CELEBRATING CENTENARY

IIT (BHU) VARANASI

DEPARTMENT OF MATHEMATICAL SCIENCES

CONTENTS

INTRODUCTION

- The Department of Mathematical Sciences, established in 1968 as a section supporting the engineering departments at IIT (BHU), played a pivotal role in shaping the engineering education in India.

- In 1985, it evolved into a full-fledged department and now caters to both undergraduate and postgraduate students.

- Since 2005, the department has offered a highly sought-after 5-year Integrated Dual Degree (IDD) program in Mathematics and Computing.

- The program has earned a reputation for attracting top placements from leading multinational companies, reflecting its significance for industrial and software sector growth.

Message from the Head Of Department

Welcome to the Department of Mathematical Sciences at IIT (BHU), Varanasi!

Prof. Subir Das
Head of the Department
Department of Mathematical Sciences
IIT (BHU), Varanasi

Our department is esteemed as one of the premier departments of the Institute and one in the country. Our department provides a vibrant academic ecosystem which nurtures research guidance initiatives and collaborative endeavors besides teaching-learning pursuits with an aspiration to accomplish 360° growth and development of human resource.

The Department offers a 5-year IDD course in Mathematics and Computing, which occupies top position in popularity charts amongst the courses offered by the Institute. In terms of placements also, it is the best in our Institute. Besides, we are leading so far as the basic and advanced courses offered to the undergraduate engineering students are concerned.

The Department hosts Ph.D. programs in various branches of Pure and Applied Mathematics, and we feel happy to say that every semester, nearly 20 research scholars join the PhD programs. The department has, to its credit, more than one hundred publications in reputed journals every year. A number of research projects are being run by the faculty members of the department, funded by various agencies such as BRNS (BARC), DRDO, ISRO, SERB, NBHM to name a few.

As HOD, I warmly invite young talents to contribute as faculty members, undergraduate and postgraduate students, research scholars, and postdoctoral scholars. Your interest in our department and positive suggestions will be highly appreciated, and we hope they will help us to reach the highest level of excellence.

VISION

CENTRE OF EXCELLENCE

The Department of Mathematical Sciences aspires to establish itself as a Center of Excellence in teaching, learning, and research, with a strong emphasis on quality and innovation.

COMMITMENT

We are committed to enhancing our global visibility by producing impactful, fundamental research that not only advances mathematical theory but also provides real-world solutions to interdisciplinary problems.

COLLABORATION

The department seeks to expand collaborative efforts with academic institutions, industry, and research organizations worldwide.

STATISTICS

279

Alumni
(since 2010)

22

Faculty

13

Staff

2

Patents

282

IDD

24

Sponsored Projects
(2021-24)
Value: 2.93Cr

102

PhD
(since 2012)

320

Publications
(2021-24)

ACHIEVEMENTS

PLACEMENTS

- The department boasts a 100% placement record in the IDD program.
- Many students get internship offers from companies and universities abroad.
  - **Maximum CTC:** Rs. 2.2 Cr
    Average CTC: Rs. 40 Lakh
    Median: Rs. 35 Lakh
    (for the year 2024)
- Companies include: Google, Microsoft, Amazon, Adobe

TOP RECRUITERS

Google
Microsoft
Adobe
ITC Limited
Goldman Sachs
IBM
amazon
zomato
A.P.T. ALGORITHMS PROFIT TRUST
ORACLE
Uber
VISA
sprinklr
Jio
SAMSUNG

FACULTY

Prof. Subir Das & Prof. S. Mukhopadhyay: Figured among the top 2% of world scientists in a world database created by Stanford university since the year 2020

In 2010, the department was honored with the **Special Assistance Program (SAP)** grant by the **University Grants Commission (UGC)**, recognizing its excellence in research and development.

Prof. Rakesh Arora: Awarded with Scientific High-level Visiting Fellowships (SSHN-2024) by the French Institute of India and French Embassy of India to visit UPPA, France.

Two faculty members have been elected as **Fellows of the Royal Astronomical Society, London**, highlighting the department's significant contributions to the field of astronomy and mathematics on an international stage.

Faculty members are actively involved in giving seminars and invited/keynote/plenary talks in India and abroad.

SPECIALIZATION

Faculty Specialized:

#1 ALGEBRA, COMBINATRONICS AND NUMBER THEORY

- Coding Theory and Cryptography
- Number Theory
- Graph Theory and Network Science

Dr. Ashok Ji Gupta
Dr. L. Selvaganesh
Dr. Abash Kumar Jha
Dr. Anoop Singh
Dr. S. K. Mishra

#2 ANALYSIS

- Functional Analysis and Operator Theory
- Harmonic Analysis
- Analysis of PDE

Prof. S.K Upadhyay
Prof. M. K. Vemuri
Dr. Sheela Verma
Dr. Divya Goel
Dr. Rakesh Arora

#3 DIFFERENTIAL EQUATIONS

- Ordinary and Partial Differential Equation
- Numerical Analysis
- Dynamical Systems
- Applied Functional Analysis

Prof. L. P. Singh
Prof. S. Mukhopadhyay
Prof. Subir Das
Prof. Rajeev
Prof. V. K. Singh
Prof. R. K. Pandey
Dr. Sunil Kumar
Dr. M. K. Khandelwal

#4 GEOMETRY

- Spectral and Riemannian Geometry
- Differential Geometry
- Algebraic Geometry and Complex Geometry

Prof. M. K. Vemuri
Dr. Sheela Verma
Dr. Anoop Singh

#5 MATHEMATICAL MODELING AND COMPUTING

- Solid and Fluid Mechanics
- Biomathematics
- Heat Transfer
- Image Processing
- Artificial Intelligence

Prof. S. K. Pandey
Prof. S Mukhopadhyay
Prof. Subir Das
Prof. Rajeev
Prof. V. K. Singh
Prof. R. K. Pandey
Dr. M. K. Khandelwal

#6 PROBABILITY, STATISTICS AND OPTIMIZATION

- Probability Theory
- Optimization Theory and Operation Research
- Queuing Theory
- Stochastic Modelling

Dr. Debdas Ghosh
Dr. Anuradha Banerjee
Dr. Amit Kumar

THRUST AREAS

- **Modelling & Simulation:**

Our work in this area involves the development and use of advanced mathematical and computational models to simulate and predict the behavior of complex systems in various scientific and engineering domains.

- **Algebra, Combinatorics, and Number Theory:**

Our work explores how number theory strengthens cryptography, coding theory enhances data security, algebraic geometry supports string theory, and graph theory advances network analysis in social and biological systems, showcasing the profound impact of mathematics on technology and scientific discovery.

- **Differential Equations:**

Our work in this area involves studying the qualitative and quantitative properties of nonlinear and nonlocal DEs via analytical methods, and numerical techniques. Applications extend to fluid dynamics, quantum computing, neural networks, and deep learning, where PDEs help model diffusion processes and optimize training dynamics. This field bridges theoretical and computational approaches, driving advancements in science, engineering, and AI.

- **Probability, Statistics, and Optimization:**

Our work focuses on developing advanced mathematical tools in probability theory, stochastic modeling, and optimization problems. These new tools enhance decision-making and predictive accuracy across diverse fields, including telecommunications, healthcare, finance, and machine learning.

- **Geometry & Analysis:**

We delve into geometrical structures and mathematical analysis, pushing the boundaries of theoretical mathematics and applying these insights to solve real world problems.

FACULTY

Professor

*Hyperlinks to the professors' websites are embedded in their names

Prof. Lal Pratap Singh

Year of PhD Degree: 1987
Areas of Specialization: Nonlinear Waves in Gasdynamics, Computational Fluid Dynamics

Prof. Sanjay Kumar Pandey

Year of PhD Degree: 1998
Areas of Specialization: Bio-mechanics, Fluid Dynamics, Graph Theory, Digital Image Processing

Prof. Santwana Mukhopadhyay

Year of PhD Degree: 1998
Areas of Specialization: Modeling, Heat Transfer and Non-linear Dynamics

Prof. Subir Das

Year of PhD Degree: 1999
Areas of Specialization: Fracture Mechanics, Mathematical Modelling, Nonlinear Dynamics

Prof. Santosh Kumar Upadhyay

Year of PhD Degree: 1993
Areas of Specialization: Wavelet Analysis, Functional Analysis, Pseudo-Differential Operator

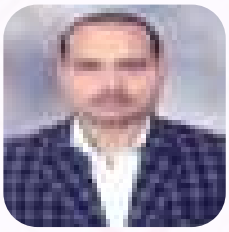
FACULTY

Professor

*Hyperlinks to the professors' websites are embedded in their names

Prof. Murali Krishna Vemuri

Year of PhD Degree: 1997
Areas of Specialization: Harmonic Analysis, Differential Geometry



Prof. Rajeev

Year of PhD Degree: 2009
Areas of Specialization: Moving Boundary Problem, Computational schemes for the parabolic PDE

Prof. Vineet Kumar Singh

Year of PhD Degree: 2009
Areas of Specialization: Computational Approach for Integral and Differential Equations, Numerical Wavelets Analysis

Prof. Rajesh Kumar Pandey

Year of PhD Degree: 2009
Areas of Specialization: Numerical Methods for Fractional Integro-Differential Equations, Image Processing

FACULTY

Associate Professor

*Hyperlinks to the professors' websites are embedded in their names

Dr. Ashok Ji Gupta

Year of PhD Degree: 2003
Areas of Specialization: Theory of Rings and Modules

Dr. Debdas Ghosh

Year of PhD Degree: 2014
Areas of Specialization: Multiobjective Optimization, Interval Optimization, Fuzzy Geometry

Dr. Lavanya Selvaganesh

Year of PhD Degree: 2008
Areas of Specialization: Graph Theory, Network Sciences, Analysis of Complex Networks

Dr. Sunil Kumar

Year of PhD Degree: 2012
Areas of Specialization: Numerical Analysis, Image Processing, Artificial Intelligence

FACULTY

Assistant Professor

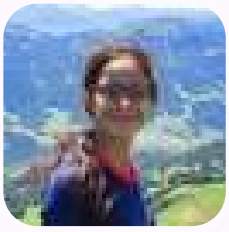
*Hyperlinks to the professors' websites are embedded in their names

Dr. Anuradha Banerjee

Year of PhD Degree: 2012
Areas of Specialization: Stochastic Modelling in Queuing Theory

Dr. Abash Kumar Jha

Year of PhD Degree: 2017
Areas of Specialization: Number Theory, Siegel Modular forms and Jacobi Forms



Dr. Sheela Verma

Year of PhD Degree: 2019
Areas of Specialization: Spectral Geometry, Analysis on Manifolds, Riemannian Geometry

Dr. Divya Goel

Year of PhD Degree: 2020
Areas of Specialization: Analysis of partial Differential equations

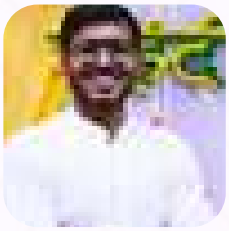
Dr. Anoop Singh

Year of PhD Degree: 2021
Areas of Specialization: Algebraic Geometry, Complex Geometry

FACULTY

Assistant Professor

*Hyperlinks to the professors' websites are embedded in their names



Dr. Rakesh Arora

Year of PhD Degree: 2020
Areas of Specialization: Analysis of Partial differential equations, Functional Analysis

Dr. Amit Kumar

Year of PhD Degree: 2018
Areas of Specialization: Applied Probability

Dr. Manish Kumar Khandelwal

Year of PhD Degree: 2014
Areas of Specialization: Computational Fluid Dynamics, Hydrodynamic Stability Analysis

Dr. Satyendra Kumar Mishra

Year of PhD Degree: 2019
Areas of Specialization: Homological Algebra, (non)-associative algebras, Operads, and homotopy algebras

CONFERENCES & COLLOQUIUMS

(*data from the calendar year 2023-24)

Seminars and Conferences attended by the Faculty	Special Lectures delivered by the Faculty	Short-term workshops conducted by the Faculty	Seminars and Conferences attended by the students
23	36	4	66

SOME PROMINENT CONFERENCES

- *June '23* — GIAN course on Network Sciences and Multi Agent Systems
- *July '23* — National Instructional Workshop on Cryptology (NIWC -2023)
- *July '24* — Recent Advances in Applied Mathematics (RAAM - 2024)

COLLABORATION

Showcasing impactful partnerships that ignite innovations at national and international level

INTERNATIONAL

The department maintains collaborations with institutions, including:

- University of Oxford, UK.
- University of Cambridge, UK.
- National University of Singapore (NUS), Singapore.
- Nanyang Technological University (NTU), Singapore.
- Berlin Mathematical Society(BMS), Germany.
- Max-Planck University, Germany.
- University of Pau, France.
- University of Melbourne, Australia.
- University of Oviedo, Spain.
- University of Waterloo, Canada.
- IFS, Tohoku University, Japan.
- ICAI, Comillas Pontifical University, Spain.

DOMESTIC

- The department collaborates with IITs (Bombay, Madras, Delhi, Kharagpur, Roorkee, Jodhpur, Goa) and leading institutions like TIFR Mumbai, ISI Bangalore, TIFR-CAM Bangalore, CAIR-DRDO, IISERs Pune and Tirupati, Harish-Chandra Research Institute and BHU for advanced research.

MoUs

- A significant MoU has been signed with Kursk State University, Russia, facilitating research collaborations and knowledge exchange.

AWARDS

Global Recognition and Academic Contributions

- Prof. T Som: Organized three International Conferences in 2021, 2022, and 2023 as Organizing Chair and Program Chair.
- Prof. S.K. Pandey: Was awarded the “Prof. T. Pati Memorial Lecture Award” in CONIAPS XXIX at Dehradun, Uttarakhand.

Excellence and Research Fellowships

- Dr. M.K. Khandelwal: SERB Overseas Postdoctoral Fellowship 2016
- Dr. S.K. Mishra: NBHM PhD Fellow 2013; Shyama Prasad Mukherjee Fellow 2013

Fellowships, Memberships, and Professional Society Recognitions

- Prof. L.P. Singh: President of the Mathematical Society, BHU, Varanasi.
- Prof. S.K. Upadhyay: Associate Fellow, the International Academy of Physical Sciences, University of Allahabad, Prayagraj, Uttar Pradesh.
- Dr. A. Gupta: Life member of the Indian Mathematical Society and Cryptology Research Society of India

Lifetime Achievement and Career Contributions

- Prof. S. Mukhopadhyay: Nominated by the Institute as a woman achiever in the Compendium on Women in STEM 2022 and included in the Women Achievers list of the Women in STEM Vanguards of India launched in December 2023.

AWARDS

Educator excellence (Editor in Journals/Magazines)

- Prof. Subir Das: Acting as the Associate Editor for the Journal of Porous Media, STRPM - an international journal and Chinese Journal of Physics.
- Prof. S. Mukhopadhyay: Acting as an Associate Editor for the journals: Mathematics and Mechanics of Solids, Computational Methods in Science and Technology (CMST), Journal of Thermal Stresses

Other Awards or Achievements

- Prof. Subir Das: Conferred the institute for the “Excellence in Teaching Award” for the session 2016-17"
- Dr. Rakesh Arora: Awarded with NBHM travel grant to visit, MATRIX, Melbourne, Australia.
- Dr. Anoop Singh: Received NBHM travel grant to visit Mathematical Institute, University of Oxford, UK

Leadership Roles and Contributions to National Committees

- Prof. S. Mukhopadhyay: Actively contributed as a member of Advisory Committees for the AMSE-2024 at SOA University (July 2024), ICAMS at Mahatma Gandhi Central University (March 2024), and ICAMM at IIT Indore (Oct 2023).

Major achievements in past 10 years

- Prof. S. Mukhopadhyay:. Serving on the Scientific Committee for the 14th International Congress on Thermal Stresses in Hong Kong (June 2-6, 2025).
- Dr. A. Gupta: Introduced finite direct-injective and direct-projective modules, characterized various rings, and analyzed new quantum codes over finite non-chain rings.
- Dr. D. Ghosh: Figured among world 2% scientists in the year 2024
- Dr. R. Arora: Awarded European Doctoral label for the doctoral thesis.

SPONSORED PROJECTS

OVERVIEW

- **Total number** of sponsored projects from 2021 to 2024: **24**
- **Total value** of sponsored projects during 2021-2024: **2.93 crore**
- **Completed** projects: **20**, **Ongoing** projects: **20**

ONGOING PROJECT

Sl. No	Title	PI/Co-PI	Period	Funding Agency	Research Grant
1	Study of Two Dimensional Fractional Order Nonlinear Transport Phenomena Problems in Porous Media.	Prof. S. Das	2022-2025 (3 years)	BRNS – BARC, Government of India	14.84 Lakhs
2	Shape optimization problems for higher Neumann eigenvalues.	Dr. S. Verma	2024-2027 (3 years)	CSIR-ASPIRE grant, India	23 Lakhs
3	Approximation of runs in multi-state trials with appropriate distributions.	Dr. A. Kumar	2024-2027 (3 years)	MATRICS - SERB, Government of India	6.6 Lakhs
4	Certain space of cusp forms spanned by eta quotients and application.	Dr. A. K. Jha	2023-2026 (3 years)	MATRICS - SERB, Government of India	6.6 Lakhs
5	Non-smooth Optimization and Duality Theory Under Variable Dominance and Interval Uncertainty.	Dr. D. Ghosh	2023-2026 (3 years)	CRG – SERB, Government of India	27.47 lakhs
6	Approximation Methods for Generalized Sturm-Liouville Problems.	Prof. R. K. Pandey	2023-2026 (3 years)	MATRICS - SERB, Government of India	6.6 Lakhs
7	Adaptive Computational Approach for Riesz Fractional Advection Dispersion Wave Equations.	Prof. V. K. Singh	2023-2026 (3 years)	CRG – SERB, Government of India	21.67 Lakhs
8	Wavelets Adaptive Schemes for Tumor Growth Models.	Prof. V. K. Singh/ Prof. S. Das	2023-2026 (3 years)	CSTUP, Government of Uttar Pradesh	11.44 Lakhs
9	Instability mechanism of magnetohydrodynamic non-isothermal Annular Poiseuille flow: A numerical study.	Dr. M. K. Khandelwal	2023-2026 (3 years)	ANRF – SERB, Government of India	6.6 Lakhs
10	Investigation of size effects on vibration and thermoelastic damping in Nano-electromechanical systems (NEMS) of piezoelectric materials.	Prof. S. Mukhopadhyay	2023-2025 (2 years)	MATRICS - SERB, Government of India	6.6 Lakhs

SPONSORED PROJECTS

Sl. No	Title	PI/Co-PI	Period	Funding Agency	Research Grant
11	Study of runs in multi-state trials.	Dr. A. Kumar	2022-2025 (3 years)	SRG – SERB, Government of India	14.71 Lakhs
12	Motives and algebro-geometric invariants of certain moduli spaces of Connections.	Dr. A. Singh	2022-2025 (3 years)	SRG – SERB, Government of India	14.71 Lakhs
13	Mixed local-nonlocal double-phase elliptic and parabolic problems.	Dr. R. Arora	2022-2025 (3 years)	SRG – SERB, Government of India	14.71 Lakhs
14	A Numerical Study of Some Non-classical Diffusion/Heat Equations With Free Boundaries.	Prof. Rajeev	2022-2025 (3 years)	MATRICS - SERB, Government of India	6.6 Lakhs
15	On Developing Polynomial-time Interior-Point Methods for Robust Multiobjective Convex Optimization Problems.	Dr. D. Ghosh	2022-2025 (3 years)	MATRICS - SERB, Government of India	6.6 Lakhs
16	Study and Analysis of Interfacial cracks in composite media.	Prof. S. Das	2022-2025 (3 years)	NBHM, DAE, Government of India	
17	Wavelets Adaptive Schemes for Singular Integral Equations.	Prof. V. K. Singh	2022-2025 (3 years)	MATRICS - SERB, Government of India	6.6 Lakhs
18	Efficient layer adapted methods for parabolic interface problems with Boundary and interior layers.	Dr. S. Kumar	2024-2027 (3 years)	CRG – SERB, Government of India	21 Lakhs
19	Development of Cryptographically efficient lightweight MDS matrices And its extension to code based PQC.	Dr. A. J. Gupta	2022-2025 (3 years)	DRDO, Government of India	23.10 Lakhs
20	Globally supported radial basis function based fractional order mesh free fast algorithms for image denoising and enhancement.	Prof. R. K. Pandey	2025-2028 (3 years)	RAC-S-ISRO, Govt. of India	22.55 Lakhs

Click here *to view the list of completed and ongoing projects.*

PUBLICATIONS

More than 300 publications, *in Last 4 years*

Overview

- Total No. of **Publications**: more than **320** (SCI/Scopus Indexed)
- 2021: **63**
- 2022: **83**
- 2023: **114**
- 2024: **51**

No. of Books/Monographs: **10** (Published)

Journals

- Total number of papers published in refereed International journals: 120
- Total number of papers published in refereed National journals: 1
- Total number of papers presented in National conferences: 1
- Total number of papers presented in International conferences: 2

Patents

- **System & Method For Determination Of Crack Progression (Patent no.: 527489) -** By Subir Das, P.K. Mishra and N. Srikanth**; Govt. of India Patent,** Date of Filing: 03.04.2017; Date of Grant: 15.03.2024 (valid for 20 years)
- **System For Predicting Anti-Tubercular Peptides From Sequence Information Using Divergence Measure-Based Intuitionistic Fuzzy-Rough Feature Selection -** By Pankhuri Jain, Tanmoy Som, Anoop Kumar Tiwari; **Australian Innovation** Patent for on 16.03.2021 (valid for 8 years).

FUTURE PLANS

At the Department of Mathematical Sciences, IIT BHU, we are committed to advancing the frontiers of research and education by focusing on fostering **innovation**, **collaboration**, and **growth**.

Restructure the 5-year IDD (B.Tech-M.Tech) program to align with industry standards and interdisciplinary advancements.

Introduce an Integrated M.Sc.-Ph.D. Program in Mathematical Sciences.

Modernize Ph.D. courses by incorporating emerging trends in mathematics and applied sciences.

Develop interdisciplinary courses integrating mathematics with computer science, physics, and biological sciences.

Offer new specializations in data science, mathematical modeling, and financial mathematics.

Expand online and hybrid learning for increased accessibility.

Establish dedicated research groups in AI, Computational Mathematics, and Mathematical Physics.

Foster industry and institutional collaborations for real-world problem-solving and research funding.

Organize annual international conferences and workshops to encourage knowledge exchange and innovation.

Enhance post-doctoral support with funding, mentorship, and research facilities.

Upgrade research facilities and implement smart classrooms for a modern learning environment.

Recruit distinguished faculty and provide continuous training in modern pedagogical methods.

Strengthen internships, industry collaborations, and mentorship programs for better student career prospects.

Expand community outreach and global engagement through Olympiads, exchange programs, and public lectures.

Encourage student-led initiatives like mathematical clubs and societies to foster academic engagement and alumni networking.

STUDENT EVENTS

Events organised by MACS

Codemat - Competitive programming contest designed by students, this is usually a rated contest on CodeChef.

Guidance sessions by mentors from various fields, this events would be targeted for first and second yearites

Two newsletter for this session, one after each semester featuring department achievements, publications and mathematics and computer science articles written by students.

MACS Night - A night where students can showcase their talent, be it dance, music, standup or something else, followed by speeches from professors. To be followed by dept dinner.

MACS Sports Week- A week-long event featuring a range of indoor and outdoor sports activities across all the years of the Mathematics dept.

GALLERY

This document has been created by the
Public Relations Cell Team

PUBLIC RELATIONS CELL
IIT (BHU), VARANASI

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