Abhay Kumar Singh

Professor, Department of Mathematics & Computing, IIT (ISM), Dhanbad

PIC, Quantum Computing Centre, IIT (ISM), Dhanbad

Contact Information

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Date of Birth August 24, 1981

Marital Status Married

Citizenship Indian

Research Interests

- Quantum Coding
- Coding Theory
- Post-Artificial Intelligence Cryptography
- Post-Quantum Cryptography

Experience

Professor **April 20, 2026 - Present**
Department of Mathematics & Computing,
Indian Institute of Technology (ISM), Dhanbad, India

Associate Professor **April 12, 2021 - April 19, 2026**
Department of Mathematics & Computing,
Indian Institute of Technology (ISM), Dhanbad, India

Visiting Associate Professor **Sept 01, 2023 - Sept 30, 2023**
Quantum Computing Research, School of Computing and Information System,
University of Melbourne, Australia

Visiting Associate Professor **May 19, 2022 - July 18, 2022**
Department of Mathematics & Computing,
Vietnam Institute for Advanced Study in Mathematics, Hanoi, Vietnam

Assistant Professor **July, 2010 - April, 2021**
Department of Mathematics & Computing,
Indian Institute of Technology (ISM), Dhanbad, India

Assistant Professor **September, 2009 - June, 2010**
Department of Mathematics,
Mahatma Gandhi Kashi Vidyapith, Varanasi, India

Lecturer **March, 2007 - August, 2009**
Department of Mathematics,
UIET, CSJM University Kanpur, India

Education

Ph.D. **2007**
Indian Institute of Technology (Banaras Hindu University),
Varanasi, Uttar Pradesh, India Dissertation Topic: *"Characterization of Compressible Modules, Clean Rings and study of the properties of such Modules related with Injectivity"*

M.Sc., Mathematics **2002**
Banaras Hindu University,
Varanasi, Uttar Pradesh, India
First Division

International Research Collaboration and Funding

- Guided two Ph. D. students jointly with **Prof. Hai Q. Dinh, Kent State University, Ohio, USA**.
- Jointly guided an integrated M.Tech student, Vatsal Jha, with **Prof. Udaya Parampalli, Melbourne University, Australia** on Quantum Coding.
- Offered visiting position in summer 2019 at **Telecom Paris Tech, France** with monthly stipend 2500 Euro per month.
- **Visiting Associate Professor, Vietnam Instiute for Advance Study in Mathematics, Hanoi, May 17, 2022 to July 16, 2022**.
- **Visiting Associate Professor, Department of CSE, University of Melbourne, Australia. Sept. 1 to Sept. 30, 2023**.

Awards / Scholarships

- **CSIR-JRF (NET)**
  Mathematical Sciences 2005
- **CSIR-UGC (NET)**
  Mathematical Sciences 2004
- **Graduate Aptitude Test for Engineering(GATE)**
  Mathematics, IIT Madras 2003

Sponsored Research Project

CSS construction with Symbol-pair Metric over Finite Field **Completed**
Metrics funding scheme of *March 2022- March 2025*
Science and Engineering Research Board, Department of Science & Technology
Grant Amount: 6.6 Lakhs INR

Design and Analysis of Code-based Public-Key Cryptosystem **Completed**
Defense Research and Development Organization *July 2022- December 2024*
Grant Amount: 49.90 Lakhs INR

Symbol-Pair Codes over Finite Rings **Completed**
Extramural Research (EMR) funding scheme of *2017-2020*
Science and Engineering Research Board, Department of Science & Technology
Grant Amount: 15.32 Lakhs INR

Compressible Modules and their Application **Completed**
National Board for Higher Mathematics, Department of Atomic Energy *2017-2020*
Grant Amount: 3.53 Lakhs INR

Characterization of Clean Rings **Completed**
FRS Scheme, *2010-2013*
Indian Institute of Technology (ISM), Dhanbad
Grant Amount: 3.90 Lakhs INR

Clean Rings and Their Application **Completed**
University Grant Commission, New Delhi *2009-2010*
Grant Amount: .95 Lakhs INR

Invited Lectures

- 2026, November 11: Delivered a two-hour invited lecture on "Post Quantum Cryptography", Faculty Development Programme on "ISEA Phase III: Short-Term Course on Mathematical Foundation on Number Theory and Cryptography, Department of Computer Science and Engineering, IIT (ISM), Dhanbad
- 2026, October 06: Delivered an invited lecture on "Function-Correcting Codes: A New Coding Framework", Punjab Engineering College (Deemed to be University), Chandigarh.
- 2026, October 05: Delivered an invited lecture on "Function-Correcting Codes: A New Coding Framework", Himachal Pradesh University, Shimla.
- 2026, August 31: Delivered a two-hour invited lecture on "Introduction and Classical Cryptography", Faculty Development Programme on "Cryptography and Security Applications: Classical to Post-Quantum", under the ISEA Project Phase III, Department of Computer Science and Engineering, IIT (ISM), Dhanbad.
- 2026, August 13: Delivered an invited talk on "Post-Quantum Cryptography for IoT Security: A Comprehensive Review of Emerging Threats and Solutions", Faculty Development Programme, Electronics & ICT Academy, IIT Roorkee.
- 2026, July 30: Delivered an invited talk on "Post-Quantum Cryptography for IoT Security: A Comprehensive Review of Emerging Threats and Solutions", Faculty Development Programme, Electronics & ICT Academy, IIT Roorkee.
- 2026, July 18: Delivered an invited talk on "Function-Correcting Codes: A New Coding Framework", Centre for Interdisciplinary Mathematical Sciences (CIMS), Banaras Hindu University, Varanasi.
- 2026, July 06: Delivered an invited talk on "Bounds in Coding Theory", Faculty Development Programme, Hansraj College, University of Delhi.
- 2026, June 22: Delivered an invited talk on "AI for Coding Theory", Online Faculty Development Programme on "Next Gen NLP: LLM and Generative AI Models", organized by Electronics & ICT Academy in association with Gandhi Institute of Engineering and Technology University, Gunupur, sponsored by the Ministry of Electronics and Information Technology (MeitY), Government of India.
- Delivered an Invited Talk entitled "Function-Correcting Codes: A New Coding Framework" at the International Conference on Artificial Intelligence, Mathematical Sciences and Statistical Data Science (AIMSSDS-2026), held during February 4–6, 2026, at the School of Mathematics, Statistics and Computer Science, Central University of South Bihar, Gaya, India.
- Delivered a Six-Hour Invited Lecture at the Mathematical Nurture Program for Undergraduates for North Eastern Students, organized by the National Institute of Technology (NIT) Nagaland in association with Kohima Science College, during January 19–23, 2026
- Delivered an Invited Talk in the symposium entitled "Cryptography: Mathematical Foundations, Algorithmic Design Security Paradigms" at the First Indo-European Conference on Mathematics, held during January 12–16, 2026, in Pune, India.
- 2025, June 27: Delivered lectures on Overview of Code-based Cryptography in PQC workshop, IIT Dhanbad.
- Delivered an Invited Talk entitled "Symbol-Pair Codes" at the International Conference on Mathematical Sciences and Computing, Innovation and Applications (ICMSC-2025), held on June 26–28, 2025, as part of the International Symposium on Rings, Modules, Algebras and Their Applications.
- 2025: Delivered 40 hours of lectures for IPM students at IIM Rohtak.
- 2024, December 27: Delivered lectures on Coding Theory at IIT Patna.
- 2024, September 26: Delivered a lecture on CSS construction for the Symbol-Pair Metric at the Joint Workshop on Coding Theory, IIT Bombay and Virginia Tech, USA.
- 2023, September 26: Delivered a lecture on Symbol Codes, Department of Computer Science and Engineering, University of Melbourne, Australia.
- 2023, September 22: Delivered a lecture on b-Symbol Codes, Department of Mathematics, RMIT University, Australia.
- 2023, September 20: Delivered a lecture on Symbol Codes, Department of Computer Science and Engineering, Monash University, Australia.
- 2022, May 24: "An Overview of Code-Based Cryptography", Algebra with Applications Seminar, Department of Mathematics, Aligarh Muslim University, Aligarh (Invited Speaker).
- 2022, February 01–07: "Code-Based Post-Quantum Cryptography", 20-hour lecture series for Code-Based Post-Quantum Cryptography training, Department of Research and Defence Organisation (Invited Speaker).
- 2021, November 16: "Linear Algebra for Quantum Computing and Quantum Information", Refresher Course on "Advances in Mathematical and Physical Sciences", UGC-Human Resource Development Centre, Doctor Harisingh Gour Vishwavidyalaya, Sagar, Madhya Pradesh (Invited Speaker).
- 2021, October 06: "Post-Quantum Cryptography", National Workshop on Computational Intelligence

and Blockchain Technology, National Institute of Technology Raipur (Expert Lecture).

- 2021, August 13: "Codes over Finite Fields: Applications", Five-Day Webinar on "Stability Analysis and Cryptography in Engineering", Department of Mathematics, KPR Institute of Engineering and Technology, Coimbatore (Invited Speaker).
- 2021, April 28–May 02: "Overview of Code-Based Cryptography", E-Workshop on Recent Trends in Information Security and Blockchain Technology, Department of Mathematics and Scientific Computing, NIT Hamirpur (Invited Speaker).
- 2020, December 23: "Finite Fields, Coding and Their Applications", Faculty Development Programme on "Applications of Algebra and Number Theory in Network Security", Mahatma Hansraj Faculty Development Centre, Hansraj College (Invited Speaker).
- 2020, December 14–19: "Challenges and Applications of Cyber-Physical Systems", AICTE Sponsored STTP 2020, GIET Gunupur (Invited Speaker).
- 2018, June 07: "Symbol-Pair Constacyclic Codes over Finite Fields", ADMA 2018, IIT Gandhinagar (Invited Speaker).
- 2017, December 13–17: "DNA Cyclic Codes", Short-Term Course on Coding Theory and Cryptography, IIT (ISM), Dhanbad (Invited Speaker).
- 2017, June 15: "Symbol-Pair Codes over Finite Fields", SAG, DRDO, New Delhi (Invited Speaker).
- 2017, May 17: "A Course on Linear Algebra", Faculty Development Centre, IIT (ISM), Dhanbad (Invited Speaker).
- 2012, May 28: "An Introduction to Real Analysis", Undergraduate Training Program on Linear Algebra and Real Analysis (DST), IIT (ISM), Dhanbad (Invited Speaker).
- 2010, February 21: "Uniquely Clean Ideals", Conference on Algebra and its Application, **Aligarh Muslim University, Aligarh**. (Paper Presented)
- 2007, December 30: "Essentially Slightly Compressible Modules and Rings", Annual Conference of **BHU, Varanasi**. (Paper Presented)

Teaching Experience

University Level Courses Taught:

- Cryptography
- Calculus
- Complex Analysis
- Vector Calculus & its Application
- Algebra I
- Algebra II
- Linear Algebra
- Real Analysis
- Information & Coding Theory
- Quantum Computing
- Post-Quantum Cryptography

Ph.D. Students Supervised:

- 2017: Shiv Kumar
- 2017: Amrit Kumar Mahato
- 2018: Sukhamoy Pattanayak
- 2020: Pratyush Kumar
- 2020: Narendra Kumar
- 2022: Sampurna Satpati
- 2022: Madhu Kant Thakur
- 2022: Pooja Mishra (Co-Supervised)(CSE Dept)
- 2024: Ekta Bindal

Ph.D. Students (In Progress):

- 2021-: Mrinal Kanti Bose (Thesis Submitted)
- 2023-:Anamika Singh
- 2024-: Anubhav Tiwari
- 2024-: Chiranjeev Bhaya,(Jointly with CSE Dept)
- 2025-: Adarsh Nishad
- 2025-: Anshumani

- 2025-: Vibhav Kumar(Jointly with CSE Dept)
- 2025-: Neha Srivastava (Jointly with CSE Dept)

Masters Students (Guided):
- M.Tech: 28
- M.Sc: 30

Review Duty

Reviewer of
- Cryptography and Communications Discrete Structures, Boolean Functions and Sequences - Springer
- Journal of Applied Mathematics and Computing - Springer
- Applicable Algebra in Engineering, Communication and Computing - Springer
- Information Sciences - Elsevier
- Journal of Algebra Combinatorics Discrete Structures and Applications
- Discrete Mathematics, Algorithms and Applications - World Scientific
- Turkish Journal of Mathematics
- IEEE Communication Letter
- IEEE Transactions on Information Theory
- Designs, Codes and Cryptography
- Discreet Mathematics
- Indian Journal of Pure and Applied Mathematics
- International Journal of Theoretical Physics
- Finite Fields and Their Applications

Administrative Responsibilities
- Professor in charge of Quantum Computing Center
  2022-till date
- Hostel Warden
  2011-2014
- Co-ordinator of M.Sc.(Mathematics & Computing)
  2013-2022
- Faculty Mentor of 1st year B.Tech
  Batch: 2017-18, 2018-19
- Member of Departmental Budget Committee
- Invigilation Duty In-charge of Departmental Semester Examination
- Member of DUGC
  2018 - 2022
- Member of DPGC
  Since 2022

Academic Resposiblities outside IIT(ISM) Dhanbad
- Examiner of PhD Thesis of IITs, NITs, IIITs, Central Universities. and many state universities across the country.
- Expert member of selection committee for faculty position at IIIT Ranchi, IIIT Bhopal, IIIT Vadodara, and F M University, Balasore.
- Member, Academic Council JNU New Delhi
- Expert Member of Project evaluation and approval committee in Physical Science, UP CST.