Dr. Ajay Bhandari
Assistant Professor (Grade I)
Department of Mechanical Engineering, IIT (ISM) Dhanbad
From: 3rd July 2020- Present
Email Id: ajayb@iitism.ac.in ; ajaybhandari25@gmail.com
Research Interests: Bio-fluid Mechanics and heat transfer, Image based modeling, Patient-specific computational models, Computational Oncology and Drug Delivery, **CFD**, Fluid flow and heat transfer, Personalized medicine.
Research Gate **Google Scholar** **ORCID** **Linked In**

EDUCATIONAL QUALIFICATIONS AND DETAILS

1. Ph.D. (Mechanical Engineering) ***July 2014-Feb 2020***
Department of Mechanical Engineering, Indian Institute of Technology (IIT) Kanpur
Academic Performance- CPI 9.4 out of 10
Thesis Title- Dynamic Contrast Enhanced-Magnetic Resonance Imaging (DCE-MRI) based numerical modeling of anticancer drug transport in human brain tumors.
Supervisor- Prof. Niraj Sinha (IIT Kanpur)

2. M.Tech. (Mechanical Engineering) Under Joint MTech-PhD programme ***May 2017-May 2018***
Department of Mechanical Engineering, Indian Institute of Technology (IIT) Kanpur
Academic Performance- CPI 9.4 out of 10
Thesis Title- Numerical modeling of drug transport in anterior human eye for treatment of Primary Open Angle Glaucoma (POAG).
Supervisor- Prof. Niraj Sinha (IIT Kanpur)

3. B.E. (Mechanical Engineering) ***July 2009- July 2013***
Department of Mechanical Engineering, University Institute of Engineering and Technology (UIET), Panjab University (PU), Chandigarh.
Academic Performance- 75.12%
Distinction- First Division with Honors (Third position in whole batch)
Final Year Project Title- To reduce the rejection/rework of gear box line in Mahindra and Mahindra Ltd. Swaraj Division Mohali.
Mentor- Prof. U K Das (Head, Heavy Machine shop, Mahindra and Mahindra Ltd. Swaraj Division Mohali)

WORK EXPERIENCE

1. Designation: Assistant Professor (Grade I) **July 2023- Present**
Department of Mechanical Engineering, IIT(ISM) Dhanbad

2. Designation: Assistant Professor (Grade II) **July 2020- July 2023**
Department of Mechanical Engineering, IIT(ISM) Dhanbad

3. Designation: Visiting Researcher **June 2023- July 2023**
School of Engineering, King's College University of Aberdeen, Aberdeen, UK
Sponsor: The Royal Society

4. Designation: Research Associate **Jan 2020- April 2020**
Department of Mechanical and Industrial Engineering, Indian Institute of Technology (IIT), Roorkee.
Sponsors: TBRL/DRDO

PEER-REVIEWED JOURNAL PUBLICATIONS (PUBLISHED)

1. Anahita Piranfar, Farshad Moradi Kashkooli, Wenbo Zhan, **Ajay Bhandari,** and M. Soltani, A Comparative Analysis of Alpha and Beta Therapy in Prostate Cancer Using a 3D Image-Based Spatiotemporal Model**, Annals of Biomedical Engineering, November 2024** Access Link **IF: 4**
2. Kartika Chandra Tripathy, and **Ajay Bhandari**, Effect of various septal deviations and corrections on nasal aero and particle dynamics: An *insilico* and *invitro* investigation**, Physics of Fluids** Vol. 36(1), pp. 091919, **September 2024** Access Link **IF: 4.6**
3. **Ajay Bhandari**, Boram Gu, Farshad Moradi Kashkooli, Wenbo Zhan, Image-based Predictive Modelling Frameworks for Personalised Drug Delivery in Cancer Therapy**, Journal of Controlled Release,** Vol 370, pp. 721-746, **June 2024**, Access Link **IF: 11.467.**
4. **Ajay Bhandari**, Anup Singh, and Wenbo Zhan, Decoding the effect of different tumor heterogeneities on thermosensitive liposome drug delivery during radiofrequency ablation: A novel heat and mass transfer perspective**, International Communications in Heat and Mass Transfer,** Vol. 153, **April, 2024,** Access Link **IF:7**
5. Anahita Piranfar, Farshad Moradi Kashkooli, Wenbo Zhan, **Ajay Bhandari**, Arman Rahmim, and M. Soltani, Radiopharmaceutical Transport in Solid Tumors via a 3-Dimensional Image-Based Spatiotemporal Model**, NPJ Systems Biology and Applications (Nature),** Vol. 10, **April, 2024,** Access Link **IF: 4.3**
6. Ashish Siddharth, **Ajay Bhandari**, Sarthak S. Singh, and Arun Dayal Udai, Effect of Twisting of Intravitreal Injections on Ocular Bio-mechanics: A Novel Insight to Ocular Surgery**, Biomechanics and Modeling in Mechanobiology** Vol. 23(1), **February 2024**, Access Link **IF: 3.5**
7. Kartika Chandra Tripathy, Md Sirajullah, Deepak Kumar Mandal, and **Ajay Bhandari**, Delineating the effects of morphological changes on retinal hemodynamics in diabetic human retinas: An *invitro* investigation**, Physics of Fluids** Vol. 36(1), pp. 011912, **January 2024 (Selected as featured by the Editor)** Access Link **IF: 4.6**
8. Kartika Chandra Tripathy, Ashish Siddharth and **Ajay Bhandari**, Image-based *insilico* investigation of hemodynamics and biomechanics in healthy and diabetic human retinas**, Microvascular Research** Vol. 150, pp. 104594, **November 2023** Access Link **IF: 3.75**
9. Kartika Chandra Tripathy, Rakesh Kumar Gupta and **Ajay Bhandari**, Importance of nasal air conditioning in pre-septoplasty planning: A heat and mass transfer perspective**, International Journal of Thermal Sciences** Vol. 193, pp. 108521, **November 2023** Access Link **IF: 4.8**
10. **Ajay Bhandari,** Kartikey Jaiswal, Anup Singh and Wenbo Zhan, Highlighting the effect of heterogeneous blood perfusion on radio-frequency ablation of human brain tumors: An image-based numerical investigation**, International Journal of Thermal Sciences** Vol. 189, pp. 108283, **Mar 2023** Access Link **IF: 4.8**
11. **Ajay Bhandari,** Kartikey Jaiswal, Anup Singh and Wenbo Zhan, Convection-enhanced delivery of antiangiogenic drugs and liposomal cytotoxic drugs to heterogeneous brain tumour for combination therapy**, Cancers** Vol. 14, Issue 17, pp. 4177, **August 2022** Access Link **IF: 6.575**
12. **Ajay Bhandari,** Ocular Fluid Mechanics and Drug Delivery: A Review of Mathematical and Computational Models**, Pharmaceutical Research** Vol.38, Issue 12, pp. 2003-2033, **December 2021** Access Link **IF: 4.580**
13. **Ajay Bhandari**, Ankit Bansal and Niraj Sinha, Effect of Aging on Heat Transfer, Fluid Flow and Drug Transport in Anterior Human Eye: A Computational Study, **Journal of Controlled Release** Vol. 328, Issue 10, pp. 286-303, **August, 2020,** Access Link **IF: 11.467**
14. **Ajay Bhandari**, Ankit Bansal and Niraj Sinha, Numerical Modeling of Therapeutic lens Drug Delivery in Anterior Human Eye for Treatment of Primary Open Angle Glaucoma (POAG), **Proceedings of the Institution of Mechanical Engineers, Part H: Journal of Engineering in Medicine** Vol. 234, Issue 9 pp. 942-954, **July, 2020,** Access Link **IF: 1.763**
15. **Ajay Bhandari**, Ankit Bansal, Anup Singh, Rakesh Kumar Gupta and Niraj Sinha, Comparison of Transport of Chemotherapeutic Drugs in Voxelized Heterogeneous Model of Human Brain Tumor, **Microvascular Research**. Vol. 124 pp. 76-90, **March 2019,** Access Link **IF: 3.75**
16. **Ajay Bhandari**, Ankit Bansal, Rishav Jain, Anup Singh and Niraj Sinha, Effect of Tumor Volume on Drug Delivery in Heterogeneous Vasculature of Human Brain Tumors, **ASME Journal of Engineering**

and Science in Medical Diagnostics and Therapy. Vol.2 pp. 021004 (1-10), **May 2019,** Access Link **IF: 1.7**

17. **Ajay Bhandari**, Ankit Bansal, Anup Singh and Niraj Sinha, DCE-MRI Based Voxelized Computational Model for Chemotherapeutic Drug Transport in Human Brain Tumor, **International Journal of Advances Engineering Science and Applied Mathematics** vol. 10(4) pp. 252-262, **September 2018,** Access Link **IF: 0.9**
18. **Ajay Bhandari**, Ankit Bansal, Anup Singh and Niraj Sinha, Numerical Study of Transport of Anticancer Drugs in Heterogeneous Vasculature of Human Brain Tumors Using Dynamic Contrast Enhanced-Magnetic Resonance Imaging**, ASME Journal of Biomechanical Engineering**. vol. 140 pp. 051010 (1-10), **March 2018,** Access Link **IF: 1.899**
19. **Ajay Bhandari**, Ankit Bansal, Anup Singh and Niraj Sinha**,** Transport of Liposome Encapsulated drugs in Voxelized Computational Model of Human Brain Tumors, **IEEE Transactions on Nano Bio Science**. vol. 16(7) pp. 634-644, **October 2017,** Access Link **IF: 3.9**
20. **Ajay Bhandari**, Ankit Bansal, Anup Singh and Niraj Sinha**,** Perfusion Kinetics in Human Brain Tumor with DCE-MRI derived model and CFD analysis, **Journal of Biomechanics**. Vol. 59 pp. 80-89, **May 2017,** Access Link **IF: 2.789**

PEER-REVIEWED JOURNAL PUBLICATIONS (Under Review)

21. **Ajay Bhandari**, Anup Singh, and Wenbo Zhan, Investigating the effect of Anti-angiogenic drugs on heterogeneous tumor microenvironment**, Royal Society Interface Focus IF:4.6**
22. **Ajay Bhandari,** Boram Gu, Farshad Moradi Kashkooli, Wenbo Zhan, Multiphysics and multiscale models in drug release, transport and delivery for different types of systems, **Small IF: 13**
23. **Ajay Bhandari**, Kartika Chandra Tripathy, Prashant Bokam, and Arnaud Germaneau, Patient-specific glioblastoma tumor response to electric field-mediated nanomedicine therapy and treatment optimization: A multiscale approach**, Computers in Biology and Medicine IF:7**
24. **Ajay Bhandari**, and Kartika Chandra Tripathy, Optimization of coil embolization procedure in ophthalmic aneurysms to restore normal blood flow to retina**, Physics of Fluids IF:4.6**

CONFERENCE PROCEEDINGS, PRESENTATIONS AND BOOK CHAPTERS

1. Kartika Chandra Tripathy and **Ajay Bhandari**, "Importance of Drug Administration Parameters on the Targeted Drug Delivery in the nasal cavities for various septal deviations" International Conference on Biological Innovation, Technology, Engineering, and Sciences -2024, 18th -20th December 2024, NIT Rourkela, India.
2. Sourav Choudhury, Kartika Chandra Tripathy and **Ajay Bhandari**, "Tumor Treating Field mediated Thermosensitive Liposome Drug Delivery in Human Brain Tumors: A pilot Numerical investigation" International Conference on Biological Innovation, Technology, Engineering, and Sciences -2024, 18th -20th December 2024, NIT Rourkela, India.
3. Gautam Kumar, Kartika Chandra Tripathy, and **Ajay Bhandari**, "Investigation of Hemodynamics in the Carotid Artery with Aneurysm at the Carotid-Ophthalmic Junction: An In Vitro Experiment" International Conference on Biological Innovation, Technology, Engineering, and Sciences -2024, 18th -20th December 2024, NIT Rourkela, India.
4. Aritra Roy, Balbir Prasad, Ayan Mukherjee, and **Ajay Bhandari**, "Demystifying the flow dynamics of non-Newtonian fluids in electrokinetically modulated typographically patterned Channels with Physics Informed Neural Networks" International Conference on Biological Innovation, Technology, Engineering, and Sciences -2024, 18th -20th December 2024, NIT Rourkela, India.
5. Kartika Chandra Tripathy and **Ajay Bhandari,** "Effect of septal correction on nasal aerodynamics – An invitro experimental and numerical investigation" International Conference on Thermo-Fluids and System Design, April 4-5, 2024, BIT Mesra, India.

6. Sourav Choudhury, Prashant Bokam and **Ajay Bhandari,** "Alternative brain cancer treatment using tumor treating fields: A computational approach." International Conference on Thermo-Fluids and System Design, April 4-5, 2024, BIT Mesra, India.
7. Dhruvjyoti Roy, Prashant Bokam and **Ajay Bhandari,** "Optimization of probe positioning in radiofrequency ablation of heterogeneous human brain tumor: A numerical heat transfer study" International Conference on Thermo-Fluids and System Design, April 4-5, 2024, BIT Mesra, India.
8. Kartika Chandra Tripathy and **Ajay Bhandari,** "Micro-particle deposition patterns in human nasal cavity with different types of deviations" Fluid Mechanics and Fluid Power, **December 20-22, 2023**, **IIT Jodhpur**, India.
9. Parth Dev Bundela, Ajay Bhandari, Sarthak S. Singh; Convection enhanced drug delivery in deformable human tumors. **AIP Conf. Proc.** 5 September 2023; 2863 (1): 020003. **Access Link.**
10. Sangly P Srinivas, Parth Dev Bundela, Yamalapalli Sowmya, **Ajay Bhandari**; Pharmacokinetic simulation of topical lipophilic solutes across the cornea by the finite element method. **Invest. Ophthalmol. Vis. Sci**. 2023;64(8):4744.**Access Link.**
11. Anahita Piranfar, M. Soltani, Farshad M. Kashkooli, Wenbo Zhan, **Ajay Bhandari**, Arman Rahmim," 177Lu-PSMA-617 Transport in Solid Tumor via 3D Spatio-temporal Model Reconstructed from Magnetic Resonance Image", Society of Nuclear Medicine and Molecular Imaging, **June 24-27, 2023**, **Chicago, Illinois, USA**. **Access Link.**
12. Shivam Gupta and **Ajay Bhandari,** "Image-based retinal hemodynamics simulation of healthy and pathological retinal vasculature" Fluid Mechanics and Fluid Power, **December 14-16, 2022**, **IIT Roorkee**, India. **Access Link.**
13. Kartika Chandra Tripathy and **Ajay Bhandari,** "Highlighting the importance of nasal air conditioning in septoplasty using virtual correction tools: A numerical study" Fluid Mechanics and Fluid Power, **December 14-16, 2022**, **IIT Roorkee**, India. **Access Link.**
14. **Ajay Bhandari**, Ankit Bansal and Niraj Sinha, "Comparison of efficacy of different drug delivery modes in anterior human eye for treatment of primary open angle glaucoma (POAG)", Computational and Mathematical Biomedical Engineering, **June 10-12, 2019**, **Tohoku University, Japan**.
15. Ashish Tiwari, **Ajay Bhandari**, Pankaj Wahi and Niraj Sinha, Finite Element Analysis and Computational Fluid Dynamics Study of Pore Shape in Bio-Scaffolds" International Conference on Design, Materials and Manufacturing Concerns in Production of Quality Engineering Goods, **March 27-29, 2017**, **HBTU, Kanpur**, pp. 31-37.
16. **Ajay Bhandari**, Ankit Bansal, Anup Singh and Niraj Sinha, "DCE-MRI Based Voxelized Computational Model for Chemotherapeutic Drug Transport in Human Brain Tumor", Asian Symposium on Computational Heat Transfer and Fluid Flow (ASCHT2017), **10th - 13rd December, 2017**, **IIT Madras, India.**
17. **Ajay Bhandari**, Ankit Bansal, Anup Singh and Niraj Sinha, "Study of Perfusion Kinetics in Human Brain Tumor using Leaky Tracer Kinetic Model of DCE-MRI Data and CFD", 2017 International Conference on Life System Modeling and Simulation, **Sep 22-24 2017**, **Nanjing, China** **Access Link.**
18. **Ajay Bhandari**, Ankit Bansal, Anup Singh and Niraj Sinha, "Transport of Liposome Encapsulated Drugs in Voxelized Computational Model of Brain Tumors", International Conference of Nanomedicine and Nano-biotechnology, **Sep 28-30, 2016**, **University Pierre and Marie Curie, Paris** **Access Link**
19. **Ajay Bhandari**, Ankit Bansal, Anup Singh and Niraj Sinha, "CFD Analysis of Perfusion Kinetics in Brain Tumor with DCE-MRI Derived Model", Sixth International Congress on Computational Mechanics and Simulation, **27th June–1st July 2016**, **IIT Bombay**, **India**.

SPONSORED R&D PROJECTS (Ongoing and completed)

1. **Project Name**: Image based modelling and optimisation of convection enhanced delivery for combination therapy against heterogeneous human brain tumour

   Role: Principal Investigator (PI from India) in collaboration with Dr. Wenbo Zhan (PI from UK)
   Sponsoring Organization: The Royal Society (The Yusuf and Farida Hamied Foundation)
   Period of Funding: 2022-2024 (2 years) Ongoing
   Amount of grant: 12,000 Pounds. (Rs. 12 Lacs INR Equivalent)

2. **Project Name:** Investigation of Human Retinal Vasculature for early prognosis of microaneurysm regions

   Role: Principal Investigator (PI)
   Sponsoring Organization: Science and Engineering Research Board (DST-SERB) under Start up research grant (SRG)
   Period of Funding: 2021-2023 (2 years) Completed
   Amount of grant: INR 27,61,000/- (Rs. 27.61 Lacs)

3. **Project Name:** Investigation of Effect of Nasal Septum Deviation on Nasal Airflow Obstruction using Computational Fluid Dynamics and 3D Printing for Septoplasty Planning

   Role: Principal Investigator (PI)
   Sponsoring Organization: Indian Institute of Technology (Indian School of Mines), Dhanbad under Faculty Research Scheme (FRS)
   Period of Funding: 2021-2024 (3 years) Completed
   Amount of grant: INR 12,00,000/- (Rs. 12 Lacs)

PATENTS

- Ashish Siddharth, **Ajay Bhandari**, and Arun Dayal Udai, Method and Equipment for Ocular Surgery and Drug Delivery **(Filed). Application No: 202431060703**

GUEST EDITOR

- Guest editor for special issue "Image-based Diagnostic and/or Therapeutic Agent Delivery Models in Cancer" for the Frontiers in Oncology, Frontiers in Pharmacology, and Frontiers in Radiology Journal. **Access Link**

LABS DEVELOPED

- Developed **Biofluids Research Lab at IIT(ISM) Dhanbad** from scratch. **Biofluids Research Lab**

AWARDS AND RECOGNITIONS

1. Got "Gullapalli Young Investigator Award" at Sign 2024 Conference, Hyderabad for outstanding research work in the field of Computational Oncology and awarded 1000 USD cash prize.
2. Our idea, "Scrap to Advanced Materials by Guiding the Communities," has been selected in the top 75 best ideas out of 2538 ideas form 67 countries for the LiFE Global Call for Ideas and Papers by Niti Aayog, Government of India. **Access Link**
3. Got the "Royal Society Yusuf Hamied International Exchange Award" funded by The Yusuf and Farida Hamied Foundation.
4. ASME JBME journal article got selected by Research Matters (Entrepreneurship Cell) at Indian Institute of Science (IISc) Bangalore as cutting-edge research and a research story was published on it, which appeared as a media coverage. **Access Link**
5. POF journal article got selected as **Scilight** article. **Access Link**
6. The ASCHT 2017 conference paper was selected to publish in a special issue of the International Journal of Advances in Engineering Science and Applied Mathematics. Only 8 out of 200 conference papers were selected for the journal.
7. Lalit Kishore Chaudhary Memorial Award for best research paper of the Mechanical Department of IIT Kanpur.
8. Full scholarship to present international conference in Sendai, Japan. Funding agency: IIT Kanpur, Funding amount INR 1.5 Lac.
9. Qualified GATE in 2014 in Mechanical Engineering and got MHRD scholarship during Ph.D. 2014-19).
10. Secured third position and first division with honors in Mechanical Engineering Batch in BE in 2013.

11. Secured first position in 10+2 and was awarded scholarship, certificate of merit and state level award by Chief minister of Punjab.

INVITED TALKES AND WEBINARS ORGANIZED

1. Delivered one online lecture as an expert speaker on the topic "Emerging trends of multidisciplinary research in fluid mechanics" Short term course organized by Department of Mechanical Engineering, NIT Rourkela, INDIA in September 2023.
2. Delivered one online lecture as an expert speaker on the topic "Basics and Application of Computational fluid Dynamics (CFD) in Understanding Human Nasal Airflow" Digital Designing and manufacturing of Pediatric Facial Prosthesis organized by Department of Oral and Maxillofacial Surgery King George's Medical University, Lucknow in October 2021.
3. Delivered one online lecture as an expert speaker on the topic "Image-based numerical modeling of chemotherapeutic drug transport in human brain tumors" in the AICTE sponsored Faculty Development Program on Advanced Computational Fluid Dynamics organized by the Department of Mechanical Engineering, Institute of Engineering and Technology, Lucknow in November 2020.
4. Organized webinar as a convener on the topic "Mechanical Engineering Solutions to Biomedical Problems" sponsored by TEQIP-III in Department of Mechanical Engineering at IIT (ISM) Dhanbad from 24-27th September 2020.

COURSES TAUGHT AND DEVELOPED

1. Research Methodology and Statistics (PG) (Monsoon Semester 2020-21, Winter Semester 20-21, 21-22)
2. Conduction and Radiation (UG and PG) (Winter Semester 21-22, 22-23, 23-24, 24-25), **Course feedback (9.31/10 for 32 students)**
3. Fluid Mechanics (UG) (Monsoon Semester 23-24, 24-25), **Course feedback (8.4/10 for 118 students)**
4. Fluid Mechanics Lab (Monsoon Semester 22-23, 23-24, 24-25)
5. CFD Lab (Winter Semester 21-22, Winter Semester 22-23, 23-24)
6. Biofluid Mechanics (Newly developed course for PG students)

PhD and MASTERS SUPERVISED

PhD: 03 (Ongoing)
Masters: 06 (03 Completed, 03 Ongoing)
BTech Interns: 15 completed (Undergraduate Projects)

ADMINISTRATIVE RESPONSIBILITIES

1. Department Grievance Committee Member March 2024-till present.
2. Coordinator Media from April 2023-till present.
3. Member of Department post graduate committee (DPGC) from July 2020 – July 2022.
4. Faculty-in-Charge (FIC) Placements of Department of Mechanical Engineering from June 2022 till present.
5. Co-Faculty in charge of Advanced fluid mechanics and heat transfer lab.

RESEARCH COLLABORATIONS

1. Department of Radiology, Fortis Memorial Research Institute Gurugram
2. Department of Biomedical Engineering. All Indian Institute of Medical Sciences (AIIMS)-Delhi
3. Advanced Eye center, Post Graduate Institute of Medical Sciences (PGI)-Chandigarh
4. Centre for Biomedical Engineering, Indian Institute of Technology (IIT) Delhi
5. University Of Aberdeen, Scotland
6. Imperial College, London
7. Toronto Metropolitan University, Canada
8. Cranfield University, UK
9. Indiana University, USA