

FACULTY PROFILE



Name: Dr. Santosh Kumar Rai

Designation: Assistant professor

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Professional Qualification:

Qualification	Title	Organization/ Institute	Year
Ph.D	A study of flow instability and safe limit in supercritical water natural circulation loop	SRM-IST	2023
Post graduate	Mechanical Engineering	IIITDM Jabalpur	2014
Under graduate	Mechanical Engineering	IIITDM Jabalpur	2010

Publications (SCI/ESCI and Scopus)

- **Rai, S. K.**, Kumar, P., Tiwari, M., Panwar, V., Kumar, D., & Sharma, V. K. (2025). A comprehensive overview of advancements, applications, and impact of supercritical fluid natural circulation loops. *Annals of Nuclear Energy*, 211, 110971.
- Kumar, R., Gupta, M. K., **Rai, S. K.**, & Panwar, V. (2023). Grain size responsive uniaxial tensile behavior of polycrystalline nanocopper under different temperatures and strain rates. *Multidiscipline Modeling in Materials and Structures*, 19(3), 507-521.
- **Rai, S. K.**, Ahlawat, N., Upadhyay, R., Kumar, P., & Panwar, V. (2022). A study on the effect of geometry and operating variables on density wave oscillation in a supercritical natural circulation loop. *Computation*, 10(2), 25.

- **Rai, S. K.**, Kumar, P., & Panwar, V. (2021). Numerical investigation of steady state characteristics and stability of supercritical water natural circulation loop of a heater and cooler arrangements. *Nuclear Engineering and Technology*, 53(11), 3597-3611.
- **Rai, S. K.**, Kumar, P., & Panwar, V. (2021). Mathematical and numerical investigation of Ledinegg flow excursion and dynamic instability of natural circulation loop at supercritical condition. *Annals of Nuclear Energy*, 155, 108129.
- **Rai, S. K.**, Kumar, P., & Panwar, V. (2020). Numerical analysis of influence of geometry and operating parameters on Ledinegg and dynamic instability on supercritical water natural circulation loop. *Nuclear Engineering and Design*, 369, 110830.
- Upadhyay, R., **Rai, S. K.**, & Dutta, G. (2018). Numerical analysis of density wave instability and heat transfer deterioration in a supercritical water reactor. *Journal of Mechanical Science and Technology*, 32, 1063-1070.
- **Rai, S. K.**, Suman, S., Upadhyaya, R., Raghuvanshi, N. S., Gupta, M. K., Shah, S., & Alam, S. (2022). A state of art review of instability in parallel channels of supercritical fluid in nuclear applications. *Materials Today: Proceedings*, 62, 226-232.
- Suman, S., **Rai, S. K.**, Singh, R. K., Bhushan, A., & Rajak, D. K. (2022). Compositional Ligno-cellulosic behaviour of some residual biomass. *Materials Today: Proceedings*, 62, 392-397.
- Singh, P., Shah, S., & **Rai, S. K.** (2022). Post-combustion carbon capture by polymeric membrane: A review. *Materials Today: Proceedings*, 62, 318-324.
- Singh, P., Shah, S., & **Rai, S. K.** (2022). Membrane modeling for carbon capture by using CFD. *Materials Today: Proceedings*, 62, 142-150.
- Suman, S., **Rai, S. K.**, Yadav, A. M., Bhushan, A., Tomar, N., Singh, R. K., ... & Mishra, A. K. (2021). Influence of Thermal and Morphological Behaviour on Biomass Waste Materials during Pyrolysis. In *E3S Web of Conferences* (Vol. 321, p. 01005). EDP Sciences.
- **Rai, S. K.**, Ahlawat, N., Kumar, P., & Panwar, V. (2021). Mathematical modeling and numerical investigation of density wave instability of supercritical natural circulation loop. In *E3S Web of Conferences* (Vol. 321, p. 04004). EDP Sciences.
- **Rai, S. K.**, Dutta, G., & Sheorey, T. (2017). Stability analysis of supercritical water natural circulation loop with vertical heater and cooler. In *Proceedings of the 24th National and 2nd International ISHMT-ASTFE Heat and Mass Transfer Conference (IHMTTC-2017)*. Begel House Inc..
- Gupta, H. K., **Rai, S. K.**, & Sheorey, T. (2015). Boiling flow heat transfer in microchannel: Experimental and numerical investigation. In *Proceedings of the 23rd National Heat and Mass Transfer Conference and 1st International ISHMT-ASTFE Heat and Mass Transfer Conference IHMTTC-2015* (pp. 1-8), Begel House Inc.
- Gupta, M. K., **Rai, S. K.**, Panwar, V., Parinov, I. A., & Haldkar, R. K. (2023, October). Molecular Dynamic Study of Dependency on Mechanical Characteristic of Nanocrystalline Copper over Various Temperature and Strain Rate. In *International*

Conference on Physics and Mechanics of New Materials and Their Applications (pp. 345-354). Cham: **Springer Nature Switzerland**.

- Hussain, M. E., **Rai, S. K.**, Suman, S., Gupta, P., & Gupta, M. K. (2022, August). Computational Analysis of Transfer of Heat in Micro Size Channels Using Different Boundary Condition in Laminar Flow. In *Biennial International Conference on Future Learning Aspects of Mechanical Engineering* (pp. 445-455). **Singapore: Springer Nature Singapore**.
- Ahlawat, N., **Rai, S. K.**, & Gupta, M. K. (2022). Prospects Toward the Development of Nanomaterials for Advanced Applications. In *Nanomaterials for Advanced Technologies* (pp. 195-197). **Singapore: Springer Nature Singapore**.
- **Rai, S. K.**, Kumar, P., & Panwar, V. (2021). Computational analysis of static flow instabilities in supercritical natural circulation loop. In *Proceedings of International Conference on Thermofluids: KIIT Thermo 2020* (pp. 387-395). **Springer Singapore**.
- **Rai, S. K.**, Sharma, R., Saifi, M., Tyagi, R., Singh, D., & Gupta, H. (2018). Review of recent applications of micro channel in mems devices. *International Journal of Applied Engineering Research*, 13(9), 64-69.
- **Rai, S. K.**, & Dutta, G. (2018). A review of recent applications of supercritical fluid in natural circulation loops for nuclear reactor. *Int. J. Appl. Eng. Res*, 23, 195-204.
- Singh, D., **Rai, S.**, & Shukla, S. (2017). Numerical analysis of two phase flow boiling heat transfer through microchannel. *Int. J. Eng. Res. Technol.*, 6, 1-6.
- Nimesh, P. and **Rai, S. K.** (2019). Numerical Research of Flow Heat Transfer through Micro Channel of Mems Device, *Int. J. Eng. Res. Technol.*, 6, 1-6.

Patent:

- Dr. Santosh Kumar Rai, Ap. No. 202411043139A Filing: 16/06/2024 Portable decentralized low-pressure multipurpose grain saver system Patent Published 2024
- Dr. Santosh Kumar Rai Design No. 356926-001 Date:18/01/2022 Hands free water taps mechanism, Grant- 2022
- Dr. Santosh Kumar Rai Application number 202411019902. date of filing- 18/03/2024, India. Renewal energy based smart assistive device for partial and fully visual impaired person, Published 2024

Awards and Achievements

- I got MHRD Scholarship during M-Tech, 2012 to 2014
- I have GATE qualified, year 2010, 2012, 2013, 2014, 2015 and 2017

Work Experience:

10 Years

Professional Memberships:

- International Association for Engineers (IAENG)