Department of Electronics Engineering

Expert Lecture
on
"Free Space Optics: Opportunities and Challenges"
on
2nd November 2025

Title: Free Space Optics: Opportunities and Challenges

Date: 02 November 2025

Venue: SH-9, Madhav Institute of Technology & Science (MITS), Gwalior

Mode: Physical

Duration: 2 Hours (11:00 AM – 1:00 PM)

Expert Speaker: Dr. Dheeraj Dubey, Assistant Professor, Department of Electronics and Communication Engineering, IIIT Pune

Introduction:

The Department of Electronics Engineering, MITS Gwalior, organized an expert lecture on the topic "Free Space Optics (FSO): Opportunities and Challenges" on 02 November 2025. The session was conducted in SH-9 in physical mode and was delivered by Dr. Dheeraj Dubey, an eminent researcher with expertise in Hybrid FSO/RF Systems, Next-Generation Communication, 5G and beyond networks, and underwater communication.

The lecture was coordinated by Dr. Varun Mishra, Dr. Mukesh Mishra, and Dr. Kumar Gaurav, with Prerna Pandey serving as the student coordinator. Dr. Laxmi Shrivastava, Head of the Electronics Engineering Department, provided overall guidance.

Objectives of the Workshop:

- To introduce participants to the fundamental principles of Free Space Optics (FSO) and its role in modern communication systems.
- To develop an understanding of the design, components, and operational mechanisms of FSO and hybrid FSO/RF communication links.
- To analyze the opportunities, advantages, and emerging applications of FSO technology in 5G/6G networks, inter-satellite links, and last-mile connectivity.
- To highlight the key challenges and limitations associated with FSO systems, including atmospheric attenuation, alignment issues, and environmental effects.
- To expose students to current research trends and technological innovations in optical wireless communication and next-generation networks.
- To encourage hands-on learning through interactive discussion and problem-solving, enabling participants to understand real-world deployment scenarios.

About the Expert:

Dr. Dheeraj Dubey holds a Ph.D. from MNNIT Allahabad and has significant research contributions in hybrid FSO/RF systems for satellite and terrestrial communication. He has served as a Research Scientist at IIT Bombay, contributed to advanced 5G projects, and collaborated on major sponsored research initiatives including a ₹4.35 Cr ANRF-PAIR grant (2025). He has several SCI-indexed publications and a granted patent.

Workshop Schedule:

Hour 1 (11:00 AM – 12:00 PM): Fundamental Concepts and System Design

- Introduction to Free Space Optics (FSO)
- Comparison of FSO with conventional RF communication
- Key components of an FSO communication link
- Atmospheric effects on FSO: scattering, absorption, turbulence
- Demonstration of hybrid FSO/RF architecture used in next-generation communication
- Discussion on system performance metrics and link budget calculations

Hour 2 (12:00 PM – 1:00 PM): Advanced Applications, Challenges, and Research Trends

- FSO applications in:
  - Last-mile connectivity
  - Inter-satellite links
  - 5G/6G backbone network
  - Underwater communication
- Challenges in practical deployment: pointing errors, weather-induced attenuation, alignment issues
- Overview of Dr. Dubey's research on hybrid FSO/RF systems
- Future opportunities in 5G, 6G, IoT backhaul, and smart city communication infrastructure
- Interactive Q&A session with students and faculty
- Discussion on research directions and career opportunities in communication engineering

Brochure:

Outcomes of the workshop

The lecture provided valuable insights into an emerging communication technology with significant relevance to future wireless networks. Key outcomes include:

- Enhanced understanding of FSO communication principles and challenges
- Awareness of current research trends and industrial applications

- Motivation for students to explore advanced communication technologies and pursue research projects
- Strengthened industry-academia exposure through interaction with a domain expert

Faculty and students rated the session highly for its technical depth, clarity, and relevance.

Conclusion:

The expert lecture by Dr. Dheeraj Dubey was highly informative and aligned with the department's objective to expose students to cutting-edge communication technologies. The Electronics Engineering Department extends gratitude to Dr. Dubey for sharing his expertise and to all coordinators for facilitating a successful event.

Some Glimpses




Dr. Varun Mishra Coordinator	Dr. Mukesh Mishra Coordinator	Dr. Kumar Gaurav Co-Coordinator	Dr. Laxmi Shrivastava Head of Department

माधव प्रौद्योगिकी एवं विज्ञान संस्थान, ग्वालियर (म.प्र.), भारत
MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR (M.P.), INDIA

Department of Electronics Engineering

Attendance Sheet

Expert Session on "Free Space Optics: Opportunities and Challenges" by Dr. Dheeraj Dubey, Assistant Professor, IIIT Pune

Date: 2nd November 2025

Time: 2:00 PM onwards

Venue: Seminar Hall–VI

S. No.	Name of Participant	Enrollment No.	Semester	Signature
1.	Soumya Sandeep Sharma	BTEL2501111	1st	Soumya
2.	Om chacle	BTEL2401082	3rd	
3.	Naman Kushwah	BTEL2401076	3rd	Naman
4.	Prakriti Krishna Pal	BTEL2401087	3rd	
5.	Riya Malik	BTEL2401107	3rd	Riya
6.	Swati Dixit	PDEL2401007	PhD IIIrd	
7.	Harshit Sharma	BTEL2501050	1st	Harshit
8.	Sanskar Nath Samadhiya	BTEL2501096	1st	
9.	Prashant Singh Bhadauriya	BTEL2501081	1st	
10.	Ayushman Singh Bhadauria	BTEL2501035	1st	
11.	Neelkant Rathour	BTET2401084	2nd	
12.	Paras mahor	BTET2401087	2nd	Paras
13.	Hrishabh Simaiya	0901EE231055	3rd	
14.	Mayank Sahu	BTET2401074	2nd	Mayank Sahu
15.	Dharendra Vishwakarma	BTET2401044	2nd	Dharendra
16.	Nishant Ku. Vishwakarma	BTEE2501052	1st	Nishant
17.	Neetesh Rawat	BTEL2501073	1st	
18.	Sourav Dhakar	BTEL2501112	1st	
19.	Priyanshu Patel	BTET2401098	3rd	Priyanshu
20.	Tisha Bhimawad	BTET2401140	3rd	
21.	Vishal Baghel	BTET2401150	3rd	
22.	Parth Shukla	BTET2402088	3rd	
23.	Mohit Kumar Koti	BTET2401077	3rd	
24.	Rahul Patel	BTET2401101	3rd	
25.	Udit Anoda	BTEL2501117	1st	
26.	SHRIDHAR SHARMA	BTEL2501108	1st	
27.	Vishnu Agrawal	BTEL2501123	1st	
28.	Jaideep Lodhi	0901ET231024	5th	
29.	Vaishnavi Pathak	0901ET231074	5th	
30.	Gaurav Rawat	0901ET231020	5th	
31.	Vansh Shrivastava	BTEL2501118	1st	
32.	Priyanshu Kushwah	BTEL2501134	1st	
33.	ANSH Jaiswal	BTEL2501137	1st	
34.	Anoop Singh Rajawat	BTEL2401023	3rd sem	
35.	Aakarsh Ahmed	BTEL2401002	3rd sem	

02/11/2025
Dr. Varun Mishra

Dr Mukesh Mishra

माधव प्रौद्योगिकी एवं विज्ञान संस्थान, ग्वालियर (म.प्र.), भारत
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36.	Ashutosh Singh Rathore	BTEL2401035	3rd	Ashutosh
37.	Gauri Tiwari	BTEL2401048	3rd	G Tiwari
38.	Pranjal Jain	BTEL2401088	3rd	pranjal
39.	Alok Singh Kushwaha	0901ET231007	5th	
40.	Tanushka Verma.	BTEL2401123	3rd	Tanushka
41.	Vedika Singh	BTEL2401142	3rd	Vedika
42.	Rishav Patel	0901ET231055	5th	Rishav.
43.	Utkarsh Kataare	BTEL2401138	3rd	Utkarsh K
44.	Vishal Garg	BTEL2401147	3rd	Vishal
45.	Abhinav Sharma	BTEL2501002	1st	Abhinav
46.	Aradhy dubey	BTEL2501027	1st	Aradhy.
47.	Varun Pahuja	BTEO2401052	2nd	Varun
48.	Ojaswi Anand Sharma	BTEO2401035	2nd	Ojaswi
49.	Tahir Ujjainwala	BTET2401137	2nd	
50.	Shivansh Singh Chauhan	BTET2401127	2nd	
51.	Om Mishra	BTMC2501090	1st	Om mishra
52.	Nishant kumar Vishwakarma	BTEE2501045	1st	
53.	Kalyan Singh Mewada	0901ET231028	3rd	
54.	Akansha Singh Tomar	BTEL2401019	2nd	Akansha
55.	Sourabh Patidar	0901ET231070	5th sem	Patidar.
56.	Rahul Jadhav	0901ET231053	5th sem	Rahul
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02/11/2025

Dr. Varun Mishra	Dr. Mukesh Mishra	Dr. Kumar Gaurav	Dr. Laxmi Shrivastava
Coordinator	Coordinator	Co-Coordinator	HoD