

Curriculum Vitae

Name: Maneesh Punetha
Date of Birth: September 01, 1989 (Pithoragarh, UK, India)
Nationality: Indian
Present Address: Nuclear Power Safety Division
Department of Physics
School of Engineering Sciences
KTH Royal Institute of Technology
Stockholm, Sweden – 114 19
Mobile: +91-8960544696
E-mail: punetha@kth.se, maneesh40@gmail.com
Current Position: Postdoctor (since 21st June 2021)
Google Scholar: <https://scholar.google.co.in/citations?user=8GQ6AHwAAAAJ&hl=en>
Research Gate: https://www.researchgate.net/profile/Maneesh_Punetha
Webpage: <https://maneeshpunetha.github.io/index.html>
Fields of interest: Experimental **Nuclear Thermal Hydraulics, Phase Change in Multiphase Flow, Heat Transfer, and Computational Fluid Dynamics**



Academic qualifications

- **Ph. D.** – Mechanical Engineering – **Indian Institute of Technology Kanpur**, Uttar Pradesh, India 2014-2020 (**CGPA: 8.67**)
- **M. Tech.** – Thermal System Design – Sardar Vallabhbhai **National Institute of Technology, Surat**, India, 2012-2014 (**CGPA: 9.65**)
- **B. Tech.** – Mechanical Engineering – **Government College of Engineering Amravati**, Maharashtra, India, 2007-2011 (**CGPA: 8.45**)

Academic achievements/fellowships

- Received “**Outstanding Ph. D. Thesis Award - 2020**” of IIT Kanpur on 53rd Convocation.
- “Student Best Poster Award” for 'Effect of surface inclination on film condensation heat transfer in the presence of non-condensable gases' at 27th International Conference on Nuclear Engineering (ICONE27), Ibaraki, Japan, May 19-24, 2019.
- Another paper entitled "Steam Condensation Heat Transfer inside Reactor Containment during the Initial Transient of a Severe Accident" presented at 27th International Conference on Nuclear Engineering (ICONE27), Ibaraki, Japan, May 19-24, 2019 is selected for publication in ASME Journal of Nuclear Engineering and Radiation Sciences.
- International travel grant from IIT Kanpur for attending the 27th International Conference on Nuclear Engineering (ICONE27), May 19-24, 2019 at Tsukuba International Congress Center, Tsukuba, Ibaraki, Japan.
- Received higher education scholarship from MHRD, Government of India to pursue Ph.D. at Indian Institute of Technology Kanpur, Kanpur (U. P.), India (2014-2019) and M.Tech. at Sardar Vallabhbhai National Institute of Technology, Surat (Gujarat), India (2012-2014).

- Awarded "Times of India Merit Scholarship" in M. Tech for academic year of 2012-13.
- Awarded Merit scholarship by Army Welfare Education Society (AWES), New Delhi, India in all four years of B. Tech from 2007-2011.

Research experience

- Ph. D. Thesis: *Containment Thermal Hydraulic Studies towards Understanding Post-Severe Nuclear Accident Scenarios*
 - *Brief Summary:*
Containment is a large outer shell meant for isolating the nuclear reactor and radioactive substances to the surroundings. During a severe accident situation, several thermal-hydraulics processes, such as natural circulation, wall and bulk condensation of steam, hydrogen stratification and its mixing, occurs inside the containment. A study on these processes are conducted in large-scale test facility, also called as THYCON facility; built as a part of PhD program. A numerical modelling approach to simulate the thermal-hydraulics of the containment is also developed.
- M. Tech. Thesis: *Analysis of Dispersion of Heated Effluent in Lake Scenario*
 - *Brief Summary:*
For every power plant, water is the most common coolant and requires in large quantity. The water from the water body (lake or sea) is utilized and discharged back into it along with the excess heat, which severely disrupts the aquatic life and the surrounding ecosystem. The spread of heated plume primarily depends on convection heat transfer, diffusion, turbulence and environmental interaction (convection and evaporation). Effects of these factors were studied on the scaled-down experimental test facility. Preliminary analyses were also performed analytically, and numerically in Ansys FLUENT.
- B. Tech. Project: *Optimization of number of turns of (CLPHP) Closed Loop Pulsating Heat Pipe.*
- Worked on a project, *Studies on heat transfer during condensation of steam-hydrogen mixtures inside closed containment*, funded by Bhabha Atomic Research Center (BARC), Mumbai, India with Prof. Sameer Khandekar (PI) and Prof. K. Muralidhar (Co-PI) for four and half years from October 2015 - March 2020 (Also the main work of PhD thesis).
 - Preparing initial drawings of large facility having 0.96 m diameter and 3.6 m height.
 - Design, fabrication, erection and instrumentation of the single-compartment large scale Thermal-HYdraulic test facility for CONtainment (THYCON).
 - Performed calibration and benchmarking of a complex online mass-spectrometry system (Hiden Analytical® make with 20 sampling ports) to estimate the mass fractions of steam-air-helium mixtures, where three gases involved in the mixtures have largely different properties.
 - Implementing an inverse technique based high heat flux measurement system for adverse situations.
 - Preparing project progress report/final report and mentoring undergraduate/graduate students.
 - Published three articles (in section "List of Publications" #3, #4 and #5).
- Worked on a project, *Local heat transfer coefficient during film condensation of steam hydrogen mixtures*, funded by Board of Research in Nuclear Sciences (BRNS), Mumbai, India with Prof. Sameer Khandekar (PI) and Prof. K. Muralidhar (Co-PI) for three years from April 2015 - March 2018. The work carried out during this project includes:

- Assistance in design, fabrication and instrumentations of the experimental set-up for generic condensation studies, including the severe accident scenario.
- Experiments conducted on steam condensation heat transfer in the presence of only air and air-helium gases at all stages of a severe nuclear accident progression.
- Published two articles (in section "List of Publications" #1 and #2).

List of publications

1. Punetha M., Yadav M. K., Jain S., Khandekar S., and Sharma P. K., Thermal-Hydraulic Test Facility for Nuclear Reactor Containment: Engineering Design Methodology and Benchmarking, Progress in Nuclear Energy, Vol. 138, pp. 1-20, August 2021. DOI: [10.1016/j.pnucene.2021.103837](https://doi.org/10.1016/j.pnucene.2021.103837) **(Web of Science: Q1)**
2. Yadav M. K., Punetha M., Bhanawat A., Khandekar S., and Sharma P. K., Steam Condensation Heat Transfer during Initial Blow-down Period of a Severe Nuclear Accident, ASME Journal of Nuclear Engineering and Radiation Science, Vol. 6 (4), pp. 1-9, October 2020. DOI: [10.1115/1.4046910](https://doi.org/10.1115/1.4046910) **(Web of Science: Q3)**
3. Bhanawat A., Yadav M. K., Punetha M., Khandekar S., and Sharma P. K., Effect of Surface Inclination on Filmwise Condensation Heat Transfer During Flow of Steam–Air Mixtures, ASME Journal of Thermal Science and Engineering Applications, Vol. 12 (4), pp. 1-12, August 2020. DOI: [10.1115/1.4046867](https://doi.org/10.1115/1.4046867) **(Web of Science: Q1)**
4. Punetha M., Yadav M. K., Khandekar S., Sharma P. K., and Ganju S., Intrinsic Transport and Combustion Issues of Steam-Air-Hydrogen Mixtures in Nuclear Containments, International Journal of Hydrogen Energy, Vol. 45 (4), pp. 3340-3371, 2020. DOI: [10.1016/j.ijhydene.2019.11.179](https://doi.org/10.1016/j.ijhydene.2019.11.179) **(Web of Science: Q1)**
5. Punetha M., Choudhary A., and Khandekar S., Stratification and Mixing Dynamics of Helium in an Air-Filled Confined Enclosure, International Journal of Hydrogen Energy, Vol. 43 (42), pp. 19792-19809, 2018. DOI: [10.1016/j.ijhydene.2018.08.168](https://doi.org/10.1016/j.ijhydene.2018.08.168) **(Web of Science: Q1)**
6. Punetha M., and Khandekar S., A CFD based Modeling Approach for Predicting Steam Condensation in the Presence of Non-condensable Gases, Nuclear Engineering and Design, Vol. 324, pp. 280-296, 2017. DOI: [10.1016/j.nucengdes.2017.09.007](https://doi.org/10.1016/j.nucengdes.2017.09.007). **(Web of Science: Q1)**

Book chapter

1. Yadav M.K., Punetha M., Bhanawat A., Khandekar S., and Muralidhar K., Measurement of Condensation Heat Transfer, in 'Drop Dynamics and Dropwise Condensation on Textured Surfaces', Mechanical Engineering Series, Springer, 2020. DOI: [10.1007/978-3-030-48461-3_13](https://doi.org/10.1007/978-3-030-48461-3_13)
2. Punetha M., Thermal Pollution: Mathematical Modelling and Analysis, in 'Environmental Contaminants', Energy, Environment and Sustainability, Springer, Singapore, 2018. DOI: [10.1007/978-981-10-7332-8_18](https://doi.org/10.1007/978-981-10-7332-8_18)

Peer reviewed conference proceedings (published/presented)

1. Punetha M., Kulkarni S., Yadav M.K., and Khandekar S., A CFD Study on Coupled Issues of Hydrogen Distribution and Steam Condensation Inside Thermal Hydraulic Test facility for Containment (THYCON), 25th National and 3rd International ISHMT-ASTFE Heat and Mass Transfer Conference, IIT Roorkee, Uttarakhand, India, December 28-31st, 2019.
2. Punetha M., Yadav M.K., Bhanawat A., and Khandekar S., Steam Condensation Heat Transfer inside Reactor Containment during the Initial Transient of a Severe Accident,

- Proceedings of 27th International Conference on Nuclear Engineering (ICONE27), Tsukuba, Ibaraki, Japan, May 18-24, 2019. DOI: [10.1299/jsmeicone.2019.27.2166](https://doi.org/10.1299/jsmeicone.2019.27.2166)
3. Bhanawat A., Punetha M., Yadav M.K., and Khandekar, S., Effect of Surface Inclination on Film Condensation Heat Transfer in the Presence of Air, Proceedings of 27th International Conference on Nuclear Engineering, (ICONE27), Tsukuba, Ibaraki, Japan, May 18-24, 2019. DOI: [10.1299/jsmeicone.2019.27.2133](https://doi.org/10.1299/jsmeicone.2019.27.2133)
 4. Kulkarni S., Punetha M., Choudhary A., and Khandekar S., Effect of Stratification and Natural Circulation on Steam Condensation in Presence of Non-Condensable Gases, Proceedings of 5th International Conference on Computational Methods for Thermal Problems (ThermaComp - 2018), IISc Bangalore, Karnataka, India, pp. 480-483, July 9-11, 2018. ISSN: 23055995
 5. Punetha M., Choudhary A., Khandekar S. and Sharma P., Helium Stratification and Mixing Studies in a Fully Enclosed Chamber, 24th National Heat and Mass Transfer Conference and 2nd International ISHMT-ASTFE Heat and Mass Transfer Conference, BITS Hyderabad, Telangana, India, December 27-30, 2017.
 6. Punetha M., and Khandekar S., Study of Film-wise Condensation inside Closed Containment using Wall Condensation Model (WCM), 6th International and 43th National Conference on Fluid Mechanics and Fluid Power (FMFP2016), Motilal Nehru National Institute of Technology, Allahabad, Uttar Pradesh, India, December 15-17, 2016.
 7. Punetha M., Thaker, J. P., and Banerjee J., Experimental and Numerical Analysis of Dispersion of Heated Effluent from Power Plants, 5th International and 41th National Conference on Fluid Mechanics and Fluid Power (FMFP2014), Indian Institute of Technology Kanpur, Uttar Pradesh, India, December 12-17, 2014.
 8. Punetha M., Roopchandani C., and Banerjee J., Analysis for dispersion of thermal effluent from Thermonuclear Power Plant, 40th National Conference on Fluid Mechanics and Fluid Power (FMFP2013), National Institute of Technology Hamirpur, Himachal Pradesh, India, December 12-14, 2013.

Post-PhD experience

- 10.5 months (August 2020-June 2021) as Senior Research Fellow, Department of Mechanical Engineering, IIT Kanpur, Kanpur India (Supervisor: Prof. Sameer Khandekar)

Pre-PhD experience

- Teaching Assistant (Undergraduate course: **Refrigeration and Air Conditioning** and Postgraduate course: **Liquid-Vapour Phase-Change Phenomena**) during the Ph.D. program at IIT Kanpur, India.
- 1 Year (July 2011-August 2012) as Assistant Manager (Health, Safety and Environment) in **Essar Steel India Limited, Hazira**, Gujarat; attained six sigma yellow belt certification.

Other experience

- Maintained website of Mechanical Engineering Department, IIT Kanpur from July 2015-December 2019.
- Volunteer in Indo-French Workshop on Phase Change Thermal Systems at Khajuraho, India, 29 November 2016 - 01 December 2016.
- Volunteer in TEQIP sponsored short term training program on "Conduction and Radiation" at Sardar Vallabhbhai National Institute of Technology Surat, Gujarat, India, 1-3 July 2013.

- Volunteer in 39th National Conference on Fluid Mechanics and Fluid Power (FMFP2013), Sardar Vallabhbhai National Institute of Technology, Surat, Gujarat, India, 13-15 December 2012.
- National Cadet Corps (NCC) 'C' certificate holder for serving 3 years in "3 Maharashtra Signals Company" Army Wing.
- Organized various technical functions (Convener for CAD competition) and sports events (Sports secretary for swimming) during the undergraduate program.

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