

Curriculum Vitae

Bikash Bhattacharjya

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Personal Details

Date of Birth: 12th February, 1979.

Gender: Male

Marital Status: Married

Nationality: Indian

Employment and Education

Professor, since 11th December 2024
Department of Mathematics, IIT Guwahati

Associate Professor, 22nd April 2017 - 10th December 2024
Department of Mathematics, IIT Guwahati

Assistant Professor, 7th October 2009 - 21st April 2017
Department of Mathematics, IIT Guwahati

Research Associate, January 2009 -- September 2009
Department of Mathematics and Statistics, IIT Kanpur

Ph.D Mathematics, 2009
Indian Institute of Technology Kanpur
Thesis Title: *On some Graph Labelling Problems*
Advisor: Professor Arbind Kumar Lal

M.Sc. Mathematics, 2002
Gauhati University, Assam, India

B.Sc. (Honors) Mathematics, 2000
Nalbari College, Nalbari, Assam, India

Awards and Supports

- **Conference Travel Grant**, National Board for Higher Mathematics, 2013.
- **Post-doctoral Fellowship** by ICTP Trieste Italy during 2010 (could not avail).
- **Post-doctoral Fellowship** by NBHM during 2009 (could not avail).
- **Conference Travel Grant**, IIT Kanpur, 2007.
- **Senior Research Fellowship**, Department of Mathematics and Statistics, IIT Kanpur, August 2005 -- October 2008.
- **Junior Research Fellowship**, Department of Mathematics and Statistics, IIT Kanpur, August 2003 -- July 2005.

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Other Qualifications

- Qualified National Eligibility Test for Lectureship [**NET**] (conducted by CSIR), 2002.
- Qualified Graduate Aptitude Test in Engineering [**GATE**] in Mathematics, 2003.

Research Interests

Algebraic Graph Theory

Short and Long-term Research Plan

My short and long-term research plan is mostly in and around the study of quantum walks on graphs. In particular, my focus is in the study of perfect state transfer (PST) and a few related phenomenon in graphs and mixed graphs associated to algebraic structures such as Cayley graph, bi-Cayley graph and power graph of finite groups, zero-divisor graph and square element graph of finite commutative rings etc.

In the past, we have explored the existence of PST and PGST in circulant graphs, gcd-graphs etc. An extensive knowledge of the eigenvalues of a graph (of the concerned matrix) is inevitable in the study of quantum walks. In particular, we emphasized to understand the situations when such eigenvalues are integers. In the past, we investigated and explored when H-eigenvalues and HS-eigenvalues of some classes of mixed Cayley graphs are integers. Such understanding of integral eigenvalues of mixed Cayley graphs would play an important role in the investigation of PST and PGST in mixed Cayley graphs.

Publications

1. *Quantum walks on blow-up graphs* (with H. Pal and H. Monterde)
Journal of Physics A: Mathematical and Theoretical, 57 (2024), 335303.
2. *On spectra of Hermitian Randic matrix of second kind* (with A. Bharali, S. Borah, I. J. Gogoi)
Journal of Algebraic Systems, 2024.
3. *H-integral and Gaussian integral normal mixed Cayley graphs* (with Monu Kadyan)
Discrete Mathematics, 346(12), (2023), 113638.
4. *Switching equivalence of Hermitian adjacency matrices of mixed graphs* (with Monu Kadyan)
Australasian Journal of Combinatorics, 85(3), (2023), 228-247.
5. *On the rna number of generalized Petersen graphs* (with Deepak)
Communications in Combinatorics and Optimization, [10.22049/cco.2023.27973.1408](https://doi.org/10.22049/cco.2023.27973.1408).
6. *HS-integral and Eisenstein integral mixed circulant graphs* (with Monu Kadyan)
Theory and Applications of Graphs, 10(1), (2023), #A3.
7. *Integral mixed circulant graphs* (with Monu Kadyan)
Discrete Mathematics, 346(1), (2023), 113142.
8. *HS-integral and Eisenstein integral mixed Cayley graphs over abelian groups* (with M. Kadyan)
Linear Algebra and its Applications, 645 (2022), 68-90.
9. *Chromatic Polynomials of Signed Book Graphs* (with Deepak)
Theory and Applications of Graphs, 9(1), (2022), #A4.

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10. *Integral mixed Cayley graphs over abelian groups* (with Monu Kadyan)
The Electronic Journal of Combinatorics, 28(4) (2021), #P4.46.
11. *Non-isomorphic Signatures on Some Generalised Petersen Graph* (with Deepak)
Electronic Journal of Graph Theory and Applications, 9(2), (2021), 235-255.
12. *Signed complete graphs on six vertices and their frustration indices* (with Deepak)
Advances & Applications in Discrete Mathematics, 24(2), (2020), 129-142.
13. *Some Bounds on the Double Domination of Signed Generalized Petersen Graphs and Signed I-Graphs* (with Deepak)
Indian J. of Disc. Math., 5(2), (2019), 63-75.
14. *Maximum Frustration in Signed Generalized Petersen Graphs* (with Deepak)
Indian J. of Disc. Math., 5(2), (2019), 77-93.
15. *Pretty Good State Transfer on Circulant Graphs* (with Hiranmoy Pal)
The Electronic Journal of Combinatorics, 24(2) (2017), #P2.23.
16. *Pretty Good State Transfer on Some NEPS* (with Hiranmoy Pal)
Discrete Mathematics, 340 (4) (2017), [746-752](#).
17. *Perfect State Transfer on gcd-graphs* (with Hiranmoy Pal)
Linear and Multilinear Algebra, 65 (11) (2017), 2245-2256.
18. *A class of gcd-graphs having Perfect State Transfer* (with Hiranmoy Pal)
Electronic Notes in Discrete Mathematics, 53 (2016), 319-329.
(Proceedings of International Conference on Graph Theory and its Applications Dec 16 - Dec 19, 2015, Amrita School of Engineering, Coimbatore.)
19. *Perfect State Transfer on NEPS of the path on three vertices* (with Hiranmoy Pal)
Discrete Mathematics, 339 (2) (2016), [831-838](#)
20. *On the magic space of locally finite graphs* (with AK Lal)
Ars Combinatoria, 104 (2012), [41 - 64](#).
21. *Breaking the symmetries of the book graph and the generalized Petersen graph* (with AK Lal)
SIAM Journal of Discrete Mathematics, [23 \(3\) \(2009\)](#), 1200 - 1216.
22. *On the existence of constrained labelling of locally finite graphs* (with AK Lal)
Congressus Numerantium 187 (2007), 132 - 144.
(Proceedings of the 38 Southeastern International Conference on Combinatorics, Graph Theory and Computing, Mar 5- Mar 9, 2007, Florida Atlantic University, USA)

Research Projects

- **A Study of Randic Matrix and ABC Matrix of Graphs**, TARE, SERB, Amount: 7,50,000/- (with Prof. Ankur Bharali, Dibrugarh University), (2021-2024).
- **State transfer on graphs of groups, rings and partial Cartesian products**, MATRICS, SERB, Amount: 6,00,000/-, (2022-2025).

Resource Person / Invited Talk / Contributory Talk

A. International

- Paper Presented, **EUROCOMB'23, Prague, Czech Republic**, (Charles University), 28 August - 01 September 2023.
- Contributory talk, **The 8th Gdansk Workshop of Graph Theory, Sopot, Poland**, (Univ. of Gdansk, Gdansk Univ. of Tech., and Fahrenheit Univ.), 26 - 30 June 2023.
- Contributory talk, **Rocky Mountain Math. Consortium Summer School 2013 on Algebraic Graph Theory, University of Wyoming, USA**, 2013.
- Invited talk, **International Conference on Graph Theory and its Applications, Amrita College of Engineering, Coimbatore, India**, December 16-19, 2015.

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- Invited talk, **International Conference on Frontiers in Mathematics**, Gauhati University, India, March 26-28, 2015.
- Paper presented in the **38-th Southeastern International Conference on Combinatorics, Graph Theory and Computing**, held at **FAU, USA**, 2007.

B. National

- Invited talk, **Conference in the Memory of Prof. P. Dutt, Prof. A. K Lal and Prof. S. Dutta**, Dept. of Maths. & Stats., IIT Kanpur, 05 - 07 Nov 2022.
- Invited Lecture for "**National Mathematics Day Celebration** (Offline)" in Royal Global University, Guwahati, 22 Dec 2021.
- Invited Lecture for "**Enrichment Lecture Series** (Online)" in USTM, Meghalaya, 04 Oct-30 Nov 2021. [Lecture delivered on 9th Dec 2021]
- Invited Lecture for "**Three Days National Level Online Workshop on Mathematics for UG & PG Students** (Online)" in USTM, Meghalaya, 28-30 June 2021.
- TEQIP III Lectures for "**Faculty Development Programme**" in BBEC, Kokrajhar, 23 Aug, 2019.
- TEQIP III Lectures for "**Linear Algebra and its Applications to Engineering Sciences**" in DUIET, Dibrugarh, during 12 -- 13 Aug, 2019.
- Special Class of **Graph Theory and Combinatorics**, Tripura Institute of Technology, Narsingarh, Tripura, during 21 -- 23 Sept, 2016.
- Invited talk, **Mathematics: Journey through the ages, motivation and applications**, at **Chaygaon College**, *High School Teachers' Training Prog.*, Aug 22, 2013.
- Paper presented in the **Open House 2008 at the Department of Mathematics and Statistics, IIT Kanpur**, 2008.
- Paper presented in the **Open House 2007 at the Department of Mathematics and Statistics, IIT Kanpur**, 2007.

C. Outreach Activities

- **InitMath Programme 2024**, held at Mizoram University and supported by NBHM, India, 8 July - 13 July, 2024.
- **Academic Expert Guidance Talk**, Nalbari College, 22nd March, 2024.
- **Teachers Training Program for High School Teachers of Meghalaya**, organized by IITG and Government of Meghalaya, March 4, 12, 16, 20, 25, 29, 2024.
- **Teachers Training Program for High School (10th) Teachers of Assam**, organized by IITG and Government of Assam, 30 Nov -- 05 Dec, 2023.
- **A Motivating Lecture to Inculcate Scientific Temper among Students**, Srinivas Academy, Jagiroad, Assam, 13th October, 2022.
- **Mathematics Training and Talent Search Program 2018 (MTTS)** held at IIT Guwahati and supported by NBHM, India.
- **Summer Training Camp for Undergraduate Students**, organized by Department of Mathematics, IITG, during 03 July -- 14 July, 2017.
- **Teachers Training Program for High School (10th) Teachers**, organized by IITG and RMSA, Assam, during 27 June -- 08 July, 2016.
- **Short term Course on Higher Secondary Mathematics**, organized by Girijananda Chowdhury Institute of Management and Tech., Guwahati, 20 - 24 June, 2016.
- **Teachers Training Program for High School (10+2) Teachers**, organized by IITG and RMSA, Assam, during 04 -- 09 January, 2016.
- **Mathematics Training and Talent Search Program 2014 (MTTS)** held at IIT Guwahati and supported by NBHM, India.

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- **Mathematics Training and Talent Search Program 2012 (MTTS)** held at IIT Guwahati and supported by NBHM, India.
- **Training Program for Regional Mathematics Olympiad and Mathletics**, held at Gauhati University and Pathsala, January 2012.
- **Excursion in Mathematics** held at NIT Silchar, Organized by Assam Academy of Mathematics and supported by NBHM, June 30 - July 5, 2011.
- **Training Program for Regional Mathematics Olympiad and Mathletics**, held at Nowgong College, 2002.

Conference/Workshop Organized

- **38th Annual Conference of Ramanujan Mathematical Society**, 22 - 24 December 2023.
- KIC-TE QIP Workshop on **Mathematical Analysis and its Applications to Engineering** supported by Center for Educational Technology, IIT Guwahati, during 2 - 4 January, 2016.

Conference/Workshop Participation

- **Workshop on Algebraic Graph Theory and Quantum Information (Online)**, The Fields Institute, Toronto, Canada, August 23 - 27, 2021.
- **Rocky Mountain Mathematics Consortium Summer School 2013 on Algebraic Graph Theory**, at University of Wyoming, USA.
- Workshop on **Harmonic Analysis on Symmetric Spaces** sponsored by NBHM, held at ISI Bangalore, 2004.

Other Academic Responsibilities

I have served as referee for research articles for the following journals

- **Discrete Mathematics**
- **Linear and Multilinear Algebra**
- **Linear Algebra and its Applications**
- **The Art of Discrete and Applied Mathematics**
- **Mathematical Reviews/MathSciNet**

Administrative Responsibilities

- **Faculty Advisor**, M.Sc (M&C) 2024 batch.
- **Member, DUPC**, Department of Mathematics, IIT Guwahati, February 2024 onwards .
- **Member, Alumni & External Relations Committee**, Department of Mathematics, IIT Guwahati, April 2022-January 2024.
- **Member, DPPC**, Department of Mathematics, IIT Guwahati, January 2020-January 2022.
- **Member Secretary**, Departmental Postgraduate Programme Committee (DPPC), January 2018 - 15th January 2020.
- **Coordinator**, NBHM Regional Library, August 27, 2013 - December 2017.
- **Preparatory Coordinator**, Session 2015 - 2016, starting from August, 2015.
- **Faculty Advisor**, M.Sc (M&C) 2013 batch.
- **Department Representative, Institute Time Table Committee**, *October 2010 - August 2013.*

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PhD Students

- **Koushik Bhakta** (ongoing)
- **Akash Kalita** (ongoing)
- **Monu Kadyan** (Thesis Title: Integral Mixed Cayley Graphs)
- **Deepak** (Thesis Title: A Study of Some Parameters in Signed Graphs)
- **Hiranmoy Pal** (Thesis Title: State Transfer on NEPS and Cayley Graphs)

Post-Doctoral Fellow

- **Dr. Parveen** (ongoing)

M.Sc./B.Tech Project Supervision

- **Mr. Ankeshwar Suketh (B.Tech)** (ongoing).
- **Mr. Tanmay Bhatnagar (B.Tech)** (ongoing).
- **Mr. Krishnamoorthi V** (Flows in Networks, 2024).
- **Mr. Ayush Sanwal (B.Tech)** (Dynamics of Matchings in Graph Theory, 2024).
- **Mr. Monu Sahite** (Symmetry and Regularity, 2023).
- **Mr. Subrata Das** (Colouring Problems in Graphs, 2023).
- **Mr. Nikhil Kumar Pandey (B.Tech)** (Graph Theory, 2023).
- **Mr. Mantu Bhue** (Matchings and Factors, 2022).
- **Mr. Anit Ghosh** (Planar Graphs, 2022).
- **Mr. Abhijeet Das** (Vertex Colouring of Graphs, 2021).
- **Ms. Muskan Agarwal** (A Study of Ramsey Theory, 2021).
- **Ms. Shreya Jain** (Chromatic Polynomials and Graph Expansions, 2020).
- **Mr. Satyanistha** (Introduction to Graphs and Cubes, 2018).
- **Ms. Sayani Saha** (A Study of Planar Graph, 2016).
- **Mr. Prabhakar Namdev** (A Study of Web Graph, 2016).
- **Mr. Deepak** (A Study of Transitive Graphs, 2015).
- **Ms. Suchismita Patra** (A Study of Network Flow, 2014).
- **Mr. Sandipan Dutta** (Automorphism Group of Graph, 2014)..
- **Mr. Palas Mandal** (Incidence and Adjacency Matrices of Graphs, 2013).
- **Mr. Bhaskar Jyoti Das** (Graph and its Adjacency Matrices, 2011).

Summer Internship Student

- **Mr. Kuldeep Sarma** (Tezpur University, 2013).
- **Mr. Pranjal Pratim Borgohain** (Tezpur University, 2013).
- **Ms. Tribenee Gogoi** (Tezpur University, 2014).
- **Ms. Srimona Sarkar** (Hans Raj College, Delhi University, 2014).
- **Ms. Abheesa Gautam** (Miranda House, Delhi University, 2014).
- **Mr. Satyabrata Jana** (IIT Bhubaneswar, 2014).

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Teaching Experiences

Courses Taught at IITG

1. **MA421/MA502: Graph Theory** (M.Sc/B.Tech Elective)
Jan-April 2010, Jan-April 2011, Jan-April, Jan-April 2014, Jan-April 2016, Jan-April 2018, July-Nov 2022.
2. **MA501/MA221/CS203: Discrete Mathematics** (M.Sc/B.Tech)
July-Nov 2010, July-Nov 2012, July-Nov 2017, July-Nov 2019, Sept-Nov 2020, July-Nov 2021.
3. **MA102: Mathematics II** [Linear Algebra part] (B.Tech core course)
Jan-April 2020, March-June 2022, Jan-May 2024.
4. **MA625: Linear Algebra I** (PhD course)
Jan-April 2017, July-Nov 2018, July-Nov 2019 (half), July-Nov 2023, July-Nov 2024.
5. **MA601: Graphs and Matrices** (M.Sc/B.Tech Elective course)
Jan-May 2019, Jan-May 2021, Jan-May 2023.
6. **MA101: Mathematics I** [Linear Algebra part] (B.Tech core course)
July-Nov 2011, July-Nov 2014, July-Nov 2016.
7. **MA731: Linear Algebra and Functional Analysis** [Linear Algebra part]
Jan-April 2013.
8. **MA001: Mathematics I** (Preparatory course):
August-November 2013, August-November 2015.
9. **MA002: Mathematics II** (Preparatory course)
January-April 2015.
10. **MA719: Linear Algebra II** [half part]
August-November 2015.

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Summer Courses Taught at IITG

- **2010:** MA421, MA221
- **2011:** MA101[[Linear Algebra part](#)], MA501
- **2012:** MA101[[Linear Algebra part](#)], MA522
- **2013:** MA501
- **2014:** MA101[[Linear Algebra part](#)], MA501 [half part]

Courses Taught at Outside of IITG

- Teaching Assistant of the following courses at the Department of Mathematics and Statistics, IIT Kanpur:
 1. **Linear Algebra & Complex Analysis**, Spring 2007.
 2. **Real Analysis**, Fall 2005 and Fall 2006.
 - Taught **Tensor Analysis** to **M.Sc** students at **PGCS** (Post Graduate Correspondence School, **Gauhati University**), 2003.
 - 10 **Remedial Classes** to **M.Sc** 1st year students of **Gauhati University**, 2002.
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