doi.org/10.1007/s11071-023-09012-6">https://doi.org/10.1007/s11071-023-09012-6</a>	Springer Netherlands
28	Multi-peakons, lumps, and other solitons solutions for the (2+1)-dimensional generalized Benjamin–Ono equation: an inverse (G'/G)-expansion method and real-world applications	Sachin Kumar and Monika Niwas	2023 .		111.	22499-22512	<a href="https://doi.org/10.1007/s11071-023-09023-3">https://doi.org/10.1007/s11071-023-09023-3</a>	Springer Netherlands
29	A novel analysis of Cole-Hopf transformations in different dimensions, solitons and rogue waves for a (2+1)-dimensional shallow water wave equation of ion-acoustic waves in plasmas	Sachin Kumar and Brij Mohan	2023 .		35	1-15	<a href="https://doi.org/10.1063/5.0185772">https://doi.org/10.1063/5.0185772</a>	American Institute of Physics
30	Dynamic frameworks of	Sachin Kumar, I. Hamid,	2023 .		55	1-31	<a href="https://doi.org/10.1007/s11082-023-05461-w">https://doi.org/10.1007/s11082-023-05461-w</a>	Springer

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31	optical soliton solutions and soliton-like formations to Schrödinger–Hirota equation with parabolic law non-linearity using a highly efficient approach Dynamical forms of various optical soliton solutions and other solitons for the new Schrödinger equation in optical fibers using two distinct efficient approaches Exploring lump soliton solutions and wave interactions using new Inverse ( $G'/G$ )-expansion approach: applications to the (2+1)-dimensional nonlinear Heisenberg ferromagnetic spin chain equation	M.A. Abdou  Monika Niwas, Shubham Kumar Dhiman and Sachin Kumar	2024	13	34	1-17	<a href="https://doi.org/10.1142/S0217984924500878">https://doi.org/10.1142/S0217984924500878</a>	World Scientific
32	Inverse ( $G'/G$ )-expansion approach: applications to the (2+1)-dimensional nonlinear Heisenberg ferromagnetic spin chain equation	Sachin Kumar and Monika Niwas	2023	.	111	20257–20273	<a href="https://doi.org/10.1007/s11071-023-08937-2">https://doi.org/10.1007/s11071-023-08937-2</a>	Springer Netherlands
33	Higher-order rogue waves and dispersive solitons of a novel P-type (3+1)-D	Brij Mohan, Sachin Kumar, Raj Kumar	2023	.	111	20275-20288	<a href="https://doi.org/10.1007/s11071-023-08938-1">https://doi.org/10.1007/s11071-023-08938-1</a>	Springer Netherlands



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34	evolution equation in soliton theory and nonlinear waves Plenteous specific analytical solutions for new extended deoxyribonucleic acid (DNA) model arising in mathematical biology	M.A. Abdou, L. Ouahid and Sachin Kumar	2023	34	37	1-17	<a href="http://dx.doi.org/10.1142/S0217984923501737">http://dx.doi.org/10.1142/S0217984923501737</a>	World Scientific
35	Analysis of Lie invariance, analytical solutions, conservation laws, and a variety of wave profiles for the (2+1)-dimensional Riemann wave model arising from ocean tsunamis and seismic sea waves	Sachin Kumar, Shubham Kumar Dhiman, Astha Chauhan	2023	.	138	1-22	<a href="https://doi.org/10.1140/epjp/s13360-023-04245-1">https://doi.org/10.1140/epjp/s13360-023-04245-1</a>	Springer
36	A direct symbolic computation of center-controlled rogue waves to a new Painlevé-integrable (3+1)-D generalized nonlinear evolution equation in plasmas	Sachin Kumar, Brij Mohan	2023	.	111	16395-16405	<a href="https://doi.org/10.1007/s11071-023-08683-5">https://doi.org/10.1007/s11071-023-08683-5</a>	Springer Netherlands
37	Lie group analysis with the	Sachin Kumar, Wen-Xiu Ma,	2023	.	138	1-13	<a href="https://doi.org/10.1140/epjp/s13360-023-04053-7">https://doi.org/10.1140/epjp/s13360-023-04053-7</a>	Springer

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38	optimal system, generalized invariant solutions, and an enormous variety of different wave profiles for the higher-dimensional modified dispersive water wave system of equations Symbolic computation and Novel solitons, traveling waves and soliton-like solutions for the highly nonlinear $(2+1)$ -dimensional Schrödinger equation in the anomalous dispersion regime via newly proposed modified approach Optical soliton solutions and dynamical behaviours of Kudryashov's equation employing efficient integrating approach	Shubham Kumar Dhiman, Astha Chauhan Ihsanullah Hamid, Sachin Kumar	2023 .		55	1-23	<a href="https://doi.org/10.1007/s11082-023-04903-9">https://doi.org/10.1007/s11082-023-04903-9</a>	Springer
39	Kudryashov's equation employing efficient integrating approach	Sachin Kumar, Monika Niwas	2023 .		97	1-14	<a href="https://doi.org/10.1007/s12043-023-02575-4">https://doi.org/10.1007/s12043-023-02575-4</a>	Springer
40	On the dynamics of optical soliton solutions, modulation	Setu Rani, Sachin Kumar, Nikita Mann	2023 .		55	1-27	<a href="https://doi.org/10.1007/s11082-023-04946-y">https://doi.org/10.1007/s11082-023-04946-y</a>	Springer

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41	stability, and various wave structures of a (2+1)-dimensional complex modified Korteweg-de-Vries equation using two integration mathematical methods Some specific optical wave solutions and combined other solitons to the advanced (3+1)-dimensional Schrödinger equation in nonlinear optical fibers	Sachin Kumar, Ihsanullah Hamid, M.A. Abdou	2023 .		55	1-30	<a href="https://doi.org/10.1007/s11082-023-04976-6">https://doi.org/10.1007/s11082-023-04976-6</a>	Springer
42	A variety of newly formed soliton solutions and patterns of dynamic waveforms for the generalized complex coupled Schrödinger–Boussinesq equations	Sachin Kumar, Nikita Mann	2023 .		55	1-22	<a href="https://doi.org/10.1007/s11082-023-04869-8">https://doi.org/10.1007/s11082-023-04869-8</a>	Springer
43	New plenteous soliton solutions and other form solutions for a generalized dispersive long-wave system employing two methodological approaches	Monika Niwas, Sachin Kumar	2023 .		55	1-24	<a href="https://doi.org/10.1007/s11082-023-04847-0">https://doi.org/10.1007/s11082-023-04847-0</a>	Springer

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44	Newly generated optical wave solutions and dynamical behaviors of the highly nonlinear coupled Davey-Stewartson Fokas system in monomode optical fibers	Sachin Kumar, Amit Kumar	2023	.	55	1-33	<a href="https://doi.org/10.1007/s11082-023-04825-6">https://doi.org/10.1007/s11082-023-04825-6</a>	Springer
45	Dynamical behavior of analytical soliton solutions, bifurcation analysis, and quasi-periodic solution to the (2+1)-dimensional Konopelchenko–Dubrovsky (KD) system	Sachin Kumar, Nikita Mann, Harsha Kharbanda, Mustafa Inc	2023	.	13	1-30	<a href="https://doi.org/10.1007/s13324-023-00802-0">https://doi.org/10.1007/s13324-023-00802-0</a>	Springer
46	Abundant soliton solutions and different dynamical behaviors of various waveforms to a new (3+1)-dimensional Schrödinger equation in optical fibers	Sachin Kumar, Monika Niwas	2023	.	55	1-27	<a href="https://doi.org/10.1007/s11082-023-04712-0">https://doi.org/10.1007/s11082-023-04712-0</a>	Springer
47	Novel soliton solutions to the Atangana Baleanu (AB) fractional for ion sound and Langmuir waves (ISALWs) equations	M. M. Alanazi, L. Ouahid, J. S. Al Shahrani, M. A. Abdou, Sachin Kumar	2023	.	55	1-14	<a href="https://doi.org/10.1007/s11082-023-04736-6">https://doi.org/10.1007/s11082-023-04736-6</a>	Springer

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48	Inverses of r-primitive k-normal elements over finite fields	Mamta Rani, Avnish K. Sharma, Sharwan K. Tiwari, and Anupama Panigrahi	2023	.	63	723–747	<a href="https://doi.org/10.1007/s11139-023-00785-3">https://doi.org/10.1007/s11139-023-00785-3</a>	Springer
49	On r-primitive k-normal elements with prescribed norm and trace over finite fields	Mamta Rani, Avnish K. Sharma, Sharwan K. Tiwari, and Anupama Panigrahi	2023	.	91	102253	<a href="https://doi.org/10.1016/j.ffa.2023.102253">https://doi.org/10.1016/j.ffa.2023.102253</a>	ELSEVIER
50	Construction of S-boxes with LBN and $DBN \geq 4$	Sonu Pal, Saibal k. Pal, Anupama Panigrahi	2023	6	26	1665–1682	<a href="https://doi.org/10.47974/JDMSC-1572">https://doi.org/10.47974/JDMSC-1572</a>	Taru Publications
51	On characterization of approximation types using MacLane-Vaquie chains	Sneha Mavi, Anuj Bishnoi	2023	.	.	12pp	<a href="https://doi.org/10.1142/S0219498825500082">https://doi.org/10.1142/S0219498825500082</a>	World Scientific
52	Abstract key polynomials and MacLane-Vaquie chains	Sneha Mavi, Anuj Bishnoi	2023	1	33	15-30	<a href="https://doi.org/10.1142/S0218196723500030">https://doi.org/10.1142/S0218196723500030</a>	World Scientific
53	MacLane-Vaquie chains and valuation-transcendental extensions	Sneha Mavi, Anuj Bishnoi	2023	2	15	249-259	<a href="http://dx.doi.org/10.1216/jca.2023.15.249">http://dx.doi.org/10.1216/jca.2023.15.249</a>	Rocky Mountain Mathematics Consortium
54	Abstract key polynomials and distinguished pairs	Sneha Mavi, Anuj Bishnoi	2023	2350193 (9)	22	19pp	<a href="https://doi.org/10.1142/S0219498823501931">https://doi.org/10.1142/S0219498823501931</a>	World Scientific
55	Close-to-convex functions associated with a rational function	Sushil Kumar, Swati Anand, Pratima Rai	2024	.	.	.	Accepted	International Journal of Mathematica Slovaca (Walter de Gruyter GmbH)

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56	Analysis of SDFEM for Singularly Perturbed Delay Differential Equation with Boundary Turning Point	Aasna, Pratima Rai	2024	20	10	Online	<a href="https://doi.org/10.1007/s40819-023-01648-7">https://doi.org/10.1007/s40819-023-01648-7</a>	International Journal of Applied and Computational Mathematics (Springer Link)
57	Uniformly convergent numerical approximation for parabolic singularly perturbed delay problems with turning points	Amit Sharma, Pratima Rai	2024	2350031	21	42pp	<a href="https://dx.doi.org/10.1142/S0219876223500317">https://dx.doi.org/10.1142/S0219876223500317</a>	World Scientific
58	Finite element analysis of singularly perturbed problems with discontinuous diffusion	Ram Prasad Yadav, Pratima Rai & Kapil K. Sharma	2023	257	42	25pp	<a href="https://doi.org/10.1007/s40314-023-02391-x">https://doi.org/10.1007/s40314-023-02391-x</a>	Springer
59	Analysis of a higher order uniformly convergent method for singularly perturbed parabolic delay problems	Amit Sharma, a, Pratima Rai	2023	127906	448	23pp	<a href="https://doi.org/10.1016/j.amc.2023.127906">https://doi.org/10.1016/j.amc.2023.127906</a>	ELSEVIER
60	NIPG finite element method for convection dominated diffusion problem with discontinuous data	Ram Prasad Yadav, Pratima Rai, Kapil K. Sharma	2023	2350001	20	25pp	<a href="https://doi.org/10.1142/S0219876223500019">https://doi.org/10.1142/S0219876223500019</a>	World Scientific
61	Starlike functions associated with	Pratima Rai, Sushil Kumar, Asena Çetinkaya	2023	3	6	573-583	<a href="https://doi.org/10.3934/mfc.2022032">https://doi.org/10.3934/mfc.2022032</a>	American Institute of Mathematical Sciences

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62	and Bernardi integral operator Numerical solutions of fractional differential equation with multiple delays via block boundary value method	Abhishek Sharma, Surendra Kumar & Harendra Pal Singh	2024	.	12	924-944	<a href="https://doi.org/10.1007/s40435-023-01209-2">https://doi.org/10.1007/s40435-023-01209-2</a>	Springer
63	Approximate controllability of time-varying measure differential problem of second order with state- dependent delay and noninstantaneous impulses	Kumar S.	2024	.	47	190-205	<a href="https://doi.org/10.22541/au.165587761.19448057/v1">https://doi.org/10.22541/au.165587761.19448057/v1</a>	World Scientific Publishing Co. Pte Ltd
64	Interaction of acceleration wave with a blast wave in two-phase Chaplygin flow driven by source term	Sarswati Shah, Randheer Singh & Jasobanta Jena	2023	2	186	1-13	<a href="https://doi.org/10.1007/s10440-023-00581-7">https://doi.org/10.1007/s10440-023-00581-7</a>	Springer
65	On kinematics of one-dimensional radially symmetric shocks in non- ideal reacting gases	Randheer Singh, Sarswati Shah, Jasobanta Jena	2023	4	47	1735- 1749	<a href="https://doi.org/10.1002/mma.9511">https://doi.org/10.1002/mma.9511</a>	John Wiley and Sons Ltd
66	Interaction of steepened wave with a strong shock in van der Waals stiffened relaxing gases	Bipin Kumar Chaudhary, Randheer Singh	2023	.	134	1-12	<a href="https://doi.org/10.1063/5.0168012">https://doi.org/10.1063/5.0168012</a>	American Institute of Physics

SN.	Title	Author List	Year	Issue	Volume	Page nos.	Digital Object Identifier (DOI)	Publisher
67	Evolution of characteristic shocks in two-phase modified Chaplygin flow consisting of source term	Deepika Sharma, Randheer Singh	2024	.	131	1-13	<a href="https://doi.org/10.1016/j.cnsns.2024.107891">https://doi.org/10.1016/j.cnsns.2024.107891</a>	ELSEVIER
68	Geometric Properties of Generalized Bessel Function Associated with the Exponential Function	Adiba Naz, Sumit Nagpal and V. Ravichandran	2023	6	73	1459–1478	<a href="https://doi.org/10.1515/ms-2023-0106">https://doi.org/10.1515/ms-2023-0106</a>	Walter de Gruyter GmbH
69	Partial sums and inclusion relations for starlike functions associated with an evolute of a nephroid curve	Gurpreet Kaur and Sumit Nagpal	2023	6	60	1477-1496	<a href="https://doi.org/10.4134/BKMS.b220582">https://doi.org/10.4134/BKMS.b220582</a>	Korean Mathematical Society
70	Radius problems for ratios of analytic functions involving sigmoid domain	Gurpreet Kaur and Sumit Nagpal	2024	1	17	1-16	<a href="http://dx.doi.org/10.1142/S179355712350239X">http://dx.doi.org/10.1142/S179355712350239X</a>	World Scientific
71	Radius of convexity of classes associated with the ratio of derivative functions	Gurpreet Kaur and Sumit Nagpal	2024	.	73	587–601	<a href="https://doi.org/10.1007/s12215-023-00938-9">https://doi.org/10.1007/s12215-023-00938-9</a>	Springer
72	Ternary rings of unbounded operators	Surbhi Beniwal & Ajay Kumar	2023	2	17	22pp	<a href="https://doi.org/10.1007/s43037-022-00227-0">https://doi.org/10.1007/s43037-022-00227-0</a>	Springer
73	Representations of C*-ternary rings	Arpit Kansal, Ajay kumar and Vandana Rajpal	2023	1	38	123-135	<a href="https://doi.org/10.4134/CKMS.c210437">https://doi.org/10.4134/CKMS.c210437</a>	Korean Mathematical Society
74	Uncertainty inequalities for certain	Piyush Bansal, Ajay Kumar	2023	57	14	27pp	<a href="https://doi.org/10.1007/s43034-023-00280-2">https://doi.org/10.1007/s43034-023-00280-2</a>	Springer



SN.	Title	Author List	Year	Issue	Volume	Page nos.	Digital Object Identifier (DOI)	Publisher
75	connected Lie groups Haagerup tensor product of C*-ternary rings	& Ashish Bansal Arpit Kansal, Ajay Kumar	2023	1	528	19pp	<a href="https://doi.org/10.1016/j.jmaa.2023.127482">https://doi.org/10.1016/j.jmaa.2023.127482</a>	ELSEVIER
76	Evaluating the Effect of Measurement Error Under Randomized Response Techniques of the Sensitive Variable in Successive Sampling	Kumari Priyanka, Pidugu Trisandhya & Ajay Kumar	2023	.	93	631–644	<a href="https://doi.org/10.1007/s40010-023-00836-w">https://doi.org/10.1007/s40010-023-00836-w</a>	Springer
77	Ideals in Haagerup tensor product of C*-ternary rings and TRO's	Arpit Kansal, Ajay Kumar	2023	3	17	731–748	<a href="http://dx.doi.org/10.7153/oam-2023-17-48">http://dx.doi.org/10.7153/oam-2023-17-48</a>	Element D.O.O.

**(b.) Books/Chapter in Books**

1. -, (-), -, -, -, -, -

**(c.) Journal(s) Published by the Department**

1. -, (-), -, -, -, -, -

**Research Projects**

1. IoE, University of Delhi , Dr. C. S. Lalitha, Scalarization and Optimality in Vector and Set Optimization, 4 Lakhs
2. DST-SERB, Dr. Sachi Srivastava, Asymptotics of Solutions Linear and Non-linear Delay Differential Equations, 31.78 Lakhs
3. IoE, University of Delhi , Dr. Lalit Kumar, Application of Frames in Signal Processing, 3 Lakhs
4. IoE, University of Delhi , Dr. Arvind Patel, Study of shock waves in gases under the effect of viscosity, 4 Lakhs
5. IoE, University of Delhi , Dr. Atul Gaur, Maximal non- $\phi$ -Mori Extensions, 3 Lakhs
6. DST-SERB, Dr. Atul Gaur, On  $\phi$ -rings , 17.97 Lakhs
7. IoE, University of Delhi , Dr. Ranjana Jain , Best Approximation and orthogonality for the vector-valued integrable functions, 4 Lakhs
8. SERB-DST, Dr. Sachin Kumar , Lie Symmetry Analysis and Dynamics of Physical Phenomena for Nonlinear Evolution Equations, 6.6 Lakhs
9. SERB-DST, Dr. Sachin Kumar , Study of the dynamics of exact solutions for the nonlinear evolution equations using Lie symmetry analysis, 20.7 Lakhs

10. IoE, University of Delhi , Dr. Sachin Kumar , Symbolic computational work and potential mathematical analytical methods for solving various forms of nonlinear Schrödinger equations, 4 Lakhs
11. IoE, University of Delhi , Dr. Pratima Rai, Sharp bounds on coefficient functionals of Sakaguchi star like functions, 4 Lakhs
12. DST-SERB , Dr. Pratima Rai , Development and Analysis of the finite element methods for a class of singular perturbation problems with discontinuous data, 22 Lakhs
13. IoE, University of Delhi , Dr. Surendra Kumar, The solvability and controllability analysis of fractional stochastic differential equations with impulses, 4 Lakhs
14. IoE, University of Delhi , Dr. Sumit Nagpal , Geometric Properties of Analytic and Harmonic Univalent Mappings, 3.5 Lakhs

#### **Patents Filed/Granted**

1. NA and NA

#### **Seminars/Conferences organized by the Department**

1. Prof. Satish Verma, Prof. G. S. Tuteja, Prof. Venugopalan T. and Dr. Ravinder Kaur, SGTB Khalsa College, Zakir Husain College, SGTB Khalsa College and SGTB Khalsa College, University of Delhi, Workshop on Typesetting Indian Languages using LaTeX, 23-03-2024

2. Prof. Riddhi Shah, Jawaharlal Nehru University, New Delhi, University of Delhi and IMW, Celebrating Women in Mathematics, 01-06-2023

#### **Seminar/Conference Presentations (National/International) by Faculty Members**

1. Tarun Das, 13-03-2024, Glimpses of Poincaré recurrence and beyond, Aryabhata Lecture Series, Central University of Punjab
2. Tarun Das, 24-02-2024, Infiniteness of Primes and Recurrence in Systems, Invited talk, Jammu University
3. Tarun Das, 07-02-2024, Let's feel Hyperbolicity and Recurrence, Refresher Course in Mathematics/ Operational Research/ Statistics and Computer Science, Centre for Professional Development in Higher Education (CPDHE), UGC-HRDC, University of Delhi
4. Tarun Das, 09-02-2024, More on recurrence via Toral Endomorphisms, Refresher Course in Mathematics/ Operational Research/ Statistics and Computer Science, Centre for Professional Development in Higher Education (CPDHE), UGC-HRDC, University of Delhi
5. Tarun Das, 08-12-2023, Devaney Chaos, Refresher Course in Mathematics, DDU, Gorakhpur
6. Tarun Das, 04-05-2023, Hyperbolic Homoclinic classes and Chaotic Dynamical Systems, Plenary talk on 30th Annual Conference of Jammu Mathematical Society, Jammu University
7. Tarun Das, 15-04-2023, Poincaré recurrence phenomena and its impact on Dynamical Systems, Popular lecture Kurukshetra University, Kurukshetra University
8. C S Lalitha, 13-02-2024, Fundamental Theorem of Algebra: Optimization Approach, Refresher Course in Mathematics/ Operational Research/ Statistics and Computer Science, Centre for Professional Development in Higher Education (CPDHE), UGC-HRDC, University of Delhi
9. C S Lalitha, 23-01-2024, Convex Optimization, National Seminar on Recent Advancement of Mathematics, Ramanujan School of Mathematical Sciences, Pondicherry University
10. C S Lalitha, 30-10-2023, Optimization, UGC-Sponsored Online Refresher Course in Mathematics, Bharathidasan University, Khajamalai Campus, Tiruchirappalli, Tamil Nadu
11. C S Lalitha, 24-09-2023, Essential Stability in Set Optimization, International Conference on Variational Analysis and Optimization with Applications (ICVAOA-2023), Aligarh Muslim University

12. C S Lalitha, 14-04-2023, Constraint Qualifications in terms of Convexificators, International Symposium on Optimization Theory and its Applications, The School of Mathematics of Thapar Institute of Engineering & Technology, Patiyala, Punjab
13. C S Lalitha, 12-04-2023, Convex Optimization, Workshop on Optimization and Game Theory, St. Stephen's College, University of Delhi
14. Atul Gaur, 05-02-2024, Counting all finite reduced rings with  $n$  zero divisors, Refresher Course in Mathematics/ Operational Research/ Statistics and Computer Science, Centre for Professional Development in Higher Education (CPDHE), UGC-HRDC, University of Delhi
15. Atul Gaur, 08-02-2024, Certain ring extensions with examples through idealization of a module, Refresher Course in Mathematics/ Operational Research/ Statistics and Computer Science, Centre for Professional Development in Higher Education (CPDHE), UGC-HRDC, University of Delhi
16. Ranjana Jain, 28-03-2024, Centres of certain tensor products of Banach algebras, National Conference on Operator Theory and Function Spaces, Shiv Nadar University, UP
17. Ranjana Jain, 24-12-2023, Centres of certain tensor products of Banach algebras, 38th Annual Conference of Ramanujan Math. Soc., , IIT Guwahati, Assam
18. Sachin Kumar, 17-02-2024, Application of the Bifurcation Theory, Chaotic Behavior, and Dynamics of Exact-soliton Solutions of a (2+1)-dimensional Konopelchenko-Dubrovsky (KD) Model, National Workshop on Mathematical Modelling and Simulation, Department of Mathematics, Sri Guru Nanak Dev Khalsa College, University of Delhi
19. Sachin Kumar, 08-02-2024, New excitation wave-patterns and analytical solutions to higher-order nonlinear partial differential equations, International Conference on Advances in Pure and Applied Mathematics (ICAPAM), Department of Mathematics, Shyam Lal College (University of Delhi), Delhi
20. Sachin Kumar, 19-01-2024, Lie symmetry analysis and its applications in Nonlinear Sciences and Mathematical Physics, International Conference on Analysis and its Applications (ICAA-24), Department of Mathematics, Jamia Millia Islamia, Delhi
21. Sachin Kumar, 18-01-2024, Applications of various analytical methodologies to extract soliton-form solutions with distinct dynamics for the higher-order nonlinear partial differential equations, International Conference on Mathematical Sciences and Its Applications to Artificial Intelligence (ICMSAAI-24), SRM University, Delhi-NCR, Sonapat, Haryana
22. Sachin Kumar, 27-12-2023, New Evolutionary Behaviours and Exact Invariant Solutions of the (3+1)-dimensional Nonlinear Evolution Equations, Expert talk in the Lecture Series in "Frontiers in Mathematics and Computation, Department of Applied Sciences, National Institute of Technology Delhi, Delhi
23. Sachin Kumar, 22-12-2023, Exploring the soliton-form solutions and dynamic wave frames of the highly nonlinear evolution equations using various mathematical approaches via symbolic computation, 6th International Conference on Frontiers in Industrial and Applied Mathematics (FIAM-2023), BITS Pilani Dubai Campus, Dubai
24. Sachin Kumar, 26-10-2023, Lie symmetries with generalized invariant solutions and dynamics structures and patterns of the (2+1)- and (3+1)-dimensional nonlinear evolution equations, International Conference on Symmetries of Differential & Difference Equations and Their Applications, Stellenbosch University, Cape-Town, South Africa
25. Sachin Kumar, 25-05-2023, Dynamical analyses of various solutions and generalized invariant solutions for a (2+1)-dimensional modified dispersive water wave system of equations, DST-SERB Sponsored One week online National workshop on Mathematical Modelling with Simulation in Applied Sciences, Department of Mathematics, Central University of Haryana, India
26. Ratikanta Panda, 06-02-2024, A Complex Rolle's Theorem, Refresher Course in Mathematics/ Operational Research/ Statistics and Computer Science, Centre for Professional Development in Higher Education (CPDHE), UGC-HRDC, University of Delhi
27. Ratikanta Panda, 08-02-2024, The Implicit function Theorem, Refresher Course in Mathematics/ Operational Research/ Statistics and Computer Science, Centre for Professional Development in Higher Education (CPDHE), UGC-HRDC, University of Delhi
28. A. Zothansanga, 28-10-2023, Generalized Analytic Signals Via Fractional Boas Transform, International Conference on Pure and Applied Mathematics (ICPAM-2023), Department of Mathematics, NIT Jalandhar & MNIT Jaipur

29. Anuj Bishnoi, 06-02-2024, Fermat's Last Theorem, Refresher Course in Mathematics/ Operational Research/ Statistics and Computer Science, Centre for Professional Development in Higher Education (CPDHE), UGC-HRDC, University of Delhi
30. Anuj Bishnoi, 07-02-2024, Algebraic Number Theory, Refresher Course in Mathematics/ Operational Research/ Statistics and Computer Science, Centre for Professional Development in Higher Education (CPDHE), UGC-HRDC, University of Delhi
31. Pratima Rai, 01-09-2023, A uniformly convergent Numerical method for parabolic singularly perturbed problems with large spatial delay, International Conference on Advancement of Mathematics, Thapar University, Patiala, Punjab
32. Pratima Rai, 01-01-2024, Uniformly convergent hybrid scheme for singularly perturbed delay problems with integral boundary condition, International Conference on Computational and Mathematical Modelling 2024 (online), Faculty of Mathematical Science, University of Colombo
33. Pratima Rai, 28-03-2024, Numerical approximation of singularly perturbed delay differential equations with integral boundary conditions, Workshop on International Mathematics and Pi Day, Department of Mathematics, South Asian University
34. Sumit Nagpal, 12-01-2024, Recent Advances in Univalent Harmonic Mappings, International Conference on Mathematics and Applications, Mata Sundri College for Women, University of Delhi

### **National/International MoUs Signed**

a. NA

### **Social Outreach Programme**

1. Department organized POSTER AND SLOGAN WRITING CONTEST on the theme Freedom From CORRUPTION, TERRORISM, BLACK MONEY, FILTH to celebrate Independence through pen/ pencil on 4th August, 2023.
2. Department organized a webinar on 4th November, 2023 entitled "Say No TO Corruption: Commit to Nation" to celebrate Vigilance Awareness Week from 30th October 2023 to 5th November.
3. Department organized Diwali Quiz, Mathematical Rangoli and Diya Decoration as Diwali celebrations on November 9, 2023.
4. Department organized Mathematical Quiz, Sudoku, Crossword on Vedic Mathematics and Poster Presentation to celebrate National Mathematics Day on December 22, 2023.
5. Department organized an invited talk entitled "Quadratic Forms and Ergodic Theory" by Prof Anish Gosh from Tata Institute of Fundamental Research (TIFR), Mumbai on December 22, 2023 on the occasion of National Mathematics Day.
6. Department organized Pi-Themed Art Exhibition, Mathematical Poetry competition, Rapid Fire Competition to celebrate Pi Day on 14th March 2024.

### **Student's Achievements**

1. Gambheer Singh received Second Prize in Best Paper Presentation Award in International Symposium on "Applied Optimization and Game Theoretic Models for Decision Making" at ISI Delhi during January 17-19, 2024.
2. Prachi Gupta delivered a contributed talk in Permutation-Based Crypto 2023 and presented a poster at CrossFyre 2023 colocated with EUROCRYPT-2023 held at ENS Lyon, France on April 23, 2023.
3. Kunal Ajay Oak broke several 5x5, 6x6 and 7x7 National and International Records of cubical events during April-23 to March-24.

### **Other Inter-Institutional Collaborations**

23

### **No. of Students under Exchange Programme**

1

**Placement Details (Number and percentage of students placed)**

34

**Extension and Outreach Activities**

1. Tarun Das served on selection committees to appoint permanent faculties (Professors / Associate Professors / Assistant Professors) in many Universities outside University of Delhi domain.
2. Ruchi Das is Member of Committee constituted for formulation of re-employment of research oriented academicians for promoting and strengthening the research culture in the University and colleges.
3. Ruchi Das is Subject Expert in Mathematical Sciences; Inspire Fellowship, DST, Ministry of Science and Technology, Government of India.
4. Ruchi Das is a Member of Subject Expert Committee (SEC) on Physical & Mathematical Sciences under Women Scientists Scheme-A (WOS-A), a flagship program of Department of Science and Technology (DST).
5. Ruchi Das is a Member of Subject Expert Committee (SEC) on Physical & Mathematical Sciences under WISE-PDF program of Department of Science and Technology (DST).
6. Ranjana Jain delivered an invited talk entitled “Some applications of non-negative matrices” at the occasion of @ May 12 Initiative, at Dyal Singh College, University of Delhi, June 14, 2023.
7. Ranjana Jain delivered an invited talk entitled “Real life applications of Mathematics” at Lakshmibai College, University of Delhi, April 12, 2023.
8. Sachin Kumar delivered an invited talk on “Basic Introduction to Mathematical Modeling: Bifurcation Theory, Chaotic Behavior and Soliton Solutions” in “Annual Mathematics Fest - Exponent'24” at Department of Mathematics at Sri Venkateshwara College, University of Delhi on March 11, 2024.
9. Sachin Kumar delivered an invited talk on “Journey through Dynamical System: Bifurcation, Chaos, and Evolutionary Models” in “Annual Mathematics Fest – IMPLOSION'24” at Department of Mathematics at Ram Lal Anand College, University of Delhi on February 29, 2024.

**Faculty Strength****Senior Professor/Professor/Director.** 8**Associate Professor.** 4**Assistant Professor.** 9**Ad-hoc.** 0**Guest.** 0**Number of Ph.D. Degrees Awarded**

32

**Number of M.Phil. Degrees Awarded**

9

**Other Significant Information**

1. Ruchi Das served as Head of Department of Mathematics, Faculty of Mathematical Sciences, during April, 2022 to March 2023.
2. Ruchi Das is Chairperson of DRC, Department of Mathematics and Chairperson of M.Phil Committee, Department of Mathematics, University of Delhi.
3. Member BRS, Faculty of Mathematical Sciences, University of Delhi.
4. Ruchi Das is Member of Academic Council, University of Delhi.
5. Ruchi Das is Member of Standing Committee on academic matters to the Academic Council, University of Delhi.
6. Ruchi Das is Member of committee constituted by the Competent Authority for preparation of syllabus, books for Indian Knowledge System

(IKS), University of Delhi. 7. Ruchi Das is Co-ordinator of NBHM Library Grant, Department of Mathematics, University of Delhi, Delhi. 8. Tarun Das organized online Refresher Course in Mathematics/ Operational Research/ Statistics and Computer Science on the theme "Algebra, Analysis and Applications" at the Centre for Professional Development in Higher Education (CPDHE), UGC-HRDC, University of Delhi held during 5th February 2024 – 17th February 2024. 9. Sachi Srivastava organized Annual Conference of Indian Women in Mathematics held at IISER Bhopal during July 13-15, 2023. 10. Arvind Patel participated in Industrial Training on data Sciences and artificial Intelligence held at DUCC, Delhi University and Design Tech Systems Pvt. Ltd. during May 18-19, 2023, 11. Arvind Patel participated in Research Data Analysis using SPSS held at DUCC Delhi University and SPSS South Asia during June 14-15, 2023. 12. Arvind Patel participated in Faculty Development Program on Cyber Security, High Performance Computing, AI/ML and GenAI held at DUCC University of Delhi and AWS during October 4-6, 2023. 13. Arvind Patel participated in One week faculty development program on Communication and Presentation skill in Classroom teaching held at DUCC, University of Delhi, Delhi 110007 during Dec.18-22, 2023. 14. Department has prepared UGCF-2022 syllabi of 3rd year (5th & 6th Semester) which is passed by AC & EC. 15. Department got grant of Rs 10 lakhs from National Board of Higher Mathematics (NBHM), Department of Atomic Energy, India (DAE) to purchase books and periodicals. 16. Department organized a talk entitled "Streamlines and Shocks for infinity Laplacian Equations" by Prof. Lawrence C. Evans, University of California, Berkeley USA on March 15, 2024. 17. Department organized a talk entitled "Differential Geometry and Lie Groups in Engineering" by Prof. Ravi N. Banavar, Systems and Control Engineering, IIT Bombay on February 16, 2024. 18. Department organized a talk entitled "Algebras in which nonunits are products of idempotents" by Prof. Surender Kumar Jain, Distinguished Emeritus Professor, Ohio University USA on February 9, 2024. 19. Department organized a talk entitled "Algorithms for Computationally Hard Graph Theoretic Problems" by Dr. Diptapriyo Majumdar, Department of Computer Science and Engineering, Indraprastha Institute of Information Technology, Delhi on February 6, 2024. 20. Department organized a talk entitled "Estimate of Lp-Fourier transform norm for some Lie groups" by Prof. Ali Baklouti, Sfax University, Tunisia on December 15 2023