डॉ देवेन्द्र चक

(सह - प्राध्यापक)

इलेक्ट्रॉनिक्स इंजीनियरिंग विभाग

भारतीय प्रौद्योगिकी संस्थान

(भारतीय खनि विद्यापीठ), धनबाद, 826004

भारत

Dr. Devendra Chack

(Associate Professor)

Department of Electronics Engineering

Indian Institute of Technology

(Indian School of Mines), Dhanbad, 826004

India

Contact Information:

Website: https://electronics.iitism.ac.in/ece_faculty_details

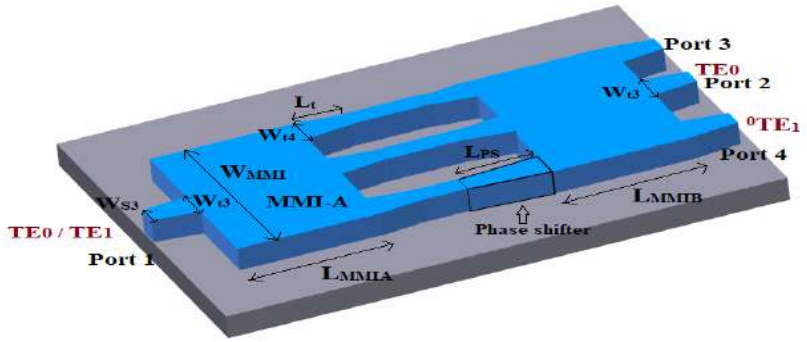
Email: devendra@iitism.ac.in ; devendra.chack@gmail.com

Phone: (0326) 2235760;

Research Interests

- Photonic Integrated Circuits
- CMOS-compatible photonics devices for high-performance computing
- Advanced optical communication technologies beyond 5G
- Optical Signal Processing technique for beyond 5G applications

CMOS-compatible on-chip optical splitter has been designed and experimentally verified. The Multimode interference coupler-based 1 × 2 optical 3-dB splitter has been designed and fabricated with a compact footprint (2.8 x 27µm^2). A Silicon-on-insulator wafer has been used as the base material for fabrication. The thickness of Si and a buffer oxide thickness of 220 nm and 2 µm, respectively have been used. The polarization beam splitter (PBS) and a compact mode demultiplexer (MDM) based on MMI are designed and experimentally verified at Applied Nanotools, Inc., Canada. In addition, a new technique is employed to design all-optical logic gates (XOR, XNOR, NAND, OR gates) using a thermo-optic phase shifter.



Employment Details

Sl No	Organization	Designation	From (Date)	To (Date)
1.	Indian Institute of Technology (Indian School of Mines), Dhanbad, India	Associate Professor	13/04/2022	Continuing
2.	Indian Institute of Technology (Indian School of Mines), Dhanbad, India	Assistant Professor	23/12/2011	12/04/2022
3.	BT-Kumaon Institute of Technology, Dwarahat, Almora UK, India *(An Autonomous Institute of Govt. of UK),* India	Assistant Professor	08/08/2011	19/12/2011
			16/08/2010	30/06/2011

Education

Degree	Subject	Institute/University	Course Duration Details	
			Year of Commencement	Year of Passing
Bachelor of Engineering (BE)	Electronics Engineering	Madhav Institute of Technology & Science (MITS) Gwalior, M.P, India, *(A govt. Aided UGC autonomous institute, Affiliated to RGPV Bhopal Estd. In 1957)*	2002	2006
Master of Technology (M.Tech)	Electronics and Communication Engineering	Indian School of Mines, Dhanbad, *(Under Ministry of H.R.D., Govt. of India)*	2007	2009
Ph.D	Photonic integrated circuits	Indian Institute of Technology (Indian School of Mines), Dhanbad, *(An Institute of National Importance under Ministry of H.R.D., Govt. of India)*	31, January, 2011	08, February, 2017

Research work and funding from external/internal agencies

S. No	Title	Cost (in INR)	Duration	PI and Co-PI Name	Funding Agency
1.	Development of Photonic Chip for 6G and beyond	1.98 Cr (accepted)	2024 - 2027	PI	TTDF/ DoT
2.	Development of field deployable fiber bragg grating sensor for monitoring of hazardous toxic chemicals	34.0 Lakhs	2018 - 2021	Co-PI	BRNS/DAE
3.	On-chip Silicon Photonic Switches for High Performance Computing and Datacenter Networks	20.3 Lakhs	Nov 2019-2022	PI	SERB/DST
4.	Design and implementation of optical components on SOI for High-speed optical communication	9.4 lakhs	2018	PI	IIT(ISM)/ FRS
5.	Study on basic Photonics Components for WDM Applications	2.0 Lakhs	2017 - 2019	PI	TEQIP-III

Ph.D Supervision

Research Scholars	PhD Status	Research Interest/thesis title	Guides
Dr. Shamsul Hassan	Date of joining: 17/03/2017 Thesis Submitted on 05/10/2021 Awarded on 14/02/2022	Silicon photonic devices using multimode interference coupler for photonic integrated circuits *Joined as PROJECT SCIENTIST I at IIT Madras*	**Devendra Chack**
Dr. Rukmani Singh	Date of joining: 01/08/2017 Thesis Submitted on 07/01/2022 Awarded on 23/09/2022	Modelling and Design of Silicon Optical Waveguides for Biosensor Applications *Joined as Postdoc Researcher, at Catalan Institute of Nanoscience and Nanotechnology, Spain*	Prof.(Retd) Vishnu Priye; **Devendra Chack**
Mr. Sunil Narayan Thool	Part time-Ongoing	Modulation/DSP technique for 5G	**Devendra Chack**
Mr. Gaurav Kumar	Full-time- Ongoing	Ultra-compact photonic devices for datacenter networks	**Devendra Chack**
Ms. Diksha Maurya	Full time- Ongoing	CMOS compatible silicon photonic chip	**Devendra Chack**
Mr. Ravi Roushan Kumar	Full-time- Ongoing	CMOS compatible silicon photonic chip For 6G	**Devendra Chack**

About my first Ph.d student:

Mr. Shamsul Hassan presented a research paper title on "Design and analysis of polarization beam splitter based on cascaded MMI on SOI", at **Photonics West** OPTO 2020 (SPIE, the international society for optics and photonics), paper 11283-70 at **San Francisco, USA**, 1–6 February 2020

Mr. Shamsul Hassan presented a research paper title on "MZI based Silicon photonic circuits for arbitrary power splitting application", at Japan Society of Applied Physics *and* Optical Society of America (JSAP- OSA) *Joint Symposia*, at **Nagoya Japan** during 18–21 September 2018.

Research work: We experimental demonstrated polarization beam splitter, mode division multiplexer on SOI. In addition, a new technique is employed to design all-optical logic gates (XOR, XNOR, NAND, OR gates) using a thermo-optic phase shifter.

Courses Introduced and/or Teaching at IIT Dhanbad

- Post Graduate Level
    - Optical fiber communications
    - Photonic Integrated Circuits
    - Advanced Optoelectronic Devices
    - Advance optical communication

- Under Graduate Level
    - Control systems
    - Signals and Networks
    - Signals and Systems
    - Optical Communication
    - Electronics Engineering
    - Digital Electronics
    - Optoelectronic Devices

Membership of Professional Bodies:

- Life Time Associate Member of the Institution of Electronics and Telecommunication Engineers (IETE) Associate Member No AM-219689
- Life fellow of Optical Society of India (OSI), ID# L657
- IEEE & IEEE Photonics Society, Senior Member # 93027538
- SPIE (the international society for optics and Photonics), Senior Member ID# 3649141
- Optica (formerly OSA) Senior Member ID# 1041033

Country Visited

- Barcelona, Spain
- Rome, Italy

Additional Responsibilities at IIT (ISM) Dhanbad

- Member of Departmental Faculty Screening Committee (DFSC) from 04.05.2023
- Member DPGC of ECE Department from 17 Jan 2023 [Ongoing].
- Member of the Library Advisory Committee [Ongoing]
- Member of Centre of Societal Mission (CSM) from 24.05.2021 [Ongoing].
- Time Table coordinator from 23.08 2019 – 30.08.23.
- Served as Chief Warden of Sapphire Hostel (from July 1 2021, to 30 June 2022).
- Member of Departmental faculty screening committee (DFSC) from 01.12.2021 – 28.02.2023
- Member, Departmental Post Graduate Committee (DPGC) (15.10.2020 – 14.10.2022)
- Served as Warden of Sapphire Hostel (from July 1 2019 to June 30 2021).
- M.Tech Coordinator for Optoelectronics and Optical Communication Engineering (25.10.2017- 2019)
- Faculty Advisor (3rd year of Electronics and Communication Engineering) (session 2019-20)
- Member of Doctoral Scrutiny Committee for Ph. D scholars of other sister departments
- Faculty Advisor (2nd year of Electronics and CommunicationFaculty Screening Committee Engineering) (session 2018-19)
- Faculty Advisor (1st of Electronics and Communication Engineering) (session 2017-18).
- Time Table Coordinator (EXAM) in the Department (February 19, 2015 – May, 2017)

Other Professional Assignments

- Faculty Advisor of **Optica (formerly OSA)** (from December 10 2022).
- Faculty Advisor of **SPIE** (SPIE is the international society for optics and Photonics) (November 1 2018 – December 10 2022).
- Participated in focus meeting on Silicon photonics-based high-performance computing research and development in the country (under National Supercomputing Mission, Ministry of electronics and information technology), December 19 2018.
- Program Committee Members of the International Conference on Intelligent Computing & Smart Communication (ICSC 2019), 19-21 April 2019, THDC-IHET, Tehri, India
- Reviewed research proposal of IMPacting Research, INnovation and Technology (IMPRINT-2) (Jointly funded and steered by MHRD and Department of Science and Technology (DST) through Science and Engineering Research Board), May 2018.
- Reviewed research papers of OSA- Optics Express
- Reviewed research papers of OSA- Applied Optics
- Reviewed research paper of IEEE-Photonics Technology Letters.
- Reviewed research papers of Optical Engineering (SPIE).
- Reviewed research paper of Journal of Nanophotonics (SPIE).

Conference /Workshop/Event Organized:

- Organized an SPIE TECHNICAL Webinar 3.2 (PHOTONIC INDIANS LECTURE SERIES) delivered by Prof. Deepa Venkitesh (EE, IIT Madras) on 24/03/22.
  Title: "The Changing Phases of Optical Communication"
- Organized an SPIE TECHNICAL Webinar 3.1 (PHOTONIC INDIANS LECTURE SERIES) delivered by Prof. Bijoy Krishna Das, IIT Madras on 30/09/2022.
- Organized an SPIE Webinar talk delivered by Prof. Winnie Ye, Carleton university, Ottawa, Canada) on 24/03/22
- Organized an SPIE Webinar series 1.1, 1.2, 1.3 and 1.4 (International and national talk) on October 2021
- Steering committee member of International Symposium on 5G and Beyond for Rural Upliftment, 08-09 February 2020 at Indian Institute of Technology (ISM) Dhanbad, India. [Twinning activity between BIT Sindri & IIT(ISM) Dhanbad]
- Organized invited talk delivered by Brajesh Kumar Kaushik, Indian Institute of Technology, Roorkee, under the SPIE Visiting Lecturer Program on December 4, 2019.
- Organized School Outreach Activities on 28th and 29 September 2019. In this activity, the application of light and optical experiments have been demonstrated to government schools such as Kendriya Vidyalaya-2 Dhanbad and our institute social and welfare society (Karma-Jyoti Society school students
- Organized a technical quiz competition, an Exhibition of photography, and Sky lantern event on International Day of Light (IDL) on May 16 2019 under the SPIE Student chapter.
- Organized invited talk delivered by Prof. Lorenzo Pavesi, Nanoscience Laboratory, University of Trento, Italy under the SPIE Visiting Lecturer Program on 27, October 2018.
- Coordinator of the 4th workshop on "Recent Trends in Photonics Technology 2018" is to be held during 25-27 October 2018 at Indian Institute of Technology (ISM), Dhanbad, India [jointly organized by Optical Society (OSA) and International Society of Optics & Photonics (SPIE), student chapters]
- Steering committee member of IEEE Technically Co-Sponsored International Conference on Microwave and Photonics 2018 (ICMAP 2018), held during 09-11 February 2018 at Indian Institute of Technology (ISM) Dhanbad, India.
- Served as Co-Convener for two days' workshop on "Emerging trends in photonics technologies" on 3-4 February 2017 under the aegis of TEQIP-II held at Indian Institute of Technology (ISM) Dhanbad, India.
- Members of the organizing committee of the International OSA Network of Students (IONS) conference organized by the Optical Society (OSA) held at Indian Institute of Technology (ISM) Dhanbad India from September 7 to 10, 2016**.**
- One of the organizing committee members of IEEE Technically Co-Sponsored International Conference on Microwave and Photonics 2013 (ICMAP 2013), held at ISM Dhanbad, India, during 13-15 Dec. 2013.
- One of the organizing committee members of IEEE Technically Co-Sponsored International Conference on Microwave and Photonics 2013 (ICMAP 2015), held during 11-13 Dec. 2015 at ISM Dhanbad India.

Supervised M.Tech Dissertations:

Name of the Student	Title of Master Thesis Guided	Year of Completion
Mr. G Vickey	Optimization of Broadband Surface Grating Antenna on a CMOS 3D Integration Platform	2024
Mr. Abhay Pratap Singh Bhadauria	Design and analysis of Photonic Devices for Photonic Integrated Circuits	2023
Mr. Pretom Das	Design and analysis of optical phased array	2022
Mr. Bipul Basumatary	Study and Optimization of Mach Zehnder Interferometer based 2x2 Optical Switches	2021
Mr. Ankit kumar Singh	Study of Optical Gates for Optical Interconnect	2021
Mr. Neha Tiwari	Performance analysis of 5G WDM-MIMO Optical Wireless Communication System.	2020
Mr. Rishabh	Study of optical switching devices for next generation communication system	2020
Mr. Mohd Qasim	Mode Converters based on MMI waveguide	2020
Mr. Dipanwita Aich	Study of Plasmonic Waveguides and its Applications	2019
Mr. Devdutt Tripathi	Study of Mode Division Multiplexing for Optical Communication Systems	2019
Mr. Jayant Kumar	Study of Fiber Bragg Grating and Applications for optical communication	2018
Mr. Debasmita Sarkar	Study of Plasmonic Waveguide and its applications	2018
Mr. Abhishek Kumar	Optical Beam Splitter Devices using MMI couplers	2017
Mr. Aayush Kumar	Study of Optical Devices Based on Photonic Crystal Waveguides	2016
Mr. Ravi Shankar Kumar	Study of Multilayer Waveguide with Metamaterial Structure	2016
Mr. Ran Vijay Singh	Implementation of Signal Processing & Ranging Electronics for Laser Range Finders	2015
Mr. Muzaffar Imam	Study of Guided Wave Optical Devices	2014
Mr. Niteshkumar Agrawal	Study of Integrated optical Waveguides	2013

Research Publications:

1. Diksha maurya , **Devendra Chack** and Vickey G, "Compact and Efficient Transverse Spliced Waveguide Grating Antenna for Integrated Optical Phased Array," in ***IEEE Transactions on Nanotechnology***, vol. 23, pp. 665-672, 2024, doi: 10.1109/TNANO.2024.3459472.
2. **Devendra Chack** and Sunil Thool, **"**High Capacity 64-Quadrature Amplitude Modulation Based Optical Coherent Transceiver for 60 GHz Radio over Fiber System" **Wireless Pers Commun** 132, 183–204 (2023). https://doi.org/10.1007/s11277-023-10606-x (Impact Factor: 1.9)
3. Shamsul Hassan, **Devendra Chack** and Lorenzo Pavesi "Reconfigurable and Multifunction All Optical Logic Gates using Thermo-optic phase shifter for optical computing" **AIP Advances** 12, 055304 (03 May 2022) https://doi.org/10.1063/5.0086185 (Impact Factor: 1.4)
4. Rukmani Singh, **Devendra Chack**, and Vishnu Priye, "SNROW-based highly sensitive label-free surface biosensor for hepatitis B detection," **Appl. Opt**. 61, 6510-6517 (2022). *DOI No.:* https://doi.org/10.1364/AO.463800 (Impact factor: 1.905)
5. **Devendra Chack**, Shamsul Hassan, and Mohd Qasim. "Broadband and low crosstalk silicon on-chip mode converter and demultiplexer for mode division multiplexing." *Applied Optics* 59.12 (2020): 3652-3659. https://doi.org/10.1364/AO.390085 (Impact Factor: 1.905)
6. Shamsul Hassan, **Devendra Chack**, and Varad Mahajan. "High extinction ratio and low loss polarization beam splitter based on multimode interference for PICs." *Applied Optics* 59.11 (2020): 3369-3375. https://doi.org/10.1364/AO.387418
   (Impact Factor: 1.905)
7. **Devendra Chack**, Shamsul Hassan and Amitesh Kumar (2021) "Broadband and Mode insensitive MMI based mode power splitter for MDM" *Laser Physics (IOP)* **31** 126205
   https://iopscience.iop.org/article/10.1088/1555-6611/ac312c
   (Impact Factor: 1.366)
8. Shamsul Hassan, and **Devendra Chack**. "Design and analysis of polarization independent MMI based power splitter for PICs" *Microelectronics Journal* 104 (2020): 104887. https://doi.org/10.1016/j.mejo.2020.104887
   (Impact Factor: 1.605)
9. **Devendra Chack**, and Shamsul Hassan. "Design and experimental analysis of multimode interference-based optical splitter for on-chip optical interconnects." *Optical Engineering* 59.10 (2020): 105102. https://doi.org/10.1117/1.OE.59.10.105102
   Impact Factor: 1.084
10. Rukmani Singh, Vishnu priye and **Devendra Chack**, "Highly sensitive refractive index based sensor for DNA hybridization using subwavelength grating waveguide" *IETE Technical Review* (2022)
    https://doi.org/10.1080/02564602.2021.2016076
    (Impact Factor: 2.20)
11. Sanjeev Kumar Raghuwanshi, Yadvendra Singh, Mandeep Singh, **Devendra Chack**, Ritesh Kumar & Om Prakash "High sensitivity detection of chemicals based on sinusoidally apodized structured grating assisted liquid filled directional coupler" *Opt Quant Electron* **53,** 398 (2021). https://doi.org/10.1007/s11082-021-03070-z
    (Impact Factor: 2.084)

12. Sunil Thool, **Devendra Chack,** Amitesh Kumar (2021) "Coherent Detection-Based Optical OFDM, 60 GHz Radio-over-Fiber Link Using Frequency Quadrupling, and Channel and Carrier Phase Estimation" *Front. Phys.* **9**:749497 https://doi.org/10.3389/fphy.2021.749497
    (Impact Factor: 3.56)
13. Abhinav Gautam, Amitesh Kumar, Jaisingh Thangaraj, **Devendra Chack**, Vishnu Priye, "Optical weight measurement system using FBG based D-IM edge filter detection, *Optical Fiber Technology*", 2020,102386 https://doi.org/10.1016/j.yofte.2020.102386
    (Impact Factor: 2.53)
14. **Devendra Chack,** V. Kumar, S. K. Raghuwanshi and Dev P Singh "Design and analysis of O-S-C triple band wavelength division demultiplexer using cascaded MMI couplers" *Optics Communications***,** Volume 382, pp. 324–331, (2017)
    https://doi.org/10.1016/j.optcom.2016.08.016
    (Impact Factor: 2.310)
15. **Devendra Chack,** V. Kumar and S. K. Raghuwanshi, Design and performance analysis of InP/InGaAsP-MMI based 1310/1550-nm wavelength division demultiplexer with tapered waveguide geometry, *Opto-Electronics Review*, Volume 23, Issue 4, pp. 271–277, (2015),
    https://doi.org/10.1515/oere-2015-0039
    (Impact Factor: 2.489)

Conferences

1. **Devendra Chack,** Shamsul Hassan, and Abhishek Kumar "Design and analysis of polarization beam splitter based on cascaded MMI on SOI", Proc. SPIE 11283, Integrated Optics: Devices, Materials, and Technologies XXIV, 1128320 (25 February 2020); https://doi.org/10.1117/12.2544405
   (The paper was presented in Photonics West OPTO 2020 (SPIE, the international society for optics and photonics), at **San Francisco, USA**)
2. S. Hassan and **Devendra Chack**, "MZI based Silicon photonic circuits for arbitrary power splitting application", *JSAP-OSA Joint Symposia 2018*, paper 21p_211B_8. at Nagoya Japan 18–21 September 2018.
   (The paper was presented in the conf.
3. S. Hassan and **Devendra Chack**, "Design and performance analysis of MMI based all optical logic gates on SOI substrate," *2018 3rd International Conference on Microwave and Photonics (ICMAP), Dhanbad, 2018, pp. 1-2.*
4. S. K. Raghuwanshi, V. Kumar, **Devendra Chack**, and R.R. Pandey, "Dispersion study of even mode thin planar slab dielectric waveguide without computing $\frac{d^2\beta}{dk^2}$ numerically" *Procedia Technology,* Volume 1, pp 286–290, (2012).
5. **Devendra Chack**, V. Kumar and D. Singh. "Performance Analysis of 1310/1490 nm Demultiplexer based on Multimode Interference Coupler for PON", In *Proceedings of the 4th International Conference on Photonics, Optics and Laser Technology* ISBN 978-989-758-174-8, pp 223-226 (2016), Rome, Italy
   (The paper was presented in the conf.)
6. **Devendra Chack**, S. K. Raghuwanshi, V. Kumar and N. Agrawal, "Analyzing the Optimum Parameter of an 1×2 MMI Splitter" , *IEEE-International Conference on Communication Systems and Network Technologies, (CSNT-13)*, April 6-8, pp 149-151 (2013), Gwalior , India.

7. **Devendra Chack**, S. K. Raghuwanshi, V. Kumar and N. Agrawal, "Field Propagation Study of Y- Branch Assisted by MMI Coupler" *Proceedings of 3rd World Conference on Information Technology (WCIT-2012)*, 14-16 November 2012 pp 1795-1800 (2013), at University of Barcelona, Barcelona, Spain *(The paper was presented in the conf.)*
8. **Devendra Chack**, S. K. Raghuwanshi and V. Kumar "Pulse Propagation Study of 1×4 Multibranch Optical Waveguide Using 3-Y Branch Optical Waveguide" *Proceedings of 3rd World Conference on Information Technology (WCIT-2012)*, 14-16 November 2012, pp 1790-1794 (2013), at University of Barcelona, Barcelona, Spain *(The paper was presented in the conf.)*