

## Dr. Shailendra K. Varshney

Professor

Department of Electronics & Electrical Communication Engineering

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### Broad research areas

- Fiber Optics: speciality fibers (photonic crystal fibers), fiber amplifiers, fiber-optic components and devices (sensors, multimode division multiplexers, lab-on-fiber)
- Modeling and simulation of photonic devices
- Nonlinear and quantum photonics
- Dielectric metasurfaces,
- Mid-IR photonics (mid-IR fibers and waveguides)
- Quantum communication and quantum photonic devices, free-space optical communication (under-water, indoor), Cavity nonlinear dynamics

### Academic Background

- Doctor of Philosophy (PhD): Dept. of Applied Physics, Delhi College of Engineering, University of Delhi, India
- Master of Science (M.Sc.): Dept. of Physics, Aligarh Muslim University, Physics with specialization in Electronics, Division: First *Received gold medal for standing first*
- Bachelor of Science (B.Sc.): Dr. B.R. Ambedkar University, Agra, India

### Selected Awards/Recognition/Achievements

- GS Sanyal Faculty Excellence Award (2020), IIT KGP and IIT KGP Alumni Foundation USA
- Faculty Excellence Award (2019) by Indian Institute of Technology Kharagpur.
- OSA Traveling Lecturer under OSA Traveling Lecturer Program (2016)
- DAAD fellowship, Germany (2015) (IIT-DAAD faculty exchange program)
- Alexander von Humboldt (AvH) fellowship, Germany (2016, 2009)
- Japanese Society for Promotion of Science (JSPS) fellowship, Japan, April 2007-March 2009.
- Monbukagakusho Fellowship (Ministry of Education, Govt. of Japan), Oct. 2002-March 2004.
- Junior Research Fellowship (JRF) and National Eligibility Test (NET) by Council for Scientific & Industrial Research (CSIR) and University Grants Commission (UGC), Govt. of India (2000).
- Gold Medal in M.Sc (Physics), 1999, Aligarh Muslim University (AMU), India.
- Sterlite Innovation Award for best paper in Photonics-2010 (group award, paper presented by student)

### Research Guidance

- Doctoral students
  - Completed: 11
  - Ongoing: 11
- Post-graduate students (M. Tech/M.Sc.)

- Completed: 68
- Ongoing: 03
- Bachelor students (at B.Tech level)
  - Completed: 26
  - Ongoing: 3

### Research Publications

- Books: 01, 02 (upcoming)
- Book chapters: 03
- Publications (in Journals): 96
- Publications (in conference proceeding): 122
- Invited talks: 42
- Patents: 04 (filed); 01 (in preparation)

### Research Projects

- Number of Projects completed: 05 (PI), 04 (Co-PI)
- Number of ongoing projects: 02 (PI); 02 (Co-PI)
- Total value of projects (PI+Co-PI): 6,457.46252 Lacs (External funding agencies); Additional Institute support: 1450 lacs
- Consultancy:

### Professional Experience

- Professor, Dept. of E&ECE, IIT Kharagpur (Dec. 2022-till)
- Associate Professor, Dept. of E&ECE (Feb. 2016-Dec. 2022)
- Assistant Professor, Dept. of E&ECE and Dept. of Physics (Nov. 2008-Feb. 2016)
- Adjunct faculty, School of Electrical Sciences, IIT Bhubaneswar (Autumn Semester of 2015, 2016)
- Visiting Researcher: (i) NIMS, Tsukuba, Japan (June 2009); (ii) Hokkaido University, Japan (July 2010)
- Post-doctoral fellow: (a) Hokkaido University (Aug. 2004-Nov. 2008), (b) Max-Planck Institute for the Science of Light, Germany (2011, on leave from institute)
- DAAD fellow, Karlsruhe Institute of Technology Germany (May-June 2015)
- Monbukagakusho Scholar, Research Institute for Electronic Sciences, Hokkaido University, Japan (Oct. 2002-March 2004)

### Teaching

- At UG Level
  - Basic Electronics
  - First year Physics (for three years while associated with Dept of Physics)
- At PG Level
  - Optical Fibers, Components & Devices
  - Optical Communication
  - Lightwave Networks

### Professional Membership

- Senior member, IEEE
- Senior member, Optica (formerly OSA)

### Selected Administrative Responsibilities

- Warden, RK Hall of Residence (Aug, 2021-July 2023)
- Chairman, PG Academy of Leadership (Feb. 2022-Jan. 2024)
- Institute coordinator-Smart India Hackathon (2018, 2019);
- Member, National Executive committee, Smart India Hackathon (2019)
- Member, Dean Student's Affair council (2019-2021)
- Rector nominee (Sports & Games), Technology Students Gymkhana (2015-2019)
- Chairman, Technical fest, Kshitij (2017, 2018, 2019, 2020)
- Faculty advisor (2017-2022)
- Assistant Warden, LLR Hall of Residence (2012-2014)

### Personal Details

- Date of Birth: March 24, 1977
- Gender: Male
- Nationality: Indian
- Marital status: Married

### Few Recent Publications (selective)

- S. Sharma, B. Lahiri and S.K. Varshney, "Multispectral Tunable Symmetry-Protected Bound States in the Continuum in All-Dielectric Split-Ring Resonator Metasurfaces, J. Phys. D (IOP), (2023).
- S. Singhal, S. Kar, S. Sharma, R. Kumari and S.K. Varshney, "Convex-shape Silicon-on-Insulator waveguide for Linear and Nonlinear applications," J. Opt. Soc. Am B, vol. 40 (2), 352-359 (2023)
- S. Kar, M. Saha, S.K. Bag, Rajat K Sinha, S. Sharma, S. Singhal and S.K. Varshney, "Cold-resonance mediated self-stabilization of Kerr frequency combs in a Si<sub>3</sub>N<sub>4</sub> microring resonator," Phy. Rev. A, vol. 106, p. 013517 (2022).
- S. Mahapatra and S.K. Varshney, "Performance of Reed-Solomon coded underwater optical wireless communication system with orientation based solar light noise," J. Opt. Soc. Am. A, (2022)
- Rajat K Sinha, Shubhanshi Sharma, Saawan K Bag, Sauradeep Kar, Basudev Lahiri and Shailendra K. Varshney, "Highly efficient two-dimensional beam steering using all-dielectric fiber metatip," Opt. Las. Technol. (Elsevier), vol. 148, p. 107694. (2022)
- M. Saha, S. Roy, and S. K. Varshney, "Intracavity field dynamics near avoided mode crossing in concentric silicon nitride ring resonator," Phys. Rev. A, vol. 104, 033514 (2021)
- Raktim Halder, Sandeep Ummethala, Rajat K Sinha and Shailendra K. Varshney, "Nested non-concentric microring resonators with high-Q and large fabrication tolerance," J. Opt. Soc. Am B, vol. 38, 3743 (2021)
- Saawan K Bag and Shailendra K Varshney, "Cascaded Microring Resonator Configuration with In-built Tapered Regions for Simultaneous Detection of Assorted Nanoparticles," J. Opt. Soc. Am. B, vol. 38, p. 3027 (2021).
- Anjali Yadav, Rashmi Kumari, Shailendra K. Varshney and Basudev Lahiri, "Tunable Phonon-Plasmon Hybridization in  $\alpha$ -MoO<sub>3</sub>—Graphene based van der Waals (vdW) Heterostructures," Opt. Express, vol. 29, p. 33171 (2021)
- Partha Mondal and Shailendra K. Varshney, "Experimental observation of Kerr beam self-cleaning in graded-index multimode fiber from higher-order mode to fundamental

mode," Opt. Fib. Technol. (Elsevier), vol. 65, p. 102587 (8 pages), Sept. 2021

- Rashmi Kumari, Anjali Yadav, Shubhanshi Sharma, Tapajyoti Das Gupta, Shailendra Kumar Varshney, and Basudev Lahiri, "Tunable Van der Waal's optical metasurfaces (VOMs) for biosensing of multiple analytes," Opt. Express 29, 25800-25811 (2021).
- Reajmina Parvin, Abhijit Roy, Shailendra K. Varshney, and Maruthi M. Brundavanam, "Modulation of coherence-polarization property of speckles using a birefringent scatterer," Appl. Opt. 60, 7259-7267 (2021).
- Saawan Kumar Bag and Shailendra K. Varshney, "Ultrawide FSR microring racetrack resonator with an integrated Fabry-Perot cavity for refractive index sensing," J. Opt. Soc. Am. B 38, 1669-1675 (2021)
- Saawan K. Bag, Rajat K. Sinha, M. Wan and S.K. Varshney, "Tapered racetrack microring resonator for single nanoparticle detection," J. Phys. D: Appl. Phys., vol. 54, 16LT01 (8 pages), (2021).
- P. Lahiri, S. Mukherjee, B. Ghosh, D. Das, B. Lahiri, S.K. Varshney, M. Pal, Ranjan R. Paul, and J. Chatterjee. "Comprehensive Evaluation of PAXgene Fixation on Oral Cancer Tissues Using Routine Histology, Immunohistochemistry, and FTIR Microspectroscopy" Biomolecules 11, no. 6: 889. (2021) <https://doi.org/10.3390/biom1106088>
- P. Mondal, V. Mishra and S.K. Varshney, "Nonlinear interactions in multimode optical fibers," Opt. Fib. Technology, vol. 54, p. 10241 (2020), Invited review article
- S. Sharma, R. Kumari, B. Lahiri and S.K. Varshney, "Optical biosensing with electromagnetic nanostructures," Reviews in Physics, vol. 5, p. 100044 (2020), (Invited review article).
- S. Bag, M. Wan, R.K. Sinha and S.K. Varshney, "Design and characterization of surface relief grating on etched multimode optical fiber for refractive index sensing," Sens. Actuators A, vol. 303, p. 111836 (2020).
- S. Sharma, R. Kumari, B. Lahiri and S.K. Varshney, "Optical biosensing with electromagnetic nanostructures," Reviews in Physics, vol. 5, p. 100044 (2020), (Invited review article)
- R. Halder, A. Roy, P. Mondal, V. Mishra and S.K. Varshney, "Free-carrier-driven Kerr frequency comb in optical microcavities: Steady state, bistability, self-pulsation, and modulation instability," Physical Rev. A, vol. 99, p 033848 (2019).
- P. Mondal, R. Halder, V. Mishra and S.K. Varshney, "All-optical mode conversion and temperature sensing via transient-grating in step-index fiber," IEEE Photon. Technol. Lett., vol. 30 (24), pp. 2175-2178 (2018).
- N. Bhatia and S.K. Varshney, "Design of an all-fiber multimode interference based multimode optical beam generator: Theory and Experiment," J. Opt. Soc. Am. B, vol. 35 (6), 1308-1317 (2018).
- V. Mishra, R. Halder, P. Mondal and S.K. Varshney, "Efficient all-optical transistor action in short-length multimode optical fibers," IEEE J. Lightwav. Technol., vol. 36 (13), 2582-2588 (2018).