

Kanhaiya Lal Chaurasiya

CONTACT INFORMATION

S-421, RA Tower, IIT Kanpur
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RESEARCH INTERESTS

Bio-inspired system design, Shape memory alloy, Actuators and control, New product development and Structural health monitoring

EDUCATION

Indian Institute of Technology Kanpur, Uttar Pradesh, India

- M.Tech in Mechanical Engineering, CPI of 9.0/10 (2016)
- B.Tech in Mechanical Engineering, CPI of 7.1/10 (2015)
(5-years Integrated Dual Degree Programme)

St. John's School, (Affiliated to CISCE Board), Varanasi, India

- 12th Grade (Intermediate), Scored 90.3%; Secured **100/100** marks in Mathematics (2010)
- 10th Grade (High School), Scored 92.0% (2008)

HONORS AND AWARDS

2022	National	ISSS Technology Award-2022 for Bio-inspired Artificial Muscle Actuator
2022	International	Invited Speaker for Yokohama-SXIP Symposium, Japan
2022	IIT Kanpur	Cert. of Recognition as Coordinator for 44 th & 45 th HAL Training Program
2021	International	Cert. of Participation in International Symposium on Robotics
2021	International	Cert. of Participation in Japanese Sakura Science Exchange Program
2017	TATA Motors	"Outstanding" assessment in annual performance appraisal
2016	IIT Kanpur	Finalist for Best M.Tech Thesis among all engineering disciplines.
2014	1 st /21	Best Engineering Summer Project Award, Whirlpool India
2014	Top 21/2500	Whirlpool Young Leaders Program Fellow
2013	2 nd /200	National level case study competition Manthan by CAG
2013	IIT Bombay	Certificate of Engineering Excellence, Robowars Tournament, Techfest
2012	1 st prize	Inter-College Combat Robot Tournament, Techkriti, IIT Kanpur
2012	IIT Kanpur	Certificate of Appreciation for a project in Manufacturing Science
2011	National	Secured IIT-JEE All India Rank- 1802 (99.62 percentile)
2011	National	Secured AIEEE All India Rank- 3338 (99.72 percentile)
2010	National	Cert. of Merit by UP State Govt. for 100/100 in Maths (Class XII)

PUBLICATIONS

International Journal

- [1] **Chaurasiya, K. L.**, Sinha, Y., Bidila, U. K., Killedar, D., Sahu, K. D. & Bhattacharya, B (2023). Design, modelling and experimental validation of bipenniform muscle architecture inspired shape memory alloy-based linear actuator. *Smart Mater. Struct.* (Under revision)
- [2] **Chaurasiya, K. L.**, Harsha, A., Sinha, Y., & Bhattacharya, B. (2022). Design and development of non-magnetic hierarchical actuator powered by shape memory alloy based bipennate muscle. *Scientific Reports*, 12(1), 1-15.
- [3] Sampath, S., **Chaurasiya, K. L.**, Aryan, P., & Bhattacharya, B. (2021). An innovative approach towards defect detection and localization in gas pipelines using integrated in-line inspection methods. *Journal of Natural Gas Science and Engineering*, 90, 103933.
- [4] **Chaurasiya, K. L.**, Bhattacharya, B., Varma, A. K., & Rastogi, S. (2020). Dynamic modeling of a cabin pressure control system. Proceedings of the Institution of Mechanical Engineers, Part G: *Journal of Aerospace Engineering*, 234(2), 401-415.

International Conference

- [1] **Chaurasiya, K. L.**, Pawar, V., & Bhattacharya, B. (2023, April). An innovative method and apparatus for speed control of pipe health monitoring robot during gas pipeline inspection. In *Health Monitoring of Structural and Biological Systems XVII* (Vol. 12488, pp. 372-379) SPIE.
- [2] Sinha, Y., **Chaurasiya, K. L.**, Patel, Y. A. K., Gupta, T., & Bhattacharya, B. (2023, April). Design and development of novel rotary actuation system based on shape memory alloy springs driven mechanism arranged in bipennate muscle architecture. In *Active and Passive Smart Structures and Integrated Systems XVII* (Vol. 12483, pp. 498-510). SPIE.

PATENTS

- [1] [Appl. No. 202311068306] (Country: India) “**Air-Levitation based Hyperloop Transporting System with Robot Vehicle for Transporting Goods**”, 2023 (*Filed*)
- [2] [Patent No. 414106] (Country: India) “**Bipennate Muscle Architecture-based Shape Memory Alloy Embedded Hierarchical Actuator**”, IPC F03G; B25J, 2022 (*Granted*)
- [3] [Appl. No. PCT/US2022/041899] (Countries: United States & European Region) “**Actuator for a Valve**”, Pub. No. WO/2023/034215, IPC F16K 31/02 2006.1, 2022 (*Filed*)
- [4] [Appl. No. 202211077045] (Country: India) “**Hyperloop Transporting System with Robot Vehicle for Transporting Goods**”, 2022 (*Filed*)
- [5] [Appl. No. 202011016379] (Country: India) “**Speed Control System for Pipe Health Monitoring Robot**”, Pub. No. 36/2020, IPC H01M; G11B, 2020 (*Filed*)

PROFESSIONAL EXPERIENCE (6.5+ years)

IIT Kanpur, Smart Materials, Structures and Systems Lab, Mechanical Engg., Kanpur, India
Senior Project Scientist (Apr’19 - Present)

- Carried out R&D activities leading to translation of research for end-users via industrial partners.
- Drafted research proposals to various sponsoring agencies and secured grant of **\$142,500**.
- Delivered strong project leadership skills via project initiation, planning, & execution phases.
- Applied and validated analytical & numerical methods to solve dynamic models and applied mechanics problems related to product performance and processes.
- Led design team and collaborated with research associates and technologists. Identification of failures and improvement in processes based on Design failure mode and effects analysis (DFMEA).
- Designed & fabricated robot components and performed experiments; gained hands-on experience in additive manufacturing. Prepared and presented reports to cross-functional technical teams.

Tata Motors Ltd., Engineering Research Centre, Pune, India

Senior Manager (Sep’16 - Mar’19)

- Performed multibody modeling and vehicle dynamics simulation of Futuristic Infantry Combat Vehicle (FICV) in LMS Virtual.Lab motion solver environment.
- Analyzed infield failures and resolve issues by designing Interior Trim components across commercial vehicle platforms range. Collaborated with Noise, Vibration & Harshness (NVH) and Engine teams to propose optimal acoustic and thermal packages based on testing & CFD analysis.
- Prepared and processed DFMEAs, drafted benchmark reports, and ensure all quality standards are met by analyzing and efficiently responding to customer feedback.
- Formulated product innovation strategies; Co-led team of 12 to implement new technology development projects across multiple vehicle platforms. Strong expertise in managing project gateways, design, estimation, resource allocation, risk management & interfacing with stakeholders.

Whirlpool of India Ltd., Global Technology and Engineering Centre, Pune, India

Summer Intern (May’14 - Jun’14)

- Studied Gyroscopic Effect in end spinning of drum-type washing machine and performed dynamic modeling of washer in MATLAB Simulink.
- Proposed a novel design having an increment in maximum end-spin velocity by 250 RPM leading to a decrease in drying time compared to benchmarked products.

INVITED TALK, EXHIBITION & SUMMIT

- [1] *Future of Work: Industry 4.0, Innovation and 21st Century Skills.*, Presented at Y20 Summit - G20 Youth Consultation Forum (Apr–2023), IIT Kanpur, India.
- [2] *Adaptive Intelligent Pipe Health Monitoring Robot*, Exhibited technology at Uttar Pradesh Global Investors Summit (Feb–2023), Lucknow, India.
- [3] *Sustainability Transformation to a Resilient Society*, Invited Speaker at YNU International Symposium (Dec–2022), Yokohama National University, Japan.
- [4] *Adaptive Intelligent Pipe Health Monitoring Robot*, Exhibited at InvenTiv (23 IITs R&D Fair) under Ministry of Education, Govt. of India (Oct–2022), IIT Delhi, India.

RESEARCH PROJECTS

Bio-inspired shape memory alloy-based artificial muscle (*Bipennate*) actuation system
 SPONSORED R&D PROJECT | PI: Prof. Bishakh Bhattacharya, IIT Kanpur (Jun’21 - Ongoing)

- Integrated bio-inspired design principles in developing bipennate muscle configured shape memory alloy powered actuators for valve control and prosthetic applications.

- Led a team of 5 to develop and experimentally validate an analytical model for a high-force actuator (257 N with 15 V input). Benchmarked the system against industry-developed actuator, achieved 67% reduction in weight, 32% in cost and 19% energy savings with SMA driven system.
- **Publications:** 2 Journal articles, 1 Conference paper, and 2 Patents (*1 Granted & 1 Filed*).

Compressed Air-based Cargo Hyperloop (CABCH) mobility system

R&D PROJECT | PI: Prof. Bishakh Bhattacharya, IIT Kanpur

(Dec'22 - Ongoing)

- Developing a CAD and mathematical model for a pipe-following modular robotic system carrying a series of cargo modules used for transporting powered by the drag force of the compressed-air flow with a designed target velocity of 180 km/hr. **Publication:** 1 Patent (*Filed*).
- Demonstrated a scaled-down working model showcasing system levitation using air lubrication theory at G20 Youth Consultation Summit (Y20) - *Future of Work: Industry 4.0 & Innovation*.

Passive speed control system for Pipeline Health Monitoring Robot (PHMR)

SPONSORED R&D PROJECT | PI: Prof. Bishakh Bhattacharya, IIT Kanpur

(Apr'19 - Apr'21)

- Designed, modelled, and experimentally validated the speed control system for an 8-inch pipeline diameter for a PHMR to improve the effectiveness of inspection tool during pipeline pigging.
- Led a team of 6 and tested the system at 3.2 bar pressure and reported to passively regulate any undesirable high-speed spikes maximum by 51% within the acceptable range. Novel system design with dual integration of bypass leakage flow and hydro-mechanical brake mechanisms.
- **Publications:** 1 Journal article, 1 Conference paper, and 1 Patent (*Filed*).

A novel and robust Cabin Pressure Control System (CPCS) for combat aircraft using active smart valve system (Supported by: Hindustan Aeronautics Limited, Lucknow)

MASTER'S THESIS | Advisors: Dr. B. Bhattacharya & Dr. A. K. Varma, IIT Kanpur (May'15 - May'16)

- Developed and validated mathematical model for design and performance analysis of pneumatically operated CPCS for multirole light combat aircraft. **Publication:** 1 Journal article.
- Proposed a piezostack-based active smart valve system for infusing robustness into existing CPCS in terms of reliability, accuracy & easy adaptability to any given cabin pressurization law.
- Created a MATLAB program by incorporating isentropic flow theory through convergent-divergent nozzle and gradient descent algorithm to cover steady-state and transient flight conditions for cabin control volume depicting a standard CPCV architecture as per SAE 2000-ARP 1270.

TEACHING & MENTORING EXPERIENCE

- Mentoring 4 UG students as a part of undergraduate projects at IIT Kanpur – projects ranging from Variable stiffness actuator, Bionic arm, SMA rotary system, and Cargo hyperloop system.
- Mentor for Summer Interns (2022 & '23), SMSS Lab - IIT Kanpur – delivered tutorials on shape memory alloy models & 3D printing techniques and conducted brainstorming sessions.
- Mentor for two HAL Training Programs (44th & 45th batches - 48 & 28 Trainees), IIT Kanpur – executed interactive sessions on variable-shaped airfoil and origami wing for UAV, provided tutorials on active and passive driving mechanism and reviewed the project deliverable.
- Mentor for Master of Science (MS) by Research Student, IIT Kanpur – delivered tutorials on Shape Memory Alloy modeling, interacted with student during doubt-clearing sessions.
- Teaching Assistant for Theory of Mechanisms Lab (UG) & Smart Material and Structures (PG).

COMPUTER SKILLS

- Languages: C, C++, Java, Go, Python
- Simulation Softwares: LMS Virtual.Lab, ABAQUS, MATLAB, modeFRONTIER
- Design Environments: CATIA V5, SolidWorks, AutoCAD, Inventor
- Familiar: MS Office, PLM, L^AT_EX Origin, Tecplot, LabVIEW, 3D Printing slicing software

RELEVANT COURSES

- Smart Materials & Structures
- Introduction to Robotics
- Data Structures & Algorithms
- Computer Aided Engg. Design
- Vibration & Control
- Finite Element Methods

EXTRA-CURRICULAR & SOCIAL ACTIVITIES

- Active member of **IITK Rock Climbing Club** – outdoor wall climbing & bouldering sessions.
- Developed and maintaining website for Smart Materials and Systems Lab, IIT Kanpur.
- Volunteered in **Tata Motors Community Service** Initiatives – educational guidance to tribal children, health awareness camp in rural schools and tree plantation drive.
- Won **first prize** in Combat robot event held in Techkriti-2012 at IIT Kanpur.
- Finalist at Megapixels-**Photography** Competition, held in Techniche-2012 at IIT Guwahati.