# Dr. Pawan Kumar


**Contact Information**

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Department of Electronics and Communication Engineering (ECE)
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**Education**

**Ph.D**, Wireless Communication, 2019
Indian Institute of Technology Guwahati, Assam, India

**M.Tech**, Communication Engineering, 2013
Indian Institute of Technology Guwahati, Assam, India
CPI: 7.44/10

**B.Tech**, Electronics Engineering, 2011
Gautam Buddha Technical University, Lucknow, U.P., India
Marks: 69.88 %

**Intermediate**, CBSE Board, 2007
Jawahar Navodaya Vidyalaya Ballia, U.P., India
Marks: 78.60 %

**High School**, CBSE Board, 2005
Jawahar Navodaya Vidyalaya Ballia, U.P., India
Marks: 77.00 %

**Work Experience**

(1) **Assistant Professor** in ECE Department, NIT Rourkela from $15^{th}$ June 2020 to the date.

(2) **Member (Research Staff)** in Central Research Lab (CRL), Bharat Electronics Limited (BEL) from $23^{rd}$ September 2019 to $29^{th}$ February 2020.

**Professional Activities**

**Continuing Education**

(1) Coordinator of a five-day short-term course of "Emerging Technologies for 6G Communications" during $17^{th}-21^{st}$ July 2023 at ECE Department, NIT Rourkela.

(2) Co-coordinator of a five-day short-term course of "Emerging Wireless Communication: 6G and Beyond" during $09^{th} - 13^{th}$ May 2022 at ECE Department, NIT Rourkela.

**Research Interests**

Performance Analysis, Cooperative Communication, Wireless Energy Harvesting, Physical Layer Security, MIMO systems, Multiple Access Techniques.

**Journal Publications**

[1] **P. Kumar** and K. Dhaka, "Average SER analysis of two-hop WP DF relay system under $\kappa - \mu$ shadowed fading," *IET Communications*, vol. 15, no. 1, pp. 1-13, January 2021 [link].

[2] **P. Kumar** and K. Dhaka, "Performance of wireless powered DF relay system under Nakagami-$m$ fading: Relay assists energy-constrained source," *IEEE Systems Journal*, vol. 14, no. 2, pp. 2497-2507, June 2020 [link].

[3] **P. Kumar** and K. Dhaka, "Average BER and resource allocation in wireless powered decode-and-forward relay system," *IET Communications*, vol. 13, no. 4, pp. 379-386, March 2019 [link].

[4] **P. Kumar** and K. Dhaka, "Performance analysis of wireless powered DF relay system under Nakagami-$m$ fading," *IEEE Transactions on Vehicular Technology*, vol. 67, no. 8, pp. 7073-7085, August 2018 [link].

[5] **P. Kumar** and K. Dhaka, "Performance analysis of a decode-and-forward relay system in $\kappa$-$\mu$ and $\eta$-$\mu$ fading channels," *IEEE Transactions on Vehicular Technology*, vol. 65, no. 4, pp. 2768-2775, April 2016 [link].

[6] **P. Kumar** and P. R. Sahu, "Analysis of $M$-PSK with MRC receiver over $\kappa-\mu$ fading channels with outdated CSI," *IEEE Wireless Communications Letters*, vol. 3, no. 6, pp. 557-560, December 2014 [link].

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## Conference Papers

[7] **P. Kumar** and K. Dhaka, "Average BER Analysis of NOMA Systems under TWDP fading," *29$^{th}$ IEEE National Conference on Communications*, Guwahati, February 23-26, 2023 [link].

[8] **P. Kumar** and K. Dhaka, "Performance analysis of wireless powered decode-and-forward relay system," *25$^{th}$ IEEE National Conference on Communications*, Bangalore, February 20-23, 2019 [link].

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## Manuscripts Under Preparation

[9] Aryan and **P. Kumar**, "Outage Probability of Wireless Powered Cooperative NOMA over Fluctuating Two-Ray Fading ".

[10] **P. Kumar** and K. Dhaka, "Average BER of NOMA Systems under Fluctuating Two-ray Fading".

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## Summary of my Ph.D Thesis

**Performance Analysis of Conventional and Wireless Powered Decode-and-Forward Relay Systems**

*Supervisor:* Dr. Kalpana Dhaka

My Ph.D research work dealt with average symbol error rate (SER) analysis of three-node decode-and-forward (DF) relay systems under different fading channels. The work is categorized into two parts. In the first part, average SER of a conventional three-node DF relay system under $\kappa-\mu$ and $\eta-\mu$ fading is analyzed. Such a system finds its application in communication systems such as, device-to-device communications, wireless body-area networks, etc. In this system, nodes are assumed to be powered by uninterrupted and continuous power supplies. This consideration violates in scenarios where nodes have limited energy storage and they cannot be physically reached for replacement or recharging. In such circumstances, if nodes' energy sources are eventually drained, the communication gets terminated. The communication lifetime can be extended by transferring wireless power to energy-constrained nodes. In the second part, average SER of wireless powered DF relay systems under Nakagami-$m$ and $\kappa-\mu$ shadowed fading channels is analyzed. Data is considered to be $M$-ary phase-shift keying ($M$-PSK) or $M$-ary frequency-shift keying ($M$-FSK) modulated.

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## M.Tech Project

**ABER Performance of MRC Receiver in $\kappa-\mu$ Fading with Channel Estimation Error**

*Supervisor:* Dr. P. R. Sahu

*Abstract:* The effect of imperfect channel estimation on average bit error rate (BER) performance of $M$-PSK modulated data is analyzed using maximum ratio combining (MRC) over $\kappa-\mu$ fading channels. An efficient technique - half-plane-decision method -

is used to analyze the average BER of 2-PSK, 4-PSK, 8-PSK, and 16-PSK modulated data. Moment generating function based approach is used to derive an expression of average BER for arbitrary number of independent and identical receiving branches.

## Activities as Student

**Teaching Activities**

- Conducted Hands-on session on "*Simulink based Modeling of Communication Systems*" in the 3rd IEEE Workshop on Advanced MATLAB Applications – 'ADMAT 2016', held at IIT Guwahati, October 2016.
- Delivered a keynote lecture on the topic "*Modulation schemes and diversity combining techniques*" at National Level Workshop on MATLAB for all, organized by Department of ECE, Gauhati University, July 2016.
- Assisted in various laboratory and theory courses offered to Undergraduate and Master students of the Dept. of EEE, IIT Guwahati, since July 2011.
- Performance evaluation of students in some of the laboratory courses offered by the Dept. of EEE, IIT Guwahati, since July 2011.

**Non-Teaching Activities**

- Acted as *Hospitality Chair* to *IEEE Student Branch*, IIT Guwahati, IEEE Kolkata Section, Region 10, for the year 2015.
- Served as Volunteer in the *5th IEEE Applied Electromagnetics Conference (AEMC) 2015*, held at IIT Guwahati, December 2015.
- Assisted as an *Event Co-coordinator* in *Udayaya – 2011*, the annual technology festival of Dr. Ambedkar Institute of Technology for Handicapped, Kanpur, March 2011.

## Achievements

- Received the Certificate of Appreciation for contribution of a one-week Faculty Development Programme on "*5G Communications*" jointly organized by Electronics and ICT Academies at IIT Guwahati, June 2018.
- Achieved the First Position in the event *"Collage"* organized by Council of Extra Curricular Activities, Dr. Ambedkar Institute of Technology for Handicapped, Kanpur, 2009.

## Software Skills

**Scripting/Programming:** MATLAB, C, and C++

**Desktop Editing:** LaTeX and Microsoft Office

**Operating Systems:** Microsoft Windows family

## Professional Memberships

IEEE Member, 2020–Present
IEEE Graduate Student Member, 2013–2019