

HEMACHANDRAN E

Department of Foundry Technology, National Institute of Advanced Manufacturing Technology (NIAMT).
(Formerly National Institute of Foundry and Forge Technology-NIFFT), Hatia, Ranchi – 834003, Jharkhand.

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Education

- 2017 – 2021 Doctor of Philosophy (Ph.D.)
Indian Institute of Technology, Chennai (IIT Madras)
Specialization: Microfluidics and Microsystems
- 2012 – 2014 Master of Engineering (M.E.)
College of Engineering Guindy, Anna University, Chennai
Thermal Science with specialization in R & AC, graduated with a **CGPA of 8.84/10**
- 2008 – 2012 Bachelor of Engineering (B. E.)
University College of Engineering, Anna University, Chennai
Specialization: Mechanical Engineering, graduated with a **CGPA of 8.59/10**
- 2008 TN State Board -Higher Secondary Certificate Examination (HSC) - **84.75 %**
- 2006 TN State Board -Secondary School Leaving Certificate Examination (SSLC) - **84.2 %**

Research Experience

- 2021 (Feb – Aug) Institute - Postdoctoral Equivalent Research Fellow (I-PDF)
Department of Mechanical Engineering, Indian Institute of Technology, Madras.
- 2017 – 2021 Graduate Researcher (Ph. D.)
Department of Mechanical Engineering, Indian Institute of Technology, Madras (IIT-M)
Thesis: Acoustic Manipulation of Fluid Streams and Droplets in Microchannels.
In collaboration with Prof. Thomas Laurell, Lund University, Sweden.
- The behavior of co-flowing immiscible liquids under the influence of the bulk acoustic wave is explored in detail.
 - On-demand droplet generation from immiscible co-flow and isolation of droplets is studied.
 - Coalescence of droplets at the interface of co-flowing fluids is investigated. The phenomenon is exploited further for the recovery of microparticles in a co-flow and size-based droplet coalescence.
 - The proposed microfluidic devices for on-demand droplet generation, manipulation, encapsulation, and extraction of microparticles in an immiscible co-flow system can be a potential lab-on-chip tool for biomedical applications.
- 2016 (5 months) Project Associate
Department of Mechanical Engineering, Indian Institute of Technology, Madras (IIT-M)
Project: Microfluidic platform for identification and isolation of target cells.

Academic Achievements

- **Gold Medalist in M.E.**
- **University Rank Holder in B.E.**
- Secured **95.3 percentile in GATE 2012**
- School second in HSC examination
- Awarded **Pre-Doctoral Research Fellowship** for early submission of the Ph.D. thesis by Indian Institute of Technology Madras
- Ministry of Human Resource and Development, Government of India, scholarship for doctoral research for 5 years from 2017, amounting to Rs. 1,860,000
- Ministry of Human Resource and Development, Government of India, scholarship during M.E. for 2 years from 2012, amounting to Rs. 192,000

Research Interest

- MEMS
- Micro-Scale Flows
- Microsystems and Bio-Microfluidics.
- Droplet Microfluidics and Interfacial Phenomena
- Heat transfer in Microgravity using Electric, Magnetic and Acoustic fields
- Spacecraft Thermal Control

Teaching Interest

- Thermodynamics
- Thermal Engineering
- Heat Transfer
- Fluid Mechanics
- Engineering Graphics
- Engineering Mechanics
- Concepts in Engineering Design
- MEMS fabrication and Applications
- Microfluidics and Microsystem

Key Research Skills

Programming languages and Analysis software

- Solid CAD modeling in Auto CAD
- Multi-Physics Modeling in COMSOL
- MATLAB programming

Microfabrication Techniques

- Silicon channel fabrication
- Photolithography and soft lithography of PDMS
- Micro-milling of PMMA
- Patterning of metals on glass

Other essential skills

- Basic wet lab skills
- Optical microscopy
- Fluorescence microscopy

Other notable collaborative research projects (2016 – 2021)

Project: Continuous monitoring of hydrogen sulfide in blood-plasma using optofluidics for the early management of Sepsis

- Involved in the design and development of a blood plasma separation module to continuously detect hydrogen sulfide in blood-plasma

Project: Acoustic focusing of bovine cells

- Involved in device design, fabrication of microfluidic system for cell focusing
- Bovine spermatozoa cells focusing experiments in a microchannel

Teaching Experience

Worked as Lecturer and Teaching Assistant, handling laboratory classes, conducting tutorials, preparing class notes, assignments and participated in invigilation duties.

Assistant Professor – NIAMT, Ranchi (Oct 2023 – Present)

Assistant Professor (Adhoc) – IIITDM Kurnool (July 2022 – Sept 2023)

Associate Professor – Saveetha University, Chennai (Oct 2021 – June 2022)

Teaching Assistant – Indian Institute of Technology Madras, Chennai (Dec 2016 – Aug 2021)

Assistant Professor – St. Joseph's Institute of Technology, Chennai (June 2014 – April 2016)

Teaching Assistant – College of Engineering, Guindy, Chennai (Sept. 2012 – May 2014)

IIITDM Kurnool

Assistant Professor (Adhoc) Indian Institute of Design and Manufacturing, Kurnool (July 2022 – Sept 2023)

Subjects Handled at IIITDM, Kurnool

1. Thermal Engineering Concepts and Applications
2. Thermal Energy System
3. Engineering Graphics
4. Concepts in Engineering Design

Student's rating of 4.7/5 for classes at IIITDM, Kurnool

Additional Responsibilities

1. Faculty Advisor (2nd Yr. Mech)
2. Department Academic Co-Ordinator
3. Internship Evaluation and Project Evaluation

Contributed to departmental activities such as MED facilities report, Syllabus and Scheme updation, Department grades compilation and report, Member of final year project evaluation committee, Internship evaluation committee and Disciplinary committee.

Peer-reviewed Journal Publications

1. E. Hemachandran, S. Z. Hoque, T. Laurell and A. K. Sen, Reversible stream drop transition in a microfluidic co-flow system via on-demand exposure to acoustic standing waves. **Physical Review Letters (PRL)**, 127, 134501, 2021. Impact factor - 9.1. DOI: <https://doi.org/10.1103/PhysRevLett.127.134501>
2. E. Hemachandran, T. Laurell and A. K. Sen, Continuous Droplet Coalescence in a Microchannel Coflow Using Bulk Acoustic Waves. **Physical Review Applied**, 12, 044008, 2019. Impact factor - 4.98. DOI:10.1103/PhysRevApplied.12.044008
3. E. Hemachandran, S. Karthick, T. Laurell and A. K. Sen, Relocation of coflowing immiscible liquids under acoustic field in a microchannel. **Europhysics Letters (EPL)**, 125, 54002, 2019. Impact factor - 1.95. DOI: 10.1209/0295-5075/125/54002
4. Meikandan M, Malarmohan K, Hemachandran E. Experimental investigation on thermal performance of nano coated surfaces for air-conditioning applications. **Thermal Science**, 23(2A):457-463. 2019. Impact factor - 1.62. DOI:10.2298/TSCI160825175M
5. Jeyapradhap Thirisangu,, E Hemachandran, Karthick Subramani , “Suspending droplets beyond the Rayleigh limit: The interplay of acoustic and gravity forces” **Physics of Fluids**, 2023. <https://doi.org/10.48550/arXiv.2308.04088>
6. Abaethan Saravanabhava, Varun Kumar, Jeyapradhap Thirisangu, Karthick Subramani and E Hemachandran, “Exploring Interdigitated Electrodes for Annular Dielectrophoresis: Heat Transfer in Microgravity Conditions” **International Journal of Heat and Mass Transfer** (In review)

Peer-reviewed International conferences

7. E. Hemachandran, T. Laurell and A. K. Sen, Bulk Acoustic Wave Activated Droplet Generation and Isolation at the **FMFP 2021**, BITS Pilani, Pilani Campus, India, 27-29th December 2021.
8. E. Hemachandran, T. Laurell and A. K. Sen, On-demand droplet generation using bulk acoustic wave, **Acoustofluidics 2021**, Contributed Talk, 26-27 August 2021.
9. E. Hemachandran and A. K. Sen, Droplet demulsification at parallel flow interface using sound waves at the **Acoustofluidics 2020**, Flash Talk, 25-27 August 2020.
10. E. Hemachandran, T. Laurell and A. K. Sen, On-demand Droplet Generation, 5th international conference on **Droplets 2021**, August 2021.
11. E. Hemachandran, T. Laurell and A. K. Sen, Acoustic Manipulation of Droplets at Liquid-Liquid Interface in a Microchannel at the **FMFP 2019**, PSG College of Technology, Coimbatore, India, 9-11 December 2019.
12. E. Hemachandran, S. Karthick, T. Laurell and A. K. Sen, Dynamics of Immiscible Fluid Flow Under Acoustic Fields in Microchannel at the **FMFP 2018**, IIT Bombay, Mumbai, India, 10-12 December 2018.