

# Dr. Rakesh Kumar

Ph.D. (Applied Mathematics)

Associate Professor,  
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## **PARTICULARS**

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### **EDUCATION**

Ph. D. in Applied Mathematics, *Aug. 2019*, I.K.G. Punjab Technical University, Kapurthala, Punjab, India

M.Phil in Mathematics, *Nov.2008*, Madurai Kamaraj University, Madurai, Tamil Nadu, India

M.Sc. in Mathematics, *Apr.2001*, Guru Nanak Dev University, Amritsar, Punjab, India

B.Ed., *Apr. 2002*, Khalsa College of Education, Amritsar, Punjab, India

Graduation, *April 1999*, D.A.V. College, Amritsar, Punjab, India

### **RESEARCH INTERESTS**

My research interests span the areas of Mathematical Modelling and Simulation, Dynamical Systems and their applications in demographic processes, Mathematical Biology and Epidemiology, Industrial Mathematics, Innovation Diffusion Modelling.

### **SPONSORED RESEARCH PROJECTS**

Completed one project as Co-coordinator of Modernization and Removal of Obsolescence (MODROB) Sponsored by All India Council for Technical Education (AICTE), New Delhi entitled "Modernization of Numerical Analysis Laboratory", sanctioned under MODROB scheme of worth Rs. 8.0 Lacs.

**Number of Attended Short** : One Week: Two Weeks: 10  
**Term Courses** 25

### **TEACHING EXPERIENCE**

- 3<sup>rd</sup> September 2004 to 25<sup>th</sup> September 2017 as Assistant Professor, Shaheed Bhagat Singh State Technical Campus, Ferozepur, Punjab, India
- 25<sup>th</sup> September 2017 to till date as Associate Professor, Shaheed Bhagat Singh State University, Ferozepur-152004 (Punjab), India

## **JOURNAL PAPERS**

1. Ghosh, S., Mondal, B., Ghosh, U. and **Kumar, Rakesh**,. Catchability-Driven Bifurcations in a Predator-Prey System with Allee Effect and Harvesting. **Braz J Phys** **56**, 121 (2026). (SCIE Indexed). <https://doi.org/10.1007/s13538-026-02038-2>
2. Kaur, Amanpreet, and **Rakesh Kumar**. "Exploring dynamical behavior of virally infected planktonic system under the influence of harvesting and holling type IV infection transmission." *The European Physical Journal Plus* 141, no. 2 (2026): 140. (SCIE Indexed).
3. **Kumar, Rakesh**, Amanpreet Kaur, Krishna Pada Das, and Ajender Kumar Malik. "Dynamics of a Virally Infected Phytoplankton and Zooplankton System with Linear Harvesting." *Journal of Applied Nonlinear Dynamics* 14, no. 02 (2025): 371-398 (ESCI & SCOPUS).
4. Rana, Navneet, **Rakesh Kumar**, Abhijit Sarkar, and Bapin Mondal. "Unraveling dynamics of bursting, transient, and tipping behavior in toxic plankton–fish system with fear and zooplankton refuge." *Journal of Computational Science* 85 (2025): 102527. (SCIE Indexed).
5. Rana, Navneet, **Rakesh Kumar**, and Abhijit Sarkar. "Bi-stability behaviors of plankton–fish model taking phytoplankton as a basic nutritional source for fish." *The European Physical Journal Plus* 140, no. 9 (2025): 857. (SCIE Indexed).
6. Saha, Satyajit, **Rakesh Kumar**, Vikash Gupta, Sandip Banerjee, and Krishna Pada Das. "Fractional-order delay SIR Model with non-monotonous incidence rate, limited treatment facility and reinfection." *Nonlinear Science* (2025): 100056.
7. Das, Krishna Pada, Satyajit Saha, and **Rakesh Kumar**. "Role of Defense Controlling Stability of a Prey-Predator Model with Disease in Predator Species." *Discontinuity, Nonlinearity, and Complexity* 14, no. 01 (2025): 179-195 (SCOPUS).
8. Saha, Satyajit, **Rakesh Kumar**, Uttam Ghosh, and Krishna Pada Das. "A Fractional Order SIR Model with Non-Monotonous Incidence Rate and Limited Treatment Facility." *Biophysical Reviews and Letters* 20, no. 03 (2025): 139-167.
9. Rana, Navneet, **Rakesh Kumar**, and Abhijit Sarkar. "Role of fear factor in controlling chaos of a plankton–fish system with prey refuge and an additional food." *The European Physical Journal Plus* 139, no. 1 (2024): 104. (SCIE Indexed).
10. Sarkai, Abhishek, Seema Sarkar, Partha Karmakai, Gaurishankar Paliwal, **Rakesh Kumar**, Kulbhushan Agnihotri, and Sanat Kumar Mahata. "Roll of viral infection in a nutrient-phytoplankton-zooplankton mathematical model." *Nonlinear Studies* 31, no. 3 (2024). (SCOPUS).
11. Sarkar, Abhishek, Seema Sarkar, Partha Karmakar, Gaurishankar Paliwal, and **Rakesh Kumar**. "A mathematical analysis of harvesting in tri-trophic food chain with complexdynamics." *Nonlinear Studies* 31, no. 3 (2024) (SCOPUS).
12. Karmakar, Partha, Krishna Pada Das, Satyajit Saha, Bhagabat Das, and **Rakesh Kumar**. "Mathematical analysis of epidemic model to assess the impact of lockdown on COVID-19." *Journal of AppliedMath* 1, no. 2.1 (2023): 97-97.
13. **Rakesh Kumar**, Minni Rani, Jyoti Gupta, A. K. Malik,“ Chaotic Dynamics of a Continuous Innovation Diffusion Model with Delayand External as well as Internal Influences”. **IJFANS INTERNATIONAL JOURNAL OF FOOD AND NUTRITIONAL SCIENCES**, Vol.11, No. 12(2022), pp. 4375-4382 (UGC- Care List).
14. Binayak Nath , Krishna Pada Das , S. Gnanavel ,Partha Karmakar, Rakesh Kumar , K.S. Nisar,“ Food conversion efficiency and disease in intermediate predator stabilizes the chaotic dynamics in tri-trophic food chain with refugia and allee in prey species”. **Nonlinear Studies**, Vol.30, No.1(2023), pp. 1-22 (SCOPUS).
15. Krishna Pada Das, S. Gnanavel, Rashmi Bhardwaj, Rakesh Kumar,“Allee effect in a harvested a predator-prey model with disease in both population”. **Nonlinear Studies**,Vol.29, No.4(2022), pp. 1-28 (SCOPUS).
16. Rakesh Kumar and Anuj K Sharma,“Dynamical behavior of an innovation diffusion model with intra-specific competition between competing adopters”. **International Journal of Bifurcation and Chaos**,Vol.31, No.14(2021), pp.2150213(SCI).

17. Rakesh Kumar, Anuj K Sharma and Govind Prasad Sahu, "Dynamical behavior of an innovation diffusion model with intra-specific competition between competing adopters". **Acta Mathematica Scientia**, Springer, Vol. 42B, No.1 (2022) 1–23 (SCIE).
18. Rakesh Kumar, Anuj K Sharma and Kulbhushan Agnihotri, "Hopf bifurcation analysis in a multiple delayed innovation diffusion model with holling ii functional response". **Mathematical Methods in the Applied Sciences**, 43, 2056–2075 (2020) (SCIE).
19. Rakesh Kumar, Anuj K Sharma and Kulbhushan Agnihotri, "Bifurcation behaviour of a nonlinear innovation diffusion model with external influences". *International Journal of Dynamical Systems and Differential Equations (ESCI)*, Vol. 10, No. 4, 329-357 (2020)..
20. Rakesh Kumar, Anuj K Sharma and Kulbhushan Agnihotri, "Dynamical Analysis of an Innovation Diffusion Model with Evaluation Period", **Boletim da Sociedade Paranaense de Matemática**, 38(5), 87–104 (2020) (ESCI & Scopus Indexed).
21. Rakesh Kumar, Anuj K Sharma and Kulbhushan Agnihotri, "Bifurcation analysis of a nonlinear diffusion model: Effect of evaluation period for the diffusion of a technology", **Arab Journal of Mathematical Sciences**, 25(2), 189-213 (2019) (Scopus Indexed).
22. Rakesh Kumar, Anuj K Sharma and Kulbhushan Agnihotri, "Stability and bifurcation analysis of a delayed innovation diffusion model", **Acta Mathematica Scientia**, Elsevier, 38B(2), 709–732, 2018 (SCIE Indexed).
23. Rakesh Kumar, Anuj K Sharma and Kulbhushan Agnihotri, "Delay Induced Hopf Bifurcation in a Nonlinear Innovation Diffusion Model: External Influences Effect", **East Asian J. Appl. Math.**, 8(3), 422–446 (2018) (SCIE Indexed).
24. Rakesh Kumar, Anuj K Sharma and Kulbhushan Agnihotri, "Dynamics of an Innovation Diffusion Model with Time Delay", **East Asian J. Appl. Math.**, 7, 455-481, 2017 (SCIE Indexed).
25. Rakesh Kumar, Anuj K Sharma and Kulbhushan Agnihotri, "Bifurcation analysis of a stage structured innovation diffusion model with evaluation period", **Journal of Advanced Research in Dynamical and Control Systems (Scopus)**, Vol. 9, No. 9, pp. 187-200, Sept. 2017.
26. Rakesh Kumar, Anuj K Sharma and Kulbhushan Agnihotri, "Modelling the effect of delay in a nonlinear innovation diffusion model", **International Journal of Advanced Research in Science and Engineering**, Vol. 6, No. 3, pp. 267-274, March 2017 (2319-8354).
27. Rakesh Kumar, "Analysis of a Delayed Innovation Diffusion Model with Carrying Capacity", *Journal of Computational Information Systems*, Vol.11, No. 4 (2015), pp. 01-06 (ISSN:1553-9105).

## CONFERENCE PAPERS

1. Kaur, Amanpreet, and **Rakesh Kumar**. "Controlling Plankton Blooms: The Role of Environmental Toxins and Harvesting in Plankton Systems." In *International Conference on Sustainable and Innovative Solutions for Current Challenges in Engineering & Technology*, pp. 163-175. Singapore: Springer Nature Singapore, 2024.
2. Rana, Navneet, **Rakesh Kumar**, and Abhijit Sarkar. "Mathematical Analysis of Time Delayed Model of Phytoplankton and Zooplankton Species." In *International Joint Conference on Advances in Computational Intelligence*, pp. 73-85. Singapore: Springer Nature Singapore, 2024.
3. **Rakesh Kumar**, and Ritu Ahuja. "Chaos Control in a Time Delayed Phytoplankton-Zooplankton System with Harvesting of Zooplankton." In *Congress on Intelligent Systems*, pp. 295-309. Singapore: Springer Nature Singapore, 2023.
4. Ghosh, Shubhadeep, **Rakesh Kumar**, and Krishna Pada Das. "The Impact of Alternative Food Sources on Chaos Occurrence and Control: Insights from the Leslie-Gower Type Tritrophic Food Chain Model." In *International Conference on Mathematical Modelling, Applied Analysis and Computation*, pp. 238-262. Cham: Springer Nature Switzerland, 2023.
5. **Rakesh Kumar**, and Amanpreet Kaur. "Role of viral infection in toxin producing phytoplankton and zooplankton dynamics: a mathematical study." In *International Joint Conference on Advances in Computational Intelligence*, pp. 729-742. Singapore: Springer Nature Singapore, 2022.
6. **Rakesh Kumar**, and Navneet Rana. "Mathematical analysis of effect of nutrients on plankton model with time delay." In *International Joint Conference on Advances in Computational Intelligence*, pp. 689-703. Singapore: Springer Nature Singapore, 2022.

## BOOK CHAPTERS

1. Ahuja, Ritu, and **Rakesh Kumar**. "Mathematical analysis and reliability in harvesting of marine resources." In *Reliability Assessment of Flow Networks and Industrial Systems*, pp. 273-291. Elsevier, 2026.

2. **Rakesh Kumar**, and Navneet Rana. "Mathematical Modelling and Reliability in Harvesting of Seafood for Food-Processing Industries." In *Industrial Reliability and Safety Engineering*, pp. 17-34. CRC Press, 2023. <https://doi.org/10.1201/9781003140092-2>.
3. **Rakesh Kumar**, Amanpreet Kaur, and Krishna Pada Das. "Mathematical modeling and analysis of virally infected phytoplankton in presence of delay." *Computational analysis of mathematical systems and wireless networks* 87 (2023).
4. **Rakesh Kumar**, Navneet Rana, and Anuj Kumar Sharma. "A mathematical study of phytoplankton and zooplankton model with time delay." *Computational analysis of mathematical systems and wireless networks* 129 (2023).
5. **Rakesh Kumar**, Navneet Rana, and Vijay Kumar. "Bifurcation behaviors of a phytoplankton-zooplankton model with toxicity." *Computational analysis of mathematical systems and wireless networks* 149 (2023).
6. **Rakesh Kumar**, "Dynamics of a Continuous Innovation Diffusion Model with Advertisements as well as Interpersonal Communications." Book on "**Applications of Advanced Optimization Techniques in Industrial Engineering**," CRC Press (Taylor & Francis), CRC Press,70--100,(2022), <https://doi.org/10.1201/9781003089636>.
7. **Rakesh Kumar**, "Optimization of an Innovation diffusion model of a high valued product with delay of adoption for low income group." Book on "*Operations Research: Methods, Techniques, and Advancements*," CRC Press (Taylor & Francis), CRC Press, 67--84,(2022), <https://doi.org/10.1201/9781003156291>.
8. Rakesh Kumar, "Mathematical modeling of a delayed innovation diffusion model with media coverage in adoption of an innovation." In "*Systems Reliability Engineering*" (pp. 153-172), (2021), De Gruyter, <https://doi.org/10.1515/9783110617375-010>.
9. Rakesh Kumar, "Modelling and Simulation Process of an Innovation Diffusion Model." Book on "*Wireless Communication and Computing*", ISBN: 978-93-90154-76-0 (2020).

## CONFERENCE PAPERS

Sr No.	Title of the paper	Name of the Conference	Sponsored by	Organised by	National/International	When(Date)
1	A two warehouse stock-dependent demand inventory model for non-instantaneous deteriorating items	25 <sup>th</sup> Annual Conference of Rajasthan Ganita Parishad & National Seminar on Applications of Computer in Mathematical Research and Symposium	Rajasthan Ganita Parishad	Seth Motilal (P.G.) College, Jhunjhunu, Rajasthan, India	National	March 1-2,2014
2	Market Innovations Diffusion Models - A Review	International Conference on "Frontiers in Materials Research & Applications"	TEQIP II	SBSSTC, Ferozepur, India	International	Oct 30-31,2014
3	Modelling the Effect of Evaluation Period on Innovation Diffusion	International Conference on "Emerging Areas of Mathematics for Science and Technology"	Indian Society of Industrial and Applied Mathematics	Punjabi University, Patiala, India	International	Jan 30-Feb 1,2015
4	Innovation Diffusion Model with delay: Emphasizing the effect of carrying capacity	National Conference on "Frontiers in Materials Research & Applications"	TEQIP II	SBSSTC, Ferozepur, India	National	Dec 24,2015
5	Dynamic Behavior in an Innovation Diffusion Marketing Model	International Conference on "Technology, Science and Management Innovation"	MM PG College Fatehabad, Haryana	MM PG College Fatehabad, Haryana, India	International	Nov 29,2015

6	Innovation Diffusion Model : Emphasizing the effect of Evaluation Period in shifting the non-adopter to Adopter Population Class	International Conference on the occasion of “Silver Jubilee of Indian Society of Industrial and Applied Mathematics ”	Indian Society of Industrial and Applied Mathematics (ISIAM)	Indian Society of Industrial and Applied Mathematics & Sharda University, Noida, India	International	Jan 29-31,2016
7	A Mathematical Innovation Diffusion Model with Time Delay	National Conference on “Frontiers in Materials Research & Applications”	TEQIP II	SBSSTC, Ferozepur, India	National	Dec 28,2016
8	The impact of time delay on innovation diffusion model	Recent Advances in Computational Techniques	CSIR	DAV College, Jalandhar	National	March 22,2017
9	Stability analysis of an innovation diffusion model	Clean Energy Technologies	AICTE	SBSSTC, Ferozepur, India	National	Nov 07,2017
10	Dynamics of an Innovation Diffusion Model with Intraspecific Competition between Competing Adopters	Recent Applications in Science and Engineering Post COVID-19	SSRE	Shivalik College of Engineering, Dehradun, India	International	June 20,2020
11	Dynamical behavior of the thinker and buyer populations in an innovation diffusion model with impact of media coverage	International Advances in Computational Mathematics & Engineering	AICTE	BKBIET, Pilani, Rajasthan, India	International	March 19-21,2021
12	Innovation Diffusion Modeling of a Product with Special Emphasis on External Factors	National Conference on Wireless Communication, Computing and Informatics	National	Mata Sundri University Girls College, Punjab	National	April 20,2021

## **PROFESSIONAL SERVICE**

### **Technical Reviewer of**

- Wiley, *Mathematical Methods in Applied Sciences*, Thomsen Reuters, SCIE
- *IEEE Transactions on Circuits and Systems I: Regular Papers*, Thomsen Reuters, SCIE
- Hindawi, *Journal of Mathematics*, Thomsen Reuters, SCIE
- Hindawi, *Discrete Dynamics in Nature and Society (DDNS)*, Thomsen Reuters, SCIE
- Hindawi, *Computational and Mathematical Methods in Medicine*, Thomsen Reuters, ESCI
- Hindawi, *Mathematical Problems in Engineering.*, Thomsen Reuters, SCIE
- Firouzabad Institute of Higher Education, Shahid Beheshti Blvd., Firouzabad, Fars. Iran, *Annals of Optimization Theory and Practice*, Islamic World Science Citation Center
- Turkish Journal of Mathematics