Program

Virtual Conference

Indian Society for Heat and Mass Transfer (ISHMT)

ASTFE American Society of Thermal and Fluids Engineers

American Society of Thermal and Fluids Engineers (ASTFE)

26th National and 4th International

ISHMT-ASTFE Heat and Mass Transfer Conference

IHMTC 2021

17th-20th December, 2021

ORGANIZED BY

Table of Contents

Welcome to 26th National 4th International ISHMT-ASTFE Heat and Mass Transfer Conference IHMTC 2021

The role of heat and mass transfer in modern engineering applications and industrial processes is quite significant. Cutting-edge research in areas like thermal management, additive manufacturing, green buildings, and micro and nano-scale transport phenomena in biological systems are becoming popular along with traditional fields such as power plant, internal combustion engine, refrigeration and air conditioning. All over the world, intensive research is in progress on all aspects of fluid flow and heat transfer using theoretical, computational and experimental approaches. The goal of the conference is to virtually gather scholars from all over the world to present advances in the fields of transport phenomena and to foster an environment conducive to exchanging ideas and information. This conference will also provide an ideal environment to develop new collaborations on the fundamentals, applications, and products of the mentioned fields. This conference includes invited keynote talks by distinguished experts from industry and academia (across the globe) and number of parallel technical sessions spread over four days. This would serve as a platform for young researchers to virtually interact with academic experts and get motivated further to produce high quality research. This edition of the conference will be held online on 17th-20th December, 2021 in the 50th year after the first Madras conference. It will bring together the scientific minds in the area of heat and mass transfer from all corners of the country and the world.

About ISHMT

The Indian Society for Heat and Mass Transfer (ISHMT) has been acting as a nodal agency in India stimulating researchers engaged in various areas of heat and mass transfer and bringing them together for fruitful interaction and exchange of ideas. The ISHMT organized the first National Heat and Mass Transfer Conference at the Indian Institute of Technology Madras in 1971 and subsequently the conference has been held once in every two years at different places across the country. In these conferences, many well-known experts from abroad have also participated, exchanged technical information and have shared their expertise with the Indian researchers. In order to foster greater interaction with the researchers from overseas, ISHMT has started collaborating with other premier professional societies. During the period of 1994-2013, ISHMT and the American Society of Mechanical Engineers (ASME) had jointly organized this conference. Thereafter, ISHMT and American Society of Thermal and Fluids Engineers (ASTFE) are jointly organizing this conference.

For more information Please visit:
https://ishmt.iitm.ac.in/

About ASTFE

ASTFE was established in July 2014 to promote and forge direct collaboration in the science and applications of thermal and fluids engineering and related disciplines. It aligns itself with globally collaborative activities in the traditional areas of heat transfer and fluids engineering, as well as, in emerging areas such as those related to energy, environmental sustainability, advanced manufacturing, thermal management, and micro- and nano-scale transport phenomena. **ASTFE** aims at providing opportunities to promote the dissemination of information and knowledge regarding thermal and fluids engineering, both nationally and internationally. n August 2015, ASTFE held its inaugural Thermal and Fluid Engineering Summer Conference (TFESC) in New York City, USA. ASTFE encourages the personal and professional development of young scientists and engineers, and promotes cooperation with other engineering and technical societies to enhance interactions with industry, government agencies and the public at large. Of particular interest to the Society is the organization of conferences, workshops, and other innovative, collaborative activities that bring together diverse groups in these fields.

For more information Please visit:
https://astfe.org/

About the organizing institute

Indian Institute of Technology Madras

The Indian Institute of Technology Madras, established by the Government of India in 1959, is among the foremost institutes not only in India but in the world for basic and higher technical education as well as fundamental and applied research. The Institute has been ranked as the top engineering institute in India for five years in a row (2016–2020) by Ministry of Human Resources Development, India. Known both nationally and internationally for excellence in innovation, entrepreneurship and industrial consultancy, it is endowed with faculty of international repute, a highly motivated and brilliant student community, excellent technical and supporting staff, and effective administration. All of these have all contributed to the pre-eminent status of IIT Madras. IIT Madras is a residential institute that occupies a 2.5 square kilometre (0.97 sq mi) campus that was formerly part of the adjoining Guindy National Park. The institute has nearly 600 faculty, 10,000 students and 1,250 administrative and supporting staff. Growing ever since it obtained its charter from the Indian Parliament in 1961, much of the campus is a protected forest, carved out of the Guindy National Park, home to large numbers of chital (spotted deer), black buck, bonnet macaque, and other rare wildlife. A natural lake, deepened in 1988 and 2003, drains most of its rainwater.

For more information Please visit:
https://www.iitm.ac.in/

Message from the ISHMT President

Since inception in 1971, the Indian Society of Heat and Mass Transfer (ISHMT) has been acting as a nodal agency for stimulating and promoting research in the area by conducting biennial conferences to provide a platform for Indian researchers to interact. The first conference was organized at the Indian Institute of Technology Madras under the mentorship of late Prof. Arcot Ramachandran. Ever since, the biennial conference has been organized regularly in various parts of the country and has grown in terms of quality and quantity of papers, and participation of the delegates. Earlier, eleven conferences (12^{th} to 22^{nd}) were organized in collaboration with American Society of Mechanical Engineers (ASME). The last three conferences (23^{rd}, 24^{th} and 25^{th}) were organized in collaboration with the American Society of Thermal and Fluids Engineers (ASTFE). Starting from the 25^{th} edition at IIT Roorkee, Asian Union of Thermal Science and Engineering (AUTSE) has also been brought in as collaborative partner along with ASTFE. Clearly, these collaborations have enhanced the character, reputation and stature of the conference.

We at ISHMT are immensely pleased that IIT Madras is hosting the 2021 edition of the conference, to mark its 50^{th} year after the first conference was held at the same venue in 1971. The conference will be held in fully virtual mode. From the program schedule, it is quite evident that very eminent and highly reputed heat transfer researchers are delivering the plenary and keynote lectures. The papers being presented at the conference have gone through a strict reviewing process conducted by the organizing team at IIT Madras. On behalf of all the members of the Executive Council and members of the Society, I wish the organizing team at IIT Madras led by Professor T. Sundararajan all success. I sincerely hope that all attendees will have a great four days of online participation and enjoy the new experience of virtual interaction.

Prof. Pradip Dutta
Department of Mechanical Engineering, IISc Bangalore
President, ISHMT

Message from the ASTFE President

Established in 2014, the long-term vision of the American Society of Thermal and Fluids Engineers (ASTFE) is to be a leading organization that brings thermal and fluids engineers together to exchange ideas and present results for an impact on new, emerging, and challenging problems in research and technology. ASTFE is focused on international collaborations, strong interactions with industry, and providing a dynamic atmosphere for young and upcoming researchers and engineers in this field. It continues to be an agile organization that is focused on the grand challenges in thermal and fluids engineering. While there is particular interest in new and emerging applications, traditional research topics are included. The society is driven largely by the members and their interests, rather than by the management, and strong efforts are made to link with industrial needs in these areas. Like all the fellow societies, the American Society of Thermal and Fluid Engineers (ASTFE) faces the same challenge due to the global Covid-19 pandemics that all the events are changed to a virtual delivery mode. Despite this challenge, ASTFE, being an agile organization, continues to focus on emerging research applications, including those related to Covid-19. Our 2021 Thermal and Fluids Engineering Conference (TFEC) was held virtually this year and attracted more than 250 participants from over 30 countries on nearly all continents. Our international collaboration remains strong. We are so happy to be a collaborating society with ISHMT for the last three conferences (23rd, 24th and 25th), and congratulating wholeheartedly the 50th anniversary of the ISHMT that is to be celebrated in the 2021 edition of the conference.

On behalf of the board of directors of ASTFE, I present our best wishes to the organizing team at IIT Madras led by Professor T. Sundararajan for the great success of the conference. I personally wish all attendees to have a wonderful, productive experience during the four days of online participation.

Prof. Yong X. Tao
Department of Mechanical Engineering, Cleveland State University, USA
President, ASTFE

Message from the Organizing Chairperson

It is my pleasure to extend a very warm welcome to all the international and Indian participants on behalf of the organising team of IHMTC-2021. Although our joy would have been limitless if all the participants could be present physically at the conference venue, due to the prevailing Covid situation, we have to contend ourselves with a fully online conference. We are indeed thankful to the Indian Society for Heat and Mass Transfer (ISHMT) and the American Society of Thermal and Fluids Engineers (ASTFE) under whose auspices the present conference is being held at IIT Madras, with cooperation from the Asian Union of Thermal Science and Engineering (AUTSE).

The organizing team at IIT Madras has spent enormous efforts in arranging several plenary and keynote lectures by very eminent heat transfer researchers from all around the world and also in maintaining high standards of contributed technical papers through a strict reviewing process. We do hope that the exciting technical exchanges between reputed academicians, students and industrial researchers during the conference will be extremely fruitful. There are several challenges facing the world today with respect to sustainable energy options, environmental pollution and climate change, novel healthcare solutions and novel material developments. We do hope that the intense technical deliberations during the conference may kindle the thought processes towards the solutions of some of these daunting problems.

Prof. T Sundararajan
Department of Mechanical Engineering, IIT Madras
Organizing Chairperson, IHMTC 2021

Message from the IHMTC secretaries

It is a great pleasure and honour to welcome all the participants to the ISHMT-ASTFE Heat and Mass Transfer Conference (IHMTC), 2021. The biennial conference is being held since 1971 at various institutions across the country under the auspices of the Indian Society for Heat and Mass Transfer (ISHMT) and later the American Society of Thermal and Fluids Engineers (ASTFE). The present edition of IHMTC is significant since it is commemorating the 50th year of the inception of the ISHMT. Indian Institute of Technology Madras is organizing IHMTC-2021 through virtual mode due to the challenges imposed by the COVID-19 pandemic. We feel that in the current pandemic situation, it is important to offer a platform for students and researchers to connect online and showcase their research progress in heat and mass transfer. We gratefully acknowledge the broad support and feedback from our colleagues of the heat and mass transfer community that eventually rendered this year's virtual conference possible. In line with previous conferences, it was not difficult to engage the President and other members of the Governing bodies of IHMTC, and our senior colleagues in the Organizing Committee for suggestions and guidance. The highlight of IHMTC 2021 is the participation of several eminent researchers in thermal sciences across different countries who will virtually deliver the Plenary and Keynote talks. We appreciate the financial support from our sponsors namely Teledyne Flir, Intel, Ansys, Comsol, TSI Instruments and Begell House. Begell House continues to partner with IHMTC in publishing the conference proceedings in the Begell House digital Library. They have also agreed to bring out special issues of selected conference papers in Begell House journals.

We acknowledge Alpcord event Management Company who have assisted in setting up the virtual conference portal and in dealing with and registration of the participants. It has been gratifying to see the positive response from the entire heat and mass transfer community in India to respond to the call for papers in the beginning of March 2021 under the ten conference tracks covering both fundamentals and applications. We have received a total of 600 abstracts. Given the strong manning of the Organizing Committee and the technical committee led by a team of 22 track chairs, each paper was subjected to careful scrutiny by experts in their respective fields. We eventually selected 307 papers for oral presentation and 187 papers for e-poster presentation.

From a glimpse into IHMTC 2021 Program Book, we are convinced that this year's conference will reflect the state-of-the-art in heat and mass transfer research, including novel scientific discoveries, cutting-edge technologies for industrial applications as has been the case in the preceding biennial IHMTC Conferences.

We wish you all a stimulating and fruitful virtual conference between 17 - 20 December 2021!

Prof. Arvind Pattamatta
Prof. Ashis Kumar Sen
Organizing Secretaries of IHMTC 2021

Chief Guest

Dr. Anil Kakodkar

Chancellor, Homi Bhabha National Institute

Dr. Kakodkar is a renowned Indian Nuclear Physicist and Mechanical Engineer. Dr. Kakodkar was the chairman of the Atomic Energy Commission of India and the Secretary to the Government of India. He was the Director of the Bhabha Atomic Research Centre, Trombay from 1996–2000. Dr. Kakodkar was awarded the Padma Vibhushan, India's second highest civilian honour, on 26 January 2009.

Overall conference schedule

17th December 2021

9 AM-10 AM	10 AM-10:50 AM	10.50 AM - 1PM		1 PM - 1:45 PM		2:45 PM-3:30 PM	3.30 PM - 5.45 PM		5:45 PM- 6:45 PM	6:45 PM- 7:15 PM
Inauguration Chief Guest Dr. Anil Kakodkar	Plenary Lecture	Break	11 AM - 1 PM Oral Sessions	Keynote Lectures 1-3	Break	Ansys Sponsored Talk	3:30 PM - 5:30 PM Oral Sessions	Break	Plenary Lecture	Keynote Lectures 4-6
		E-poster Session					E-poster Session			

18th December 2021

9 – 10 AM	10 AM – 1 PM		1 PM– 1.45 PM		3 PM – 6.30 PM			6.30 PM – 7.30 PM	7.30 PM – 8 PM
Plenary Lecture	10 AM – 12.30 PM Oral Sessions	Break	Keynote Lectures 7-9	Break	3 PM - 5 PM Oral Sessions	5 PM – 6 PM GBM	Break	Plenary Lecture	Keynote Lectures 10-12
	E-poster Session				E-poster Session				

19th December 2021

9 AM – 10 AM	10 AM – 1 PM		1 PM – 1.45 PM		3 PM – 6 PM		6 PM – 6. 30 PM	6.30 PM – 7.30 PM	7.30 PM – 8.15 PM
Plenary Lecture	10 AM – 12.30 PM Oral Sessions	Break	Keynote Lectures 13-14	Break	3 PM – 5.30 PM Oral Sessions	Break	Keynote Lectures 15-16	Plenary Lecture	Musical Event Mr. Anil Srinivasan
	E-poster Session				E-poster Session				

20th December 2021

9- 9.45 AM	9.45 AM – 12.30 PM		12.30 PM – 1 PM
Keynote Lectures 17-19	9.45 AM - 10.15 AM COMSOL Sponsored Talk	10. 15 AM – 12.30 PM Oral Sessions	Valedictory
	E-poster Session		

Note:

General body meeting (GBM) is only for ISHMT members

All times are Indian Standard Times (IST)

Plenary Lectures

Date	Time	Speaker	Lecture	Session Chair
17th December 2021	10 - 10.50 AM	Prof. P. K. Das (IIT Kharagpur)	Prof. BVSSS Prasad Memorial Lecture	Prof. Pradip Dutta (IISc Bangalore)
17th December 2021	5:45 - 6: 45 PM	Prof. Dimos Poulikakos (ETH Zurich, Switzerland)	Prof. Arcot Ramachandran Endowment Plenary Lecture	Prof. Sarit K Das (IIT Madras)
18th December 2021	9 - 10 AM	Prof. Nam-Trung-Nguyen (Griffith University, Australia)	-	Prof. Ashis Sen (IIT Madras)
18th December 2021	6:30 - 7:30 PM	Prof. George Karniadakis (Brown University, USA)	-	Prof. C. Balaji (IIT Madras)
19th December 2021	9 - 10 AM	Prof. V Narayanan (LPSC, India)	Prof. M.V. Krishnamurthy Endowment Plenary Lecture	Prof. T Sundararajan (IIT Madras)
19th December 2021	6:30 - 7:30 PM	Prof. Rajat Mittal (Johns Hopkins, USA)	-	Prof. Arvind Pattamatta (IIT Madras)

Sponsored Talks

17th December 2021	2:45-3:30 PM	Dr. Florian Menter (ANSYS)	Ansys Sponsored Talk	Dr. Kali Charan Nayak (Rolls Royce, Bangalore)
20th December 2021	9:45 - 10:15 AM	Dr. Nicolas Huc (COMSOL)	COMSOL Sponsored Talk	Dr. Laxman Malla (IIT Madras)

Plenary Lectures

Friday, December 17
10.00 AM – 11.00 AM IST

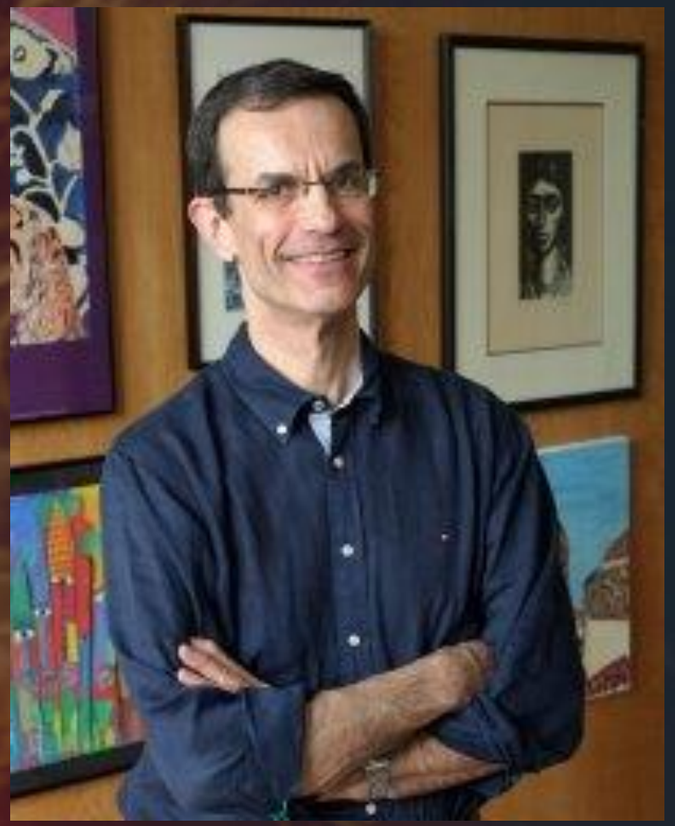
Title: Flash Evaporation and Propagation of Flashing Front: The Level of Understanding and the Gray Areas

Speaker Bio: **Prof. P. K. Das**, currently Professor A. S. Davis Chair of Thermodynamics in the Department of Mechanical Engineering, and Ex Dean of Post Graduate Studies and Research, Indian Institute of Technology Kharagpur is a well accomplished academician. His research activities encompass diverse topics of thermo-fluids engineering covering fundamental studies and applications; experiments and analyses. Some of his research interests are multiphase flow and phase change heat transfer, experimental techniques, thermo-hydraulics of nuclear reactors, sensor developments, unique CFD techniques for single- and two-phase hydrodynamics. He is recognized as a leading expert of heat exchangers. He has published around 225 papers in refereed international journals and has more than 10 patents to his credits. He has conducted many funded projects and provided consultancy to different public and private industries. He is a recipient of K. N. Seetharamu prize and medal given by Indian Society of Heat and Mass Transfer. He is a fellow of Indian National Academy of Engineering and Indian National Academy of Sciences (Allahabad). He has served as an Associate Editor of ASME journal of Heat Transfer. Currently he is actively interested in developing low-cost medical devices and health support systems as import substitute. The Electromechanical Cardiovascular Replicator developed by his group won the prestigious Sitare Gandhian Young Technological Innovation Award. He has supervised around 30 Doctoral students and presently 20 research students are working in his team.

Abstract: Liquid-vapour phase change, though ubiquitous in nature and in manmade systems, poses many riddles. Out of different modes of liquid-vapour phase change, flashing or flash evaporation is the most unique and the least understood. Nonetheless, the examples of the beneficiary role of flashing in specific applications and the potential hazard caused by it in others are many in science and technology. A clear understanding of the phenomenon is therefore essential. A rapid depressurization of a subcooled or saturated liquid brings it in the metastable or superheated state. With a small perturbation, the metastable liquid passes to an equilibrium state through vigorous or 'explosive boiling' known as flashing or flash evaporation. The phenomenon is accompanied by unique process of nucleation, formation of two phase mixture, spontaneous cooling and propagation and reflection of pressure waves. If the liquid is stagnant, in most of the cases, the flashing initiates at the free surface and then a flashing front starts propagating downwards at a relatively slow speed. In this communication results from a unique experimental scheme which enhances the current understanding on flash evaporation and flashing front propagation are presented. Requirement of threshold superheat, effect of conduit inclination and presence of secondary nucleation are the major issues. Occurrence of secondary nucleation influences the propagation of flashing front uniquely. For the first time, the propagation of flashing front in the presence of single and multiple nucleation sites has been studied computationally. An in-house developed one dimensional, six-equation, transient model is used with the implementation of mechanical, thermal and chemical relaxation. The study reveals the generic trend of the influence of the secondary nucleation and explains some of the phenomena observed during experiments. Based on the experimental observations a conceptual physical model of flashing front propagation is discussed. Finally, the knowledge gap of flashing and flashing front propagation is addressed and the specific needs of further investigations are emphasized.

Friday, December 17
5.45 PM – 6.45 PM IST

Title: Exploring interfacial physics to inspire disrupting technologies in water condensation



Speaker Bio: **Prof. Dimos Poulikakos** is the founding director of the Laboratory of Thermodynamics in Emerging Technologies of ETH Zurich. He was the VP Research of ETH Zurich 2005-07 and the ETH director of the IBM-ETH Binnig-Rohrer Nanotechnology center, at the interface of basic research and future oriented applications (2008-11). He served as the Head of the Department of Mechanical and Process Engineering at ETH (2011-2014) and of the ETH Energy Science Center (2018-present) and is a member of CORE, the advisory board of the Swiss government on energy issues. He is also the president of Division IV the of the Swiss National Science Foundation (SNF). He and his group perform fundamental research in the areas of interfacial and multiphase transport phenomena and thermodynamics across scales (nano/meso/macro), and on the development of transformative technologies, inspired by their findings. He works at the cross section of thermofluidics and materials science (rational surface nanoengineering and nanoprinting/nano-object transport, down to single molecule resolution, with applications ranging from energy and climate change to medicine and nanoelectronics. Awards and recognitions include the White House/NSF Presidential Young Investigator Award in 1985, the Pi Tau Sigma Gold Medal in 1986, the SAE Ralph R. Teetor Award in 1986, the University of Illinois Scholar Award in 1986 and the 2000 James Harry Potter Gold Medal of ASME. He was a Russell S. Springer Professor of the Mechanical Engineering Department of the University of California at Berkeley (2003) and the Hawkins Memorial Lecturer of Purdue University in 2004. He received the Heat Transfer Memorial Award for Science in 2003 from ASME. In 2008 he was a visiting Fellow at Oxford University and a distinguished visitor at the University of Tokyo. He is the recipient of the 2009 Nusselt-Reynolds Prize (awarded every four years), for his scientific contributions. He is the 2012 recipient of the Max Jacob Award, for eminent scholarly achievement and distinguished leadership, awarded jointly by (ASME) and (AIChE).

He was presented with the Outstanding Engineering Alumnus Award of the University of Colorado in Boulder in 2012. He received the Dr.h.c. of the National Technical University of Athens in 2006. In 2008 he was elected to the Swiss National Academy of Engineering (SATW). He is the president of Division IV of the Swiss National Science Foundation (2019-).

Abstract: Interfaces separating different kinds of matter, or different phases of the same matter, abandon in nature and technology. What is more, they invariably play a critical role in all systems where they occur, from regulating transport of energy and species, to dictating system shape and form. Interfaces differ in their structure and properties from the bulk matter they surround. I note here the famous quote of Wolfgang Pauli that "God made bulk (materials) but surfaces are the work of the devil". In this lecture I will primarily focus on liquid/gas and liquid/solid interfaces, as they manifest themselves in simple systems, specifically here small droplets in condensation applications, which play a significant role in the performance of a broad pallet of technologies, ranging from power generation to (unwanted) fogging of transparent objects and to direct water harvesting from the atmospheric air. I will show that, on the one hand, the combination of fundamental knowledge from thermofluidics and rational surface nanofabrication, can lead to significant advances in power generation. On the other hand, in applications where energy is expended, I will present results on how the science of harvesting sunlight through respectively engineered (meta)surfaces and devices, can enable the employment of this unparalleled renewable energy source, to reach unprecedented performance levels. Antifogging is readily achieved with photothermal plasmonic coatings maintaining surface transparency. In solar driven water harvesting, utilizing radiative cooling to the outer space with optimized radiation shielding, coupled with a fully passive superhydrophobic condensate harvester, yields uninterrupted water harvesting; not only during night-time but also during daytime.

Saturday, December 18
09.00 AM – 10.00 AM IST

Title: Micro Elastofluidics for Efficient Microscale Liquid Handling

Speaker Bio: **Prof. Nam-Trung Nguyen** received his Dip-Ing, Dr Ing and Dr Ing Habil degrees from Chemnitz University of Technology, Germany, in 1993, 1997 and 2004, respectively. In 1998, he was a postdoctoral research engineer in the Berkeley Sensor and Actuator Center (University of California at Berkeley, USA). He is a Fellow of ASME and a Senior Member of IEEE. Nguyen's research is focused on microfluidics, nanofluidics, micro/nanomachining technologies, micro/nanoscale science, and instrumentation for biomedical applications. He published approximately 500 journal papers and filed 8 patents, of which 3 were granted. Among the books he has written, the first, second and third editions of the bestseller "Fundamentals and Applications of Microfluidics" were published in 2002, 2006 and 2019 respectively. The second edition of the bestselling book "Micromixer" was acquired and published by Elsevier in 2011.

Abstract: Micro elastofluidics is the research area that covers fundamental phenomena in fluid–structure interactions at the molecular and microscopic scales and enables practical applications in liquid handling and interfacing with biological systems. Similar to conventional microfluidics, micro elastofluidics can be further divided into digital and continuous-flow micro elastofluidics. Discoveries regarding flexibility and elasticity at the interface of microfluidics, electronics and cell biology will provide great opportunities for harnessing the hidden capabilities of future flexible and elastic hybrid systems, well beyond the current state-of-the-art rigid lab-on-a-chip and organ-on-a-chip devices. This talk will provide an overview of the concept of micro elastofluidics with practical examples.

Saturday, December 18
06.30 PM – 07.30 PM IST

Title: Physics-Informed Neural Networks (PINNs) for Inverse Heat Transfer Problems

Speaker bio: **Prof. George Karniadakis** is from Crete. He received his S.M. and Ph.D. from Massachusetts Institute of Technology (1984/87). He was appointed Lecturer in the Department of Mechanical Engineering at MIT and subsequently he joined the Center for Turbulence Research at Stanford / Nasa Ames. He joined Princeton University as Assistant Professor in the Department of Mechanical and Aerospace Engineering and as Associate Faculty in the Program of Applied and Computational Mathematics. He was a Visiting Professor at Caltech in 1993 in the Aeronautics Department and joined Brown University as Associate Professor of Applied Mathematics in the Center for Fluid Mechanics in 1994. After becoming a full professor in 1996, he continued to be a Visiting Professor and Senior Lecturer of Ocean/Mechanical Engineering at MIT. He is an AAAS Fellow (2018-), Fellow of the Society for Industrial and Applied Mathematics (SIAM, 2010-), Fellow of the American Physical Society (APS, 2004-), Fellow of the American Society of Mechanical Engineers (ASME, 2003-) and Associate Fellow of the American Institute of Aeronautics and Astronautics (AIAA, 2006-). He received the SIAM/ACM Prize on Computational Science & Engineering (2021), the Alexander von Humboldt award in 2017, the SIAM Ralf E Kleinman award (2015), the J. Tinsley Oden Medal (2013), and the CFD award (2007) by the US Association in Computational Mechanics. His h-index is 113 and he has been cited over 60,000 times.

***Abstract*:** We will review physics-informed neural networks (PINNs) and summarize available extensions of PINNs, specifically designed for multiscale and multiphysics problems. We will also introduce new NNs that learn functionals and nonlinear operators from functions and corresponding responses for system identification. We will provide several examples from heat transfer where sparse measurements are used to identify thermal boundary conditions or source terms or thermal conductivity.

Sunday, December 19
09.00 AM – 10.00 AM IST

Title: Thermal and Fluid Flow Challenges in Space Programme

Speaker Bio: **Dr. V Narayanan**, a Distinguished Scientist in ISRO, is currently Director, Liquid Propulsion Systems Centre (LPSC), one of the major Centres of the Indian Space Research Organisation (ISRO) having its Headquarters at Valiamala in Thiruvananthapuram and a Unit at Bangalore. As Director he is providing techno-managerial leadership of LPSC which is engaged in the development of Liquid, Semi Cryogenic and Cryogenic Propulsion Stages for Launch Vehicles. Chemical and Electric Propulsion Systems for Satellites, Control Systems for Launch Vehicles and Transducer development for propulsion system health monitoring. Dr. V Narayanan, who is a Rocket Propulsion Expert has joined ISRO in 1984 and functioned in various capacities before becoming Director of the Centre. As Project Director for C25 Cryogenic Project, lead the team, successfully developed C25 Cryogenic Stage powered by a 20-tonne thrust Cryogenic Engine using Liquid Oxygen and Liquid Hydrogen propellant combination and played vital role in the successful launch of GSLV Mk III vehicle in its maiden attempt on 5th June, 2017 from the spaceport of ISRO, Satish Dhawan Space Centre, SHAR, Sriharikota. When India was denied the complex Cryogenic Propulsion Technology for GSLV Mk-II vehicle, he has played crucial role in the successful development of Cryogenic Upper Stage (CUS) and contributed in making it operational for the GSLV Mk II vehicle. He has guided the team and designed a 200-tonne thrust Lox-Kerosene Semi Cryogenic Rocket Engine. During the initial period in ISRO he has also contributed in the Solid Propulsion System realization for launch vehicles. As Associate Director of LPSC, he was guiding the liquid propulsion activities of ISRO and was instrumental in finalizing the Liquid Propulsion Roadmap of ISRO for the next 20 years.

Towards GSLV Mk-III M1/Chandrayaan-2 Mission, L110 Liquid Core Stage and C25 Cryogenic Stage were delivered for the vehicle. Propulsion systems for orbiter Vikram Lander which include the throttleable thrusters for soft landing were also developed and delivered for the Chandrayaan-2 Mission, under his guidance. Dr. Narayanan is an Alumni of Indian Institute of Technology Kharagpur and has taken his M.Tech. with First Rank in Cryogenic Engineering in the year 1989 and Ph.D in Aerospace Engineering in the year 2001. He is a recipient of Silver Medal from IIT Kharagpur for First Rank in M.Tech, Gold Medal from Astronautical Society of India (ASI), ASI Award for Rocket and Related Technologies Development, Team Award from High Energy Materials Society of India (HEMSI), Performance Excellence Award and Team Excellence Awards of ISRO. He is also awarded Honorary Degree of Doctor of Science (Honoris Causa) from Sathyabama University, Chennai. He has been awarded with the Distinguished Alumnus Award-2018 by IIT, Kharagpur. Dr. Narayanan is a Fellow of Indian National Academy of Engineering (FINAE), Member of Space Propulsion Committee of International Astronautical Federation (IAF), Corresponding Member of International Academy of Astronautics (IAA), Fellow of Institution of Engineers (India), Fellow of Indian Cryogenic Council, Fellow of Aeronautical Society of India, Member of INAE Governing Council, and Member in various National and International Professional Bodies. Dr. Narayanan has published large number of technical papers in National as well as International Journals.

Abstract: Spacecrafts for various applications are placed in the required orbit by Satellite Launch Vehicles. With the current state-of-the-art in Aerospace Engineering, rocket propulsion based multi-stage Launch Vehicles are the economically viable means of accessing Space. Thermal and fluid flow science is one of the key areas of Space activities. Major thermal & flow challenges in the space programme are in design and development of launch vehicles, satellites, propulsion systems for both launch vehicles & spacecrafts, propellant storage & handling of propellants especially Cryogenic propellants, testing of engine & stage at sea level HAT facility, plume radiation & its interaction effects in the case of multiple engines, cabin environmental control in Human Space Flight and re-entry of launch vehicles. Chamber pressure and chamber temperature of rocket engines are in the order of 50 to 250 bar, and 3000K to 3500K respectively. Thermal management of combustion chamber for this high pressure, high temperature system is a complex task. Cooling techniques like ablative cooling, regenerative cooling, film cooling, dump cooling etc. or combination have to be employed for protecting the walls of combustion chamber. Modelling of combustion process and fluid flow analysis in nozzle is very important and needs extensive knowledge. Temperature rise during combustion instability and nozzle flow separation is a threat to the thrust chamber.

Cryogenic Propulsion System is highly complex due to low temperature, low density propellant & explosive nature of LH2, complex test sequence and test facilities. Storage of Cryogenic propellant is a challenging task and selection of insulation system for ground storage and onboard plays an important role in the heat transfer and weight optimisation. Knowledge in two phase heat transfer, modelling of ignition process, propellant tank internal process including thermal stratification and pressure evolution during atmospheric flight, propellant outage estimates need deeper knowledge in thermal and fluid flow. Fluid flow and heat transfer studies during the ascent phase of launch vehicles especially transonic and high Mach number regimes is an interesting field. Thermal management during re-entry phases is another important area and needs extensive research activities. Cooling of rocket plume during lift-off phase to control thermal and acoustic environment is yet another challenging field of research area.

The complete vacuum, the absolute radiation sink of the outer space and the solar radiation are aspects of the environment that the satellite must survive. Thermal Control Systems are an integral part of all spacecraft and instruments, maintaining the temperature within a range required to function properly. Cooling of payloads required good understanding in thermal science field. Thermal sciences also play crucial role for Human Space Flight Programme. Extensive knowledge and R&D base in thermal & fluid flow science is required for the design of Crew modules, Service modules, Cabin environment control, Space suit etc. In summary, thermal and fluid flow science plays a vital role in the Space programme. Few of the aspects related to thermal and fluid flow sciences in Space programme are addressed in this talk.

Sunday, December 19
06.30 PM – 07.30 PM IST

Title: Immersed Boundary Methods - Translating Concepts into Simulations

Speaker Bio: **Prof. Rajat Mittal** is Professor of Mechanical Engineering at the Johns Hopkins University (JHU) with a secondary appointment in the School of Medicine. He received the B. Tech. degree from the Indian Institute of Technology at Kanpur in 1989, the M.S degree in Aerospace Engineering from the University of Florida, and the Ph.D. degree in Applied Mechanics from The University of Illinois at Urbana-Champaign, in 1995. His research interests include fluid mechanics, computing, biomedical engineering, biofluids and flow control. He is the recipient of the 1996 Francois Frenkiel Award from the Division of Fluid Dynamics of the American Physical Society, and the 2006 Lewis Moody as well as the 2021 Freeman Scholar awards from the American Society of Mechanical Engineers. He is a Fellow of American Society of Mechanical Engineers and the American Physical Society, and an Associate Fellow of the American Institute of Aeronautics and Astronautics. He is associate editor of the Journal of Computational Physics, Frontiers of Computational Physiology and Medicine, and the Journal of Experimental Biology, and on the editorial boards of the International Journal for Numerical Methods in Biomedical Engineering, and Fluids (an MDPI journal).

Abstract: The last 25 years have seen a phenomenal growth in the application of Immersed Boundary Methods (IBMs) to the computational modeling of fluid flows. The power of IBM lies in the fact that it frees the fluid dynamicist from the need to generate body-conformal grids, thereby enabling rapid translation of concepts, ideas, and even one's imagination to simulations. The very early applications of the IBM were in the areas of interfacial and biological fluid dynamics, and while these remain the strongholds for these methods, application have expanded to encompass most areas of fluids dynamics including fluid-structure interaction, multiphase flows, acoustics, fluidic microdevices, heat transfer, design optimization, reacting flows and others. This expanded scope has also been accompanied by significant numerical and computational advancements in these methods. In my talk I will review the history as well as the state-of-the-art of IBMs. The particular emphasis of my talk will be on some areas that have been the focus of my own research in recent years: IBMs with improved accuracy and conservation properties, and application to biological flows, bioacoustics, and fluid-structure interaction.

Ansys Sponsored Talk

Friday, December 17
02.45 PM – 03.30 PM IST

Title: Trends in Industrial Turbulence Modeling

Speaker Bio: **Dr. Florian Menter** studied mechanical engineering at the Technical University of Clausthal. He then completed his diploma from von Karman Institute Brussels. He moved to join DLR Gottingen for completion of the PhD degree. Dr. Menter is a world-recognized expert in turbulence modelling. He developed the widely used Shear-Stress Transport (SST) turbulence model, which has set a milestone in the accurate prediction of aerodynamic flows. He has also contributed to the formulation of one-equation turbulence models, advanced near-wall treatment of turbulence equations, transition modelling and unsteady flow models. He has been in charge of the turbulence modelling program at ANSYS for more than 15 years and has been involved in a wide range of industrial modelling challenges. He has published more than 50 papers and articles at international conferences and in international journals. Most recently, Dr. Menter has been involved in the implementation of new turbulence models for unsteady flow simulations, including Scale-Adaptive Simulation (SAS) and Embedded/Zonal LES models. These models are particularly relevant for the many industrial applications where time varying information is essential to the engineering outcomes (such as aerodynamics, acoustics, combustion, fluid-structure coupling, etc.).

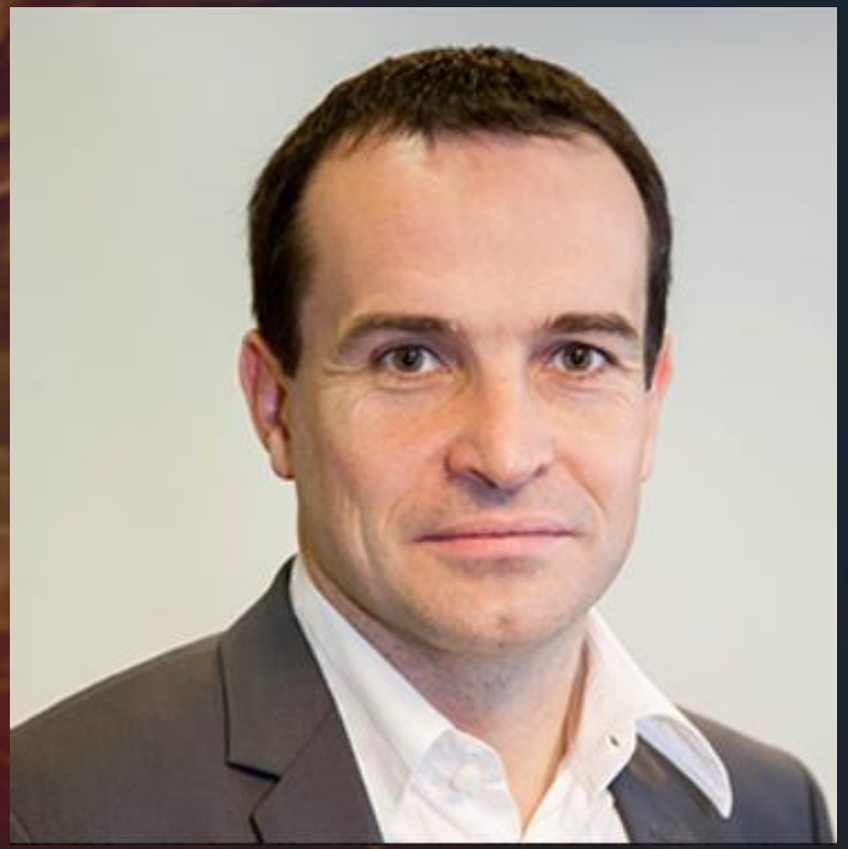
Ansys Sponsored Talk

***Abstract*:** The presentation will provide an insight into the current modeling activities at Ansys. The focus of our current work is to provide the CFD practitioner with more flexibility in turbulence modeling. This is achieved through the development of turbulence models, featuring free parameters which can be tuned by the user, without negative impact on basic flows, especially boundary layers. A first step in this direction is the Generalized k-w(GEKO) model, which allows the user to tune four free coefficients to better match given applications. The model was recently extended by an algebraic laminar-turbulent transition model, which follows the same philosophy. Finally, an infrastructure will be presented which allows the combination of GEKO with an integrated Machine-Learning environment. Free GEKO parameters can be optimized by field-inversion using an adjoint solution method. The inverted field for the coefficients can then be used for training Neural Networks (NN). The user can use either external NNs or a built-in infrastructure, which directly optimizes the NN weights. This framework is currently being extended to include Explicit-Algebraic Reynolds Stress models (EARSM).

Comsol Sponsored Talk

Monday, December 20
09.45 AM – 10.15 AM IST

Title: Multiphysics Simulation for Heat Transfer and Fluid Flow Applications



Speaker Bio: **Dr. Nicolas Huc** joined COMSOL France in 2004 and is currently the head of their development team. He is also the manager of the Heat Transfer Module. Nicolas studied engineering at ENSIMAG before receiving his PhD in living system modeling from Joseph Fourier University.

Abstract: Heat transfer is an omnipresent phenomenon, and temperature variations have a considerable impact on the operation of most devices. To better optimize the performance and improve the reliability of products and systems, it is important to accurately understand the different physical phenomena that interact with, and influence their thermal behavior. Simulation software like COMSOL Multiphysics(r) can help users to easily account for Multiphysics phenomena and set up coupled simulation models, offering a great design advantage. To learn more about modeling real-world fluid flow and heat transfer applications with COMSOL(r), join us for this interactive session. During this live presentation, we will discuss the different modes of heat transfer (conduction, convection, and radiation) and the environments and temperature conditions in which each mode must be taken into account. You will get an overview of different flow models, such as laminar and turbulent flows, compressible and incompressible flows, and multiphase flows. You will see how to combine heat transfer in solids and fluids for modeling conjugate heat transfer applications, how to model non-isothermal flows, as well as incorporating phase change and irreversible transformations. You will also learn how to couple these phenomena with structural mechanics and chemical reactions.

Keynote Talks

17th December 2021								
Forenoon					Afternoon			
	11 AM -1 PM (Oral Sessions)	**1 PM - 1.45 PM (Keynotes)**	**Session Chair**			**3.30 - 5.30 PM (Oral Sessions)**	**6.45 - 7.15 PM (Keynotes)**	**Session Chair**
Session 1	Energy and Environmental Systems	KN1: Prof. Gary Rosengarten (RMIT, Australia)	Prof. Dhiman Chatterjee (IIT Madras)		**Session 1**	Energy and Environmental Systems	KN4: Prof. Karen Ann Thole (Penn State University, USA)	Prof. Sateesh Gedupudi (IIT Madras)
Session 2	Energy and Environmental Systems	-	Prof. Arul Prakash (IIT Madras)		**Session 2**	Energy and Environmental Systems	-	Prof. Shaligram Tiwari (IIT Madras)
Session 3	Two-phase / Multiphase Flows	KN2: Prof. Peter Stephan (TU Darmstadt, Germany)	Prof. Arup Kumar Das (IIT Roorkee)		**Session 3**	Measurement Techniques+Miscellaneous	KN5: Prof. Atul Srivastava (IIT Bombay)	Prof. C Balaji (IIT Madras)
Session 4	Computational/Numerical Methods	-	Prof. Amaresh Dalal (IIT Guwahati)		**Session 4**	Two-phase / Multiphase Flows	-	Prof. Rishi Raj (IIT Patna)
Session 5	Fluid Mechanics	KN3: Prof. Gaurav Tomar (IISc Bangalore)	Prof. Kameswararao Anupindi (IIT Madras)		**Session 5**	Computational/ Numerical Methods	KN6: Prof. Marco Marengo (University of Brighton, UK)	Prof. Ganesh Natarajan (IIT Palakkad)

Friday, December 17
1 PM – 01.45 PM IST

Title: From single droplet impingement to sprays: the effect of 'enhanced' surfaces on heat transfer

Speaker bio: Prior to joining RMIT University in 2012, **Prof. Gary Rosengarten** spent 6 years at the University of New South Wales (UNSW) running the solar energy and heat transfer group, and being head of the thermal fluids research area. He has 2 years' experience in consulting for sustainable building design, and 3 years at Australia's national research organisation, CSIRO, working on thermal measurements. He has first class honours degrees in Mechanical Engineering and in Physics from Monash University, and a PhD in Mechanical Engineering from UNSW. He won the inaugural American Society of Mechanical Engineers (ASME) Solar Energy Division Graduate Student. Rosengarten founded and heads the Laboratory for Innovative Fluid Thermal Systems at RMIT, and leads a university wide initiative in energy research. He has approximately 200 refereed journal papers in fields ranging from solar energy to biotechnology.

Abstract: Spray cooling is known to offer the highest heat transfer rates of any cooling technique currently available, mainly due to the constant refreshing of the thermal boundary layer. Unlike microchannel cooling, it also allows essentially uniform heat flux/temperature over the cooling area. In this presentation I will cover research on the effect of surface properties on heat transfer rates for various 'enhanced' surfaces. I will include the progression in the flow physics from the highly investigated single droplet case, to multiple droplets and ultimately to sprays, demonstrating the important parameters that need to considered in maximizing heat transfer rates.

Friday, December 17
1 PM – 01.45 PM IST

Title: Interactions between evaporative heat transfer phenomena and wetting phenomena: generic experiments and numerical simulation

Speaker bio: **Prof. Peter Stephan** studied Mechanical Engineering at the Technical University of Munich. He then moved to the Joint Research Centre of the European Commission in Ispra/Italy as a Marie-Curie-Fellow and PhD student. In 1992 he received his PhD in collaboration with the University of Stuttgart. From 1992 to 1997 he worked in R&D for Mercedes-Benz. In 1997 he was appointed full professor at the Technical University of Darmstadt and director of the Institute for Technical Thermodynamics in the Department of Mechanical Engineering. Since then, Peter Stephan additionally worked in different part-time functions: dean Department of Mechanical Engineering, director Collaborative Research Center “Interaction between Transport and Wetting Processes “, senator of the TU Darmstadt, and spokesperson of the TU Darmstadt Research Field “Energy & Environment” to name a few. Peter Stephan has published 3 text books, more than 280 research papers, supervised more than 50 PhD students. He is member of editorial boards of four international journals and was honored by several awards, e.g., the Nukiyama Memorial Award of the Heat Transfer Society of Japan in 2012, the Golden Medal of Honor from the Association of German Engineers in 2018, and the ASME Fellowship in 2020. The main research interests of Peter Stephan are: heat transfer in multiphase systems, heat pipes and high-performance heat exchangers, heat transfer in space, and thermal analyses of coupled energy conversion systems.

Abstract: In many two-phase heat transfer processes, such as nucleate boiling, spray or drop impingement cooling, a superheated wall is in contact with a dynamically moving interface between the liquid and vapor phases of the heat transfer fluid. The local phenomena next to this moving contact line during the wetting or dewetting process strongly interact with the flow and heat transfer in the thermal boundary layer and vice versa. However, these interactions are still poorly understood. How does the wall superheat or evaporation rate influence the wetting or dewetting dynamics? And how do wetting or dewetting dynamics influence the local and overall evaporation rate? The talk will address these phenomena and their interactions from an experimental as well as from a theoretical/numerical perspective. A multiscale model was developed that combines the description of flow and heat transfer in the thermal boundary layer and in the bulk fluid with a specific subgrid model that describes the details of the non-isothermal wetting or dewetting phenomena. The model was implemented into the CFD platform interFOAM and applied to study single drop impingement cooling events as well as single bubble nucleate boiling events with high temporal and spatial resolution. Generic experimental setups were developed and used in parallel to validate the model and to compare experimental and numerical results. The model, the numerical procedure, and the experimental methods are described. Comprehensive results are presented for the drop impingement cooling case. Numerical and experimental results agree well with each other. The extremely high resolution of the numerical results gives deep insights into the local phenomena near the wetting/dewetting front and their interaction with the bulk flow evolution and the heat transferred by transient conduction and evaporation.

Friday, December 17
1 PM – 01.45 PM IST

Title: Dynamics of cluster of soft-membrane capsules in a channel flow

Speaker bio: **Prof. Gaurav Tomar** is currently an associate professor in the department of Mechanical Engineering at the Indian Institute of Science Bangalore. He completed his PhD from the department of Mechanical Engineering at Indian Institute of Technology Kanpur in 2008. He subsequently worked as a post-doctoral fellow in the university of Pierre Marie Curie, Paris and University of California Santa Barbara. He joined the department of Mechanical Engineering in the Indian Institute of Science Bangalore as an Assistant Professor in 2010. His research interests are broadly in the area of numerical simulations of multiphase and multiscale flows.

Abstract: Understanding the dynamics of soft membranes in a fluid flow is important in various biological systems. In this talk, we will discuss the numerical formulation required to simulate the dynamics of a cluster of capsules subjected to a shear and extensional flow, such as in a channel flow with a constriction. We have developed a parallel numerical solver that employs a front tracking algorithm in a finite volume method framework to capture the membrane dynamics in three dimensional flows. An inter-particle potential is used to model the interactions between the membranes of different capsules in a flow.

Friday, December 17

06.45 PM – 07.30 PM IST

Title: Exploring Additive Manufacturing for Cooling Channel Designs

Speaker Bio: **Prof. Karen A. Thole** is a Distinguished Professor in the Department of Mechanical Engineering at The Pennsylvania State University. She is a Fellow of ASME and AIAA. Dr. Thole's expertise is heat transfer and cooling of gas turbine airfoils through detailed experimental and computational studies. She directs the Steady Thermal Aero Research (START) Lab, which focuses on turbine heat transfer, additive manufacturing, and instrumentation development. Dr. Thole has published over 270 archival journal and conference papers and has supervised over 75 dissertations and theses. She has served on two National Academy of Engineering study committees related to low carbon aviation and advancing gas turbines. Dr. Thole received the 2015 ASME George Westinghouse Gold Medal for her work in gas turbine research, the 2016 Edwin F. Church Medal in Engineering Education, and in 2017 she received the ABET Claire L. Felbinger Diversity Award. In 2019, she was recognized by AIAA's Air Breathing Propulsion award. She holds two degrees in Mechanical Engineering from the University of Illinois, and a PhD from the University of Texas at Austin.

Abstract: Recent advances in the field of additive manufacturing (AM) have widened the design space for complex convective cooling designs. Using additive manufacturing allows for increasingly small and complex geometries to be fabricated with little increase in time or cost. The opportunity for gas turbine designers, in particular, is to exploit the use of additive manufacturing in re-thinking cooling schemes for components. However, high surface roughness levels result when using laser powdered bed fusion, which is a common additive manufacturing technique. The inherent roughness, in fact, can be used to enhance convective heat transfer beyond that of engineered cooling designs, but comes with a pressure drop penalty. One dictating parameter that influences the surface roughness is the component build direction. The build direction not only influences the surface roughness, but also affects whether it is possible to meet the design intent of the component, component shape and, ultimately, the resulting heat transfer and pressure loss characteristics of the component. This seminar will provide insights on various channel shapes made possible through using additive manufacturing while understanding the effects of the build direction and other processing parameters.

Friday, December 17

06.45 PM – 07.30 PM IST

Title: Mapping the primary growth mechanisms of vapor bubble(s) and heat transfer of nano-coated surfaces of varying wettability

Speaker bio: **Prof. Atul Srivastava** is currently working as a professor in the department of Mechanical Engineering at the Indian Institute of Technology Bombay. He has worked at various scientist positions at the Raja Ramana Center for Advanced Technology, Indore from July, 2005 to April, 2011. After that he served as a GCOE visiting professor at the graduate school of Science, Sendai, Japan from Oct, 2011 to Nov, 2011. He joined the department of Mechanical Engineering in the Indian Institute of Technology Bombay as an Assistant Professor in May, 2011. The focus of his research team is to measure 3D unsteady whole fluid field using advanced measurement techniques that are completely inertia-free and non-intrusive. His research has shown significant advancement in the area of heat flux management systems, nanofluids, two-phase heat transfer, coupled heat and mass transfer, droplets/interfaces and bio-heat transfer.

Abstract: Heat transfer strategies involving phase change of working fluid offer effective and efficient solutions in high heat flux dissipation applications. Of notable, nucleate pool boiling heat transfer wherein, the dynamics of vapour bubble(s) and the associated heat transfer rates are intricately linked with the surface characteristics has attracted lot of research attention. Recent developments in this field have seen a surge in the application of nanofluids and particularly, engineered surfaces of enhanced surface properties for possible enhancement in the boiling heat transfer rates. Random and nonuniform deposition of suspended nanoparticles as part of boiling phenomena leads to an uncontrolled change of the wettability parameters of the heated substrate. However, engineered surfaces provide quite a good control over the surface wettability. The present talk focuses on mapping the growth mechanisms of vapour bubble(s) and the associated heat transfer of nanofluids and thin film nano-coated surfaces of varying wettability. Bubble growth dynamics and temperature of the heater substrate have been mapped simultaneously by employing non-intrusive measurement techniques i.e., schlieren-based videography and IR thermography.

IR-based temperature and heat flux distribution underneath the growing vapor bubble revealed that the primary growth mechanism of the single vapor bubble gets changed dramatically (from purely contact line evaporation to microlayer evaporation-driven) in the case of the nanofluids vis-a-viz water experiments. In the case of the nano-coated surfaces, for certain range of the wettability parameter, transition regime is observed wherein, some bubbles exhibit pure contact line evaporation and other bubbles exhibit microlayer evaporation-driven bubble growth. The heat flux distribution data showed that the microlayer evaporation process is more efficient as compared to that of purely contact line evaporation process. Furthermore, it has been found that the nano-coated hydrophobic surfaces provide better heat transfer rates in comparison with the nano-coated hydrophilic surfaces at low heat flux levels.

Friday, December 17

06.45 PM – 07.30 PM IST

Title: Diffuse Interface modeling coupled with Fluctuating Hydrodynamics Theory for simulation of vapour nucleation

Speaker Bio: **Prof. Marco Marengo** is a Physicist, Director of the Advanced Engineering Centre, Professor of Thermal Engineering at the University of Brighton, UK. From 2019 he is Associate Editor of the International Journal of Multiphase Flows and from 2021 Associate Editor of MDPI Energies. Prof. Marengo is Adjunct Professor at York University, Toronto, Canada. He is leading the European Space Agency "Pulsating Heat Pipe" scientific team. He published more than 350 scientific papers, among which more than 90 in peer-reviewed International Journals. His research focuses in fundamental and applied research of two-phase systems for space and ground applications as well as in experimental and numerical modelling of phase-change heat transfer, microfluidics, atomization and sprays, drop physics, heat pipes, surface wettability.

Abstract: Nowadays, one of the most difficult prediction in physics is the nucleation rate of vapour together with the area density number of nucleation sites for various conditions of liquid and wall temperature, pressure, surface characteristics, such as roughness and wettability. This is very relevant to predict boiling conditions, such as the boiling onset and to avoid prescribed initial conditions for bubble formation and departure, i.e to reach an ab-initio understanding of the boiling process, able to describe with statistical robustness the vapor formation rate, the heat transfer coefficients and the cooling of the surface. Presently, molecular dynamics is the only universally trusted tool to let the nuclei spontaneously appear, capturing the proper statistical properties. However, it can be used only for synthetic or particular fluids and has enormous computational cost limits. Here, we would like to introduce an alternative approach based on the coupling of Fluctuating Hydrodynamics Theory and Diffuse Interface modeling (Gallo et al., 2018).

Keynote Talks

18th December 2021								
Forenoon					Afternoon			
	10 AM -12.30 PM (Oral Sessions)	**1 PM - 1.45 PM (Keynotes)**	**Session Chair**			**3 - 5 PM (Oral Sessions)**	**7.30 - 8 PM (Keynotes)**	**Session Chair**
Session 1	Energy and Environmental Systems	KN7: Prof. K. Srinivasa Reddy (IIT Madras)	Prof. Shyama Prasad Das (IIT Madras)		**Session 1**	Energy and Environmental Systems	KN10: Prof. Kripa Varanasi (MIT, USA)	Prof. Himanshu Tyagi (IIT Ropar)
Session 2	Energy and Environmental Systems	-	Prof. Arunn Narasimhan (IIT Madras)		**Session 2**	Fluid Mechanics	-	Prof. Vagesh Narasimhamurthy (IIT Madras)
Session 3	Mass transfer+Miscellaneous	KN8: Prof. Atsuki Komiya (Tohuku University, Japan)	Prof. Pallab Sinha Mahapatra (IIT Madras)		**Session 3**	Combustion	KN11: Prof. Nilanjan Chakraborty (Newcastle University, UK)	Prof. JM Mallikarjuna (IIT Madras)
Session 4	Micro / Nano-scale Fluid Flow and Heat Transfer	-	Prof. Sarith P Sathian (IIT Madras)		**Session 4**	Computational /Numerical Methods	-	Prof. Atul Sharma (IIT Bombay)
Session 5	Fluid Mechanics	KN9: Prof. Michael Baudoin (Univ of Lille, France)	Prof. Gaurav Tomar (IISc Bangalore)		**Session 5**	Micro / Nano-scale Fluid Flow and Heat Transfer	KN12: Prof. Pamela M Norris (University of Virginia, USA)	Prof. Susmita Dash (IISc Bangalore)

Saturday, December 18

1 PM – 01.45 PM IST

Title: Integrated Renewable Energy Technologies with Energy Storage for Standalone Power Generation

Speaker bio: **Prof. K. SRINIVAS REDDY** obtained his PhD from Indian Institute of Technology Delhi in Energy Studies in 1999. He then joined National Institute of Technology Warangal in June 1999, after a brief service of about 4 years at NITW, he joined IIT Madras in April 2003 as an Assistant Professor. Presently, Dr. Reddy is a Professor of Mechanical Engineering at IIT Madras and he is also an honorary professor at University of Exeter, UK. He also served as an Adjunct Professor at CEERI-CSIR, Chennai during 2014-17. Prof. Reddy is a Fellow of the National Academy of Engineering (FNAE) and Fellow of the World Society of Sustainable Energy Technologies (FWSSET). He is specialist in renewable energy with special research interests on concentrating solar power, energy efficiency and environment. He has 9 patent (4 granted) applications and more than 280 publications with more than 6000 citations and h-index of 43, of which, 160 papers in reputed international journals, including five review articles on solar energy systems and energy storage. His co-authored book on “Sustainable energy and the environment: a clean technology approach” Published by Springer and book chapters on solar energy systems are popular among energy and environment community. Prof. Reddy is actively involved in the implementation of solar thermal technologies for power generation and process heat applications through “Design-Development-Demonstration-Deployment (4-D)” approach. He has secured research funding (about USD15m) as Principal Investigator (PI) and Co-PI of more than 30 research projects related to solar energy, energy & environment and heat transfer areas supported by various Indian and foreign funding agencies such as DST, CSIR, MNRE, AICTE, RCUK, EPSRC, IGCS, UKIERI and ICIMPACT.

His work on estimation of thermal conductivity & thermo-physical properties and characterization of engineering materials significantly benefited the industrial associates for development of energy efficient thermal insulation materials. In recognition of his research work, Dr. Reddy received awards such as WSSET Innovation award, the Mid-Career Level Institute Research and Development Award (IRDA) Shri J.C.Bose Patent award and twice, the Bhagyalakshmi and Krishna Ayengar Awards. He also won career award for young teachers from AICTE in 2003. He surved as member in Board of Governors, IIT Tirupati during 2018-21. He is an expert committee member in various selection/ review committees and the Visitor's nominee for IITs and NITs. As a part of human resource developmental activities, he supervised over 200 UG, PG and Ph.D. students, most of them are well placed and working now in prestigious organizations. He organized several national & international workshops on advanced renewable energy technologies.

Abstract: Renewable energy based decentralized energy system is a viable approach to meet the basic energy needs of both rural and urban regions. The concept of hybrid renewable energy technologies has been discussed and developed in a large scale for both urban and rural electrification. The principal cause for choosing hybrid technologies is to overcome the inconsistency of power generation in conventional means. The smart integration of different renewable technologies not only balances the annual energy output but also can complement each other to avoid energy storage requirement and improve the overall efficiency of the system. In the recent years, plenty of research on integrating solar and biomass energy system are under the spot light as it helps in self-sufficient and sustainable rural electrification and also boosts the native community to utilize the bio-waste comprehensively. High temperature heat production for electricity generation often requires direct absorption of solar energy. Solar thermal electric power systems promise to be most cost-effective renewable energy systems to displace fossil fuels. Concentrating Solar Power (CSP) technology is among the front-runners in main stream technologies developed so far. The CSP plants are turning out to be one of the most entrusted technologies for transforming solar energy into electricity on a large scale. The solar parabolic dish with receiver configuration is often referred as most efficient system. A numerical investigation is performed to study the heat losses from three types of receivers for a fuzzy focal solar dish concentrator, namely cavity receiver, semi-cavity receiver and modified cavity receiver. The heat losses from the receivers are estimated for various orientations and temperatures.

The influence of receiver area ratio on the convective heat loss is investigated for the modified cavity receiver, and an optimum receiver area ratio of 8 is found for minimum heat losses. The modified cavity receiver is the preferred receiver for a fuzzy focal solar dish collector system. The efficiency of the system was obtained in order of 70-80%. To address the intermittency in solar energy system due to unforeseen weather conditions and to improve dispachability, the requirement of Thermal Energy Storage (TES) system is becoming increasingly inevitable. It has been an undisputed fact that a substantial cost reduction in concentrated solar thermal power plants can be achieved by incorporating TES system, which facilitates heat for extended duration and henceforth multiplying the operational capacity of the power plant and at the same time augmenting the ability of power dispatch. The present work is intended to investigate the TES thermocline system for CSP plants with different HTFs namely therminol oil, Solar Salt and HITEC. Various HTFs are studied by taking discharge effectiveness as a pivotal parameter to analyze the influence of bed porosity, HTF, design and operating parameters. As high temperature operation improves the CSP cycle efficiency, a detailed plant-level analysis with extended and seasonal thermal energy storage may give extent of reliability improvement and cost-effectiveness.

Saturday, December 18

1 PM – 01.45 PM IST

Title: Evaluation of the possibility to control mass diffusion process by a membrane with macropore patterning

Speaker Bio: **Prof. Atsuki Komiya** received his BE in 1997 and ME in 1999 in mechanical engineering from the Tohoku University, Sendai, Japan. In 2002, he received the PhD in mechanical engineering in Tohoku University. From 2002 to 2004, he was a Research Fellow with the Japan Aerospace Exploration Agency (JAXA). He worked the development of the facility of fluid experiment for space experiment. In 2004, he moved to the Tohoku University as an Assistant Professor. Since 2019, he has been a Professor of Heat Transfer Control Laboratory in the Institute of Fluid Science, Tohoku University. He is the author of two books, more than 100 articles. (h-index:25). Professor Komiya's awards and honors include the Young Researcher Award and Scientific Contribution Award of the Heat Transfer Society of Japan, and the Young Scientists' Prize of the Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology.

Abstract: A better understanding of protein transport phenomena is one of the essential key factors in medicine and the biochemical industry. This study focuses on the precise control of protein mass diffusion by using a membrane having macropore patterning. Experimentally the mass flux through the membrane was measured and the relation between hindered mass diffusion flux and macropore patterning on the membrane was evaluated. To precisely measure the transient diffusion field in the vicinity of membrane surface, a special visualization technique, namely phase-shifting interferometric technique, was applied in this study. The visualization of protein mass diffusion process has generally technical difficulties because the event of protein transport takes on slow and small phenomenon. There is a great lack of reliable experimental data due to the measurement difficulties encountered when measuring a process as slow as transport phenomena. The technique proposed in this study solves this problem and a series of clear visualized images of concentration profiles of hindered diffusion field was obtained. From the results, it is considered that the active mass flux control of protein can be realized by changing the macropore patterning on the membrane. The capability and technique for precise control of protein mass transfer are discussed.

Saturday, December 18

1 PM – 01.45 PM IST

***Title*: Extraordinary interfacial dynamics induced by partially wetting microparticles: from inverse Saffman-Taylor instability to everlasting bubbles.**

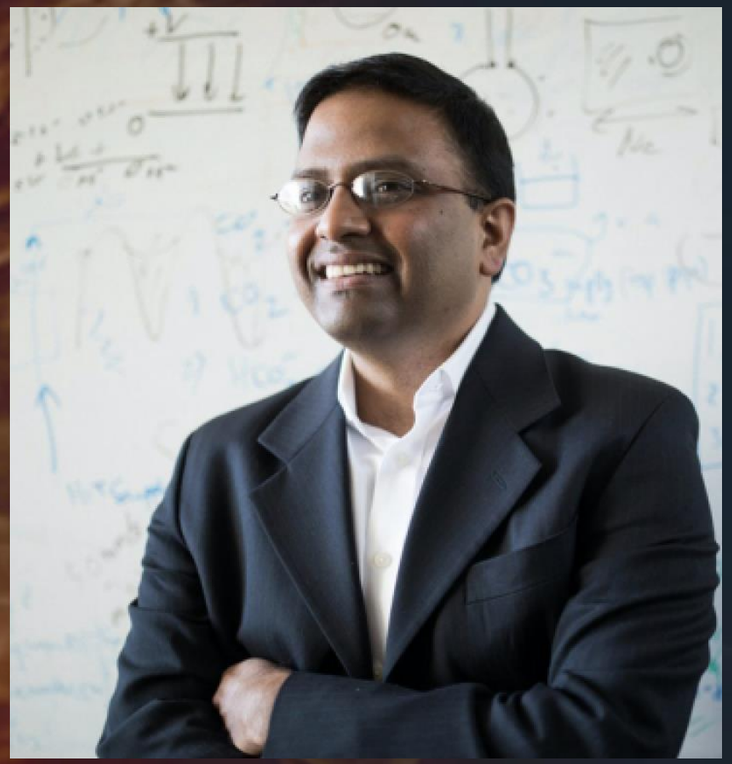
***Speaker Bio*: Prof. M. Baudoin** started his research career at Sorbonne University, where his PhD was dedicated to the linear and nonlinear propagation of acoustic waves in dense suspensions of microparticles. Then he joined the team of Pr. Baroud at LadHyx (Ecole Polytechnique) where he studied the dynamics of liquid plugs in microfluidic networks. In 2008 he started to build his own team at Université de Lille on subjects at the interface between microfluidics, acoustics and microsystems. In particular he studied how the presence of partially wetting particles can drastically modify the interfacial dynamics of fluids and how specific acoustic wavefields called acoustical vortices can be used to manipulate selectively microparticles and cells in a standard microscopy environment. In 2016 he became full Professor and was elected Junior Fellow of the Institut Universitaire de France in 2019.

***Abstract*:** In this presentation, we will discuss how the presence of partially wetting microparticles can drastically modify the behavior of fluidic interfaces, leading to some unexpected behaviors. First, we will revisit the classic Saffman-Taylor instability: While the instability normally occurs when a less viscous fluid pushes a more viscous fluid, we will show that the presence of partially wetting particles on the walls can lead to a capillarity-driven fingering instability in the reverse situation [1]. Second, we will demonstrate that these particles also alter the dynamics of liquid fingers in capillary tubes, with a liquid film growing ahead of the front meniscus, a reverse situation compared to Bretherton. This phenomenon enables the tailored synthesis of cylindrical bubbles encapsulated in a monolayer of particles (so-called “armoured bubbles”) [2]. Finally, we will explain how everlasting air bubbles resisting drainage, evaporation and nuclei induced bursting can be simply synthesized by replacing surfactant by microparticles and water by hygroscopic liquids [3].

References: **[1]** I. Bihi, M. Baudoin, J.E. Butler, C. Faille and F. Zoueshtiagh, Inverse Saffman-Taylor experiments with particles lead to capillarity driven fingering instabilities, Phys. Rev. Lett., 117: 034501 (2016) **[2]** F. Zoueshtiagh, M. Baudoin and D. Guerrin, Capillary tube wetting induced by particles: toward armoured bubble tailoring, Soft Matter (cover), 10: 9403 (2014) **[3]** Everlasting bubbles and liquid films resisting drainage, evaporation and nuclei-induced bursting, under review, arXiv:2103.15637 (2021)

Saturday, December 18
07.30 PM – 08.00 PM IST

Title: Interfacial Engineering Across Scales: A Ubiquitous Paradigm for Energy Innovation



Speaker bio: **Prof. Kripa K. Varanasi** is a Professor of Mechanical Engineering at MIT. He received his B.Tech from IIT Madras, India and his SM (ME and EECS) and Ph.D from MIT. Prior to joining MIT as a faculty member, Prof. Varanasi was a lead researcher and project leader at the GE Global Research Center. At GE he received many awards for his work including Best Patent, Best Technology Project and Leadership Award. At MIT, the focus of his work is in understanding the physico-chemical phenomena at interfaces and developing novel materials, devices, and products that can dramatically enhance performance in energy, water, agriculture, transportation, medical, and consumer devices. He is passionate about entrepreneurship and translating technologies from lab to market. He has co-founded multiple companies including LiquiGlide, Dropwise, and Infinite Cooling. Time and Forbes Magazines have named LiquiGlide to their “Best Inventions of the Year”. His Infinite Cooling project has won first prize at DOE’s National Cleantech University Prize, first prize Rice Business Plan Competition, first prize Harvard Business School Energy & Environment Start-up, first prize at MIT-100K, first prize at Mass Challenge. Prof. Varanasi has received numerous awards for his work NSF Career Award, DARPA Young Faculty Award, SME Outstanding Young Manufacturing Engineer Award, ASME Bergles-Rohsenow Heat Transfer Award, Boston Business Journal’s 40 under 40. ASME Gustus L. Larson Memorial Award for outstanding achievements in mechanical engineering, APS Milton van Dyke award, and MIT Graduate Student Council’s Frank E. Perkins Award for Excellence in Graduate Advising.

Abstract: Interfacial interactions are ubiquitous in multiple industries including energy, water, agriculture, medicine and transportation. In this talk, we show how surface/interface chemistry and morphology can be engineered across multiple length scales for significant performance enhancements in a wide range of energy processes including thermal-fluid and electrochemical processes. These approaches can involve both passive and active manipulation of the interface. We will describe a number of examples where this paradigm has helped us to make significant advances as well as commercialize technologies for significant efficiency gains. First, we will describe a wide range of slippery interfaces that can significantly boost the performance of energy applications such as enhance thermal transport in heating & cooling systems, flow assurance in oil & gas, reduce friction, and provide self-healing barriers for protection against fouling and corrosion. We will describe active approaches such as photothermal traps for thermal confinement that can enhance interfacial processes. Next we will describe efficient separation, particle removal from solar panels, and water capture technologies using space-charge driven non-Laplacian electric fields to solve important problems at the Energy-Water Nexus. The third part of the talk will focus on our efforts on enhancing electrochemical processes ranging from CO2 capture and conversion and hydrogen electrolysers by addressing bottlenecks at the electrochemical-fluid dynamic interfaces. We will finally discuss our efforts in improving photobioreactors and enhancing biological routes for CO2 capture and utilization. Manufacturing and scale-up approaches, robust materials and processes, and entrepreneurial efforts to translate these technologies into useful products and markets will also be discussed.

Saturday, December 18

07.30 PM – 08.00 PM IST

Title: Direct Numerical Simulations (DNS) based analysis of premixed flame-wall interaction and heat transfer characteristics in turbulent boundary layers

Speaker Bio: Prof. Nilanjan Chakraborty is a professor of Fluid Dynamics and the lead member of the Fluid Dynamics and Thermal Systems research group (2011-), within the School of Engineering at Newcastle University. Previously, he was a senior lecturer (2008-2011) and a lecturer (2005-2008) at the University of Liverpool and a Mechanical Engineer of General Electric's Research and Development division before he pursued his PhD and Postdoctoral research at the University of Cambridge (2001-2005). His research interests include Direct Numerical Simulation (DNS) of turbulent combustion and multiphase flows, Large Eddy Simulation (LES) combustion modelling, natural convection of non-Newtonian fluids, Melting/Solidification related heat transfer problems in classical manufacturing (e.g., welding) and Laser aided manufacturing applications (e.g., Laser Surface Alloying). To date, his research has been funded by the Nuffield Foundation (NAL/32607), Newton grant (NRCP1516/4/67), British Council (IL4279134267) and Engineering and Physical Sciences Research Council (EPSRC), UK (EP/E026516/1, EP/G008841/1, EP/I0/28013/1, EP/J003573/1, EP/J021997/1, EP/K025163/1, EP/P022286/1, EP/R029369/1, EP/S025154/1, EP/S032134/1, EP/V003534/1, EP/V013092/1). In 2005, he and his co-authors were awarded the prestigious Gaydon Prize for the most significant UK Contribution to the 30th International Symposium on Combustion. He was awarded the Hinshelwood Prize by the British Section of Combustion Institute for his contribution to combustion science in 2007. A paper co-authored by him was judged to be the most significant paper presented in the droplet combustion colloquium of the 32nd International Combustion Symposium. Prof. Chakraborty is one of the recipients of the prestigious Hind Rattan award 2015, which is one of the highest Indian awards given to people of Indian origin for outstanding contribution in their field of work by the Non-Resident Indian Welfare Society of India, an organisation under the umbrella of the Indian Government.

In 2017, he received a short-term fellowship by the Japanese Society for the Promotion of Sciences (JSPS) for collaborative research on multiphase turbulent reacting flows at the University of Kyoto. He has been awarded a Guest Professorship at the University of Duisburg-Essen in 2018. He is a steering committee member of CoSeC (Computational Science Centre for Research Communities) and the UK Research Council's ExCALIBUR programme. He is also a Strategic Advisory Team member of the Computational Fluid Dynamics (CFD) part of EPSRC's e-infrastructure team. In 2021, he was elected as a Fellow of the Combustion Institute. To date, he published 279 papers in peer-reviewed journals and 164 conference publications. His citation record is given by an h-index of 42 (source Google scholar).

Abstract: Cooling of the walls is necessary for most combustors because the burned gas temperature is often higher than the melting point of the combustor material. This cooling has a significant impact on the combustion processes in the near-wall region and the life span of the combustor itself, and this interaction is usually referred to as flame-wall interaction (FWI). In combustors, flame quenching by cold walls leads to unburned reactants, which, in combination with heat losses to the wall, negatively affects the efficiency and pollutant emission performance of the engine. Furthermore, flame propagation in the low-velocity region of the wall boundary layer leads to a flashback from the combustion chamber to the mixing zone in a gas turbine. The increasing demands for micro-combustors and lightweight compact combustors for hybrid engines make FWI an inevitable event. Therefore, an improved physical understanding of the FWI mechanism is necessary to develop and design simultaneously efficient and environmentally friendly combustion devices. FWI under turbulent conditions is driven by the intermittent passage of cold unburned and hot burned gases close to the wall. The heat flux at the wall is determined by contact with hot and cold gases and the proximity of the flame front to the wall. In most practical combustion devices, the typical burned gas temperature remains about 1200-1800 K, whereas the wall temperature of the combustor is often kept in the range of 800-1000 K because of cooling so that structural integrity is maintained.

A temperature change of the order of 400-800 K occurs within a thin layer of the order of 1mm from the wall and thus gives rise to large magnitudes of heat flux. Analysing FWI is a challenging task using experimental techniques due to the spatial resolution requirements. The only quantity, which can be measured reliably, is the wall heat flux, but this quantity is an indirect effect of the chemical processes taking place in the gaseous phase. Moreover, the transient effects associated with FWI (e.g., high wall flux for a short duration followed by reduced values of heat flux for a relatively long interval) makes the experimental characterisation of the underlying combustion process extremely difficult. The flame usually quenches close to the wall (typical distance of the order of 1.0μm), as the lower wall temperature often does not allow for chemical reactions to be sustained. Thus, the near-wall region must be resolved sufficiently to obtain fundamental physical insights into premixed FWI. This resolution can be achieved utilising the recent advances of high-performance computing to conduct Direct Numerical Simulations (DNS) of premixed FWI where all the relevant length and timescales of the turbulence and combustion processes are resolved without any physical approximation. In the last two decades, the DNS of reacting flows has led to significant advancements in the physical understanding and modelling of turbulent combustion modelling. However, to date, most combustion DNS studies have been carried out in canonical configurations in the absence of no-slip wall boundary conditions.

This keynote lecture will focus on statistical behaviors of flame quenching distance, wall heat flux, local flame displacement speed, turbulent kinetic energy, turbulent scalar flux, and turbulent scalar gradient based on DNS data for (1) transient head-on quenching by an isothermal inert cold wall, (2) FWI for premixed flames impinging on inert isothermal cold walls, (3) oblique quenching of V-shaped premixed flames by an isothermal inert wall in a turbulent channel flow, and (4) head-on quenching across a turbulent boundary layer on an inert isothermal flat plate. It has been found the flame configuration plays a key role in determining the statistical behaviors of Reynolds stresses, turbulent kinetic energy, and scalar fluxes, which have implications on the modelling of these quantities in the context of Reynolds Averaged Navier-Stokes (RANS) simulations. The heat release due to chemical reaction and the resulting dilatation rate resulting from thermal expansion alter the statistical behaviors of turbulent kinetic energy, vorticity and reactive scalar gradient statistics in the vicinity of the wall. Moreover, it has been found that the existing mean reaction rate closures using Flame Surface Density (FSD) and Scalar Dissipation Rate (SDR) methodologies do not adequately capture the reduction in mean reaction rates as a result of flame quenching in the near-wall region, and these closures need to be modified for the accurate representation of flame quenching.

It has been found that the characteristic Lewis number Le (i.e. ratio of thermal diffusivity to mass diffusivity) of turbulent premixed flames plays a key role in determining the flame quenching distance, wall heat flux magnitude and influence the near-wall statistics of key quantities (e.g., FSD, SDR, turbulent kinetic energy and scalar flux). The flame quenching distance under turbulent conditions remains comparable to that of the laminar flame in the case of head-on quenching of premixed flames with Le≥1, whereas turbulent flame quenching distance is smaller than that for the laminar flame in the case of Le<1. The effects of differential diffusion of heat and species arising from non-unity Lewis number are found to be stronger in the case of premixed FWI of hydrogen-based fuels than in the case of conventional hydrocarbon fuels. In the case of FWI of hydrogen-air premixed flames, a significant amount of heat release occurs at the wall, although the flame quenches at a distance away from the wall, and this behavior originates due to low-temperature chemical reactions and diffusion of radicals such as OH from the quenched flame. This aspect is present in the case of wall-induced quenching of turbulent premixed flames of hydrocarbon fuels (e.g. methane-air flames) but the wall heat release remains much smaller than in the corresponding hydrogen-air flames representing the same location on the regime diagram. Moreover, the high flame speed for hydrogen-rich premixed flames can lead to flashback in turbulent boundary layers, which significantly affect local flame propagation rate, reactive scalar gradient statistics and turbulent kinetic energy transport. Detailed physical explanations will be offered for the influence of flame on the near-wall heat and fluid flow based on physical insights extracted from DNS data and the associated modelling implications will be provided. Finally, an integral form of the energy conservation equation for the turbulent reacting flow boundary layer will be utilised in conjunction with DNS data to demonstrate that the Nusselt number within the turbulent boundary layer for premixed FWI is intrinsically related to turbulent burning velocity. Thus, the measurement of wall heat flux can be utilized to predict the turbulent burning velocity in the case of premixed FWI within turbulent boundary layers.

Saturday, December 18
07.30 PM – 08.00 PM IST

Title: Designing interfaces to enhance interfacial thermal transport at the nanoscale

Speaker Bio: **Prof. Pamela Norris** is the recently appointed Vice Provost for Research at George Washington University. This research was conducted while she was the Executive Dean in the School of Engineering and Applied Science and the Frederick Tracy Morse Professor of Mechanical and Aerospace Engineering at the University of Virginia. She is recognized globally as a leading expert in nanoscale heat transfer, especially interfacial thermal transport with a focus on thermal management across a range of length scales. She has served as the PI or Co-PI on over 45 sponsored research projects representing well over $25M from DOD, NSF, Industry and Foundations. In 2016 she was honored with the Society of Women Engineers Distinguished Engineering Educator Award "for enduring, positive influence on students' lives as a gifted teacher, mentor, and role model; and for promoting greater diversity in STEM higher education". Pam serves on the Advisory Committee to the Board of Directors of the American Society of Thermal and Fluids Engineers and on the Scientific Council for the International Centre for Heat and Mass Transfer and is the Editor in Chief of Nanoscale and Microscale Thermophysical Engineering.

Abstract: The ability to predict, understand, and control thermal transport in materials and at interfaces remains a critical challenge and goal of nanoscale thermal transport research. In nanostructures where phonons are the primary thermal energy carriers, interfaces between dissimilar materials represent the dominant thermal resistance. An increased understanding of phonon-mediated transport across interfaces is critically needed, so that nanostructured materials can be more effectively designed and implemented. At the Nanoscale Energy Transport Laboratory at the University of Virginia, our research efforts have combined both computational and experimental techniques to model, measure, and predict phonon dynamics, and the resulting thermal properties, for a wide range technologically relevant systems.

We have approached this problem experimentally, measuring nanoscale systems with time-domain thermoreflectance (TDTR), and computationally, tracking atomic thermal motion in non-equilibrium molecular dynamics simulations. This work is complicated by the wide spectra of phonon mean free paths, ranging from a single atomic spacing to the size of the material system. Here we explore approaches to control the heat transport at the atomistic length scale. For example, we have shown that exploiting the long-range chemical order, i.e., the positioning of atoms within the crystal structure, can be used to systematically suppress or enhance the thermal conduction at a range of temperatures. And we have demonstrated that introduction of an intermediate layer with average vibrational properties of the two contacts joining at an interface can enhance the interfacial thermal conduction. And by utilizing an exponentially mass-graded interface, we could increase the enhancement, primarily attributed to the strength of anharmonicity.

Keynote Talks

19th December 2021								
Forenoon					Afternoon			
	10 AM -12.30 PM (Oral Sessions)	**1 PM - 1.45 PM (Keynotes)**	**Session Chair**			**3 - 5.30 PM (Oral Sessions)**	**6 - 6.30 PM (Keynotes)**	**Session Chair**
Session 1	Energy and Environmental Systems	-	Prof. Achintya Mukhopadhyay (Jadavpur Univesity)		**Session 1**	Energy and Environmental Systems	KN15: Prof. Evelyn Wang (MIT, USA)	Prof. Ranjan Ganguly (Jadavpur Univesity)
Session 2	Energy and Environmental Systems	-	Prof. K. Srinivasa Reddy (IIT Madras)		**Session 2**	Energy and Environmental Systems	-	Prof. Dipankar Basu (IIT Guwahati)
Session 3	Computational/Numerical Methods	KN13: Prof. Arup Kumar Das (IIT Roorkee)	Prof. Ram Dayal (MNIT, Jaipur)		**Session 3**	Two-phase / Multiphase Flows	KN16: Prof. Prashant Valluri (University of Edinburgh, UK)	Prof. Shamit Bakshi (IIT Madras)
Session 4	Two-phase / Multiphase Flows	-	Prof. JananiSree Muralidharan (IIT Bombay)		**Session 4**	Fluid Mechanics	-	Prof. BSV Patnaik (IIT Madras)
Session 5	Micro / Nano-scale Fluid Flow and Heat Transfer	KN14: Prof. Ming Chang Lu (NTU, Taiwan)	Dr. Ganesh Guggilla (TU Darmstadt)		**Session 5**	Combustion	-	Prof. Anand Krishnasamy (IIT Madras)

Sunday, December 19
1 PM – 01.45 PM IST

Title: Multiscale modeling of contact line dynamics using combined Volume of Fluid- Molecular Dynamics simulation

Speaker Bio: **Prof. Arup Kumar Das** is currently working as an associate professor in the Department of Mechanical and Industrial Engineering, IIT Roorkee. He has received his MS and Ph.D. degree from Indian Institute of Technology Kharagpur in the years 2006 and 2010. He is recipient of numerous awards, which include K. N. Seetharamu Award and Medal for Young Researcher by ISHMT in 2019, young scientist award by INSA in 2015. His current research interests are focused on two-phase flows, microfluidics, biofluidic, boiling heat transfer, and numerical methods. He has authored more than 100 peer-reviewed journals and has six registered patents.

Abstract: For understanding contact line dynamics, utility and efficiency of a multiscale methodology will be discussed in this talk. A sequential combination of molecular dynamics (MD) and volume of fluid (VOF) based algorithm will be shown for study related to spreading dynamics of a nano-drop on a smooth surface. In the hybrid MD-VOF method, domain decomposition is made considering the critical physics to be captured. Region near the contact line is modelled using MD whereas the rest of the drop assumes VOF interface capturing. Use of a buffer zone between the multiscale implementation of domains helps in exchanging micro and macro level information. Hybrid model will be shown to capture translation, merging and splitting of drop(s) efficiently. In this context, electric field-based manipulation of droplet in VOF framework and Cassie-Wenzel transition of drop on structured surfaces using MD will be also discussed. Ideas behind multi-scale simulation schemes for tracking bubble nucleation and its coalescence with the neighbouring one will be also shared.

Sunday, December 19

1 PM – 01.45 PM IST

Title: Heat Transfer of Semicrystalline Polymer Nanofibers

Speaker Bio: **Prof. Ming-Chang Lu** received his Ph.D. degree in Mechanical Engineering from the University of California at Berkeley in 2010. He worked at National Chiao Tung University from 2010 to 2019. He joined National Taiwan University in August 2019. He is now a Professor of the Mechanical Engineering department at National Taiwan University. He also serves as the chairman of the Heat and Mass Transfer Society of Taiwan (HMTST). He received the International Association of Advanced Materials (IAAM) Scientist Medal in 2021. He was also awarded as a Distinguished Young Scholar by the Society of Theoretical and Applied Mechanics of the Republic of China in 2015. He also received the 2015 Ta-You Wu Memorial (Distinguished Young Scholar) Award from the Ministry of Science and Technology of Taiwan. His research focuses on investigating heat transfer in nanofibers/nanowires, and enhancing phase-change heat transfer, anti-icing and deicing, and thermal energy transfer and storage using micro/nanostructures.

Abstract: Polymers are semicrystalline materials that contain both crystalline and amorphous domains, and they are generally regarded as thermal insulators. However, studies have indicated that low-dimensional polymers exhibit a high thermal conductivity. While the enhanced heat transfer in low-dimensional polymers was mainly attributed to the increased crystallinity or the improved chain alignment, the role of the amorphous domain on heat transfer in polymers remains unclear. We investigate the heat transfers of semicrystalline nylon-6 and nylon-11 nanofibers. Large thermal conductivity values were obtained for the nylon nanofibers. The highest obtained value of thermal conductivity was 59.1 $\pm$ 3.1 W/m-K for the nanofibers. The substantial improvement for the thermal conductivity of the nylon fibers was achieved by annealing the nylon fibers at a temperature below the gamma transition temperature. A phenomenological model is conducted to elucidate the mechanism of heat transfer enhancement of the nanofibers. The improvement of thermal conductivity resulted from the reduction of the configuration disorder through the annealing process. The reduction of the configuration disorder was related to the frozen chain dynamics in the amorphous domains of the nylon nanofibers by stopping the crankshaft motion at temperatures lower than the gamma transition temperature. At a temperature lower than the gamma transition temperature, the initial space occupied by the crankshaft motion was gradually reduced and the configuration disorder of the polymer nanofibers decreased during the annealing process. The thermal conductivity of the nylon-6 nanofibers could be enhanced to 59.1 $\pm$ 3.1 W/m-K from being nearly insulated (0.27 $\pm$ 0.02 W/m-K) after annealing. This finding reveals the critical role of the amorphous domains on heat transfer and provides a way to modulate heat transfer in semicrystalline polymers.

Sunday, December 19
06.00 PM – 06.30 PM IST

Title: Nanoengineering Evaporative Devices for Energy and Water Applications

Speaker bio: **Prof. Evelyn N. Wang** is the Ford Professor Engineering and Department Head in the Mechanical Engineering Department at MIT. She received her BS from MIT, and MS and PhD from Stanford University in Mechanical Engineering. From 2006-2007, she was a postdoctoral researcher at Bell Laboratories. Her research interests include fundamental studies of micro/nanoscale heat and mass transport and the development of efficient thermal management, solar thermal energy conversion, and water harvesting systems. Her work has been honored with several awards including the 2012 ASME Bergles-Rohsenow Young Investigator Award, the 2016 ASME EPPD Women Engineer Award, the 2017 ASME Gustus L. Larson Award, and the 2020 ICNMM Prominent Researcher Award. She is an ASME Fellow.

Abstract: Liquid-vapor phase change is essential in many thermal and water applications. However, effectively utilizing these processes requires fine manipulation of heat, mass, and interfacial transport. First, we discuss kinetically limited evaporation and how to harness this regime using ultra-thin nanoporous membranes for high flux thermal management. We experimentally demonstrated the fundamental relationship between the evaporation flux and driving potential in a dimensionless form, which unifies kinetically limited evaporation under different working conditions. Building on these fundamental studies, we demonstrated a high heat flux nanoporous membrane-based thin film evaporation device. This design favors high volatility, low surface tension liquids where with pentane, heat fluxes of ~550 W/cm2 (~4x higher than that with water) were achieved. Next, we show how we leverage evaporation to develop a highly efficient passive multi-stage solar desalination device. With a ten-stage design with scalable and low-cost materials, a solar-to-vapor conversion efficiency of 385% and total production rate of 5.78 Lm-2 h-1 under one-sun illumination was demonstrated. The insights and developments presented in these works promise new opportunities for efficient thermal devices for energy conversion, storage, and transport, as well as water applications.

Sunday, December 19
06.00 PM – 06.30 PM IST

Title: Multiphase Flows Speak the Language of Instabilities!

Speaker bio: **Prof. Prashant Valluri** received his PhD (2004) in Chemical Engineering from Imperial College London. His research focuses on tackling industrially relevant multiphase flows with phase-change using bespoke numerical and theoretical techniques. These include stability analyses to understand interfacial instabilities, and DNS for combined heat-mass-momentum transport such as flows with phase change, and flows with mass-transfer and interfacial reactions. He is a Professor of Fluid Dynamics and the Chair of the UK-wide Multiphase Flows and Transport Phenomena Special Interest Group under the UK Fluids Network. As PI of ARCHER/HECToR eCSE 0804, e174 and e643 projects he led development of the ultra-fast high resolution TPLS 3.0 (Two-Phase Level-Set: https://sourceforge.net/projects/tpls/) and the GIS 1.0 (Gerris Immersed Solid Solver: https://github.com/eessmann/GISS) solvers. These solvers have been employed to gain understanding of fundamental phenomena during phase-change cooling of microelectronics. He is the Coordinator and the PI of the five-continent ThermaSMART project (funded by the European Commission) in which India is a major contributor with participation of TIFR-ICTS Bangalore along with 19 other major international participants.

Abstract: Multiphase flows in industry exhibit myriad regimes driven by instabilities ranging across spatial and temporal scales. This is largely due to the complex interplay between momentum, heat and mass transfer occurring within these flows. Citing our recent work on evaporating droplets and interfacial flows, my talk will present a three-pronged approach of direct numerical simulations, experiments and stability analysis to reveal complexities in these multiphase and multicomponent flows. Understanding these complexities is critical towards designing engineering systems such as that of cooling of microelectronics or oil-gas pipelines.

Keynote Talks

20th December 2021			
Forenoon			
	9.00 AM -9.45 M (Keynotes)	**10.15 AM - 12.30 PM (Oral session)**	**Session Chair**
Session 1	KN17: Prof. John Bischof (University of Minnesota, USA)	Energy and Environmental Systems	Prof. Pramod Kumar (IISc Bangalore)
Session 2	KN18: Prof. Ravi Prasher (UC Berkeley, USA)	Energy and Environmental Systems	Prof. Atul Shrivastava (IIT Bombay)
Session 3	-	Two-phase / Multiphase Flows	Prof. Rajneesh Bhardwaj (IIT Bombay)
Session 4	-	Fluid Mechanics	Prof. Baburaj AP (IIT Madras)
Session 5	KN19: Prof. Van P Carey (UC Berkeley, USA)	Machine Learning / AI Techniques in Heat and Fluid Flow	Prof. Balaji Srinivasan (IIT Madras)

Monday, December 20
09.00 AM – 10.00 AM IST

Title: Bioheat Transfer and Bio preservation

Speaker Bio: **Prof. Bischof** works in the area of thermal bioengineering with a focus on biopreservation, thermal therapy, and nanomedicine. His awards include the ASME Van Mow Medal and Fellowships in societies including Cryobiology, JSPS, ASME and AIMBE. He has served as the President of the Society for Cryobiology and Chair of the Bioengineering Division of the ASME. Bischof obtained a B.S. in Bioengineering from U.C. Berkeley (UCB) in 1987, an M.S. from UCB and U.C. San Francisco in 1989, and a Ph.D. in Mechanical Engineering from UCB in 1992. After a Post-doctoral Fellowship at Harvard in the Center for Engineering in Medicine, he joined the faculty of the University of Minnesota in 1993. Bischof is now a Distinguished McKnight University Professor and Kuhrmeyer Chair in the Departments of Mechanical and Biomedical Engineering, and the Medtronic-Bakken Endowed Chair, Director of the Institute for Engineering in Medicine at the University of Minnesota, and Director, of the new NSF Engineering Research Center ATP-Bio.

Abstract: This talk will introduce a new National Science Foundation Engineering Research Center (ERC) for Advanced Technologies for the Preservation of Biological Systems (ATP-Bio) that aims to “stop biological time” and radically extend the ability to bank and transport cells, aquatic embryos, tissue, skin, whole organs, microphysiological systems (“organs-on-a-chip”), and even whole organisms through a team approach to build advanced biopreservation technologies. As a part of this we will explore the use of nanoparticle heating for a new application entitled “nanowarming,” which allows both rapid and uniform rewarming of vitrified (i.e., cryopreserved) biomaterials back from the cryogenic state, thereby avoiding crystallization and cracking failures. This warming, which can range from 100s °C/min with iron oxide RF heating to 10,000,000 °C/min with laser gold warming, addresses a rewarming technology bottleneck for vitrified large (i.e., tissues and organs) and small systems (i.e., embryos and oocytes). New capabilities in cell, tissue, and rodent organ cryopreservation, including the first zebrafish embryo cryopreservation yielding live and reproducing fish, will be presented. In summary, this talk demonstrates the growing opportunities for innovative heat transfer to improve biopreservation.

Monday, December 20

09.00 AM – 10.00 AM IST

Title: Dynamic and Tunable Thermal Storage and Transport

Speaker bio: **Prof. Ravi Prasher** is the associate lab director of Energy Technology Area (ETA) at Lawrence Berkeley National Laboratory. ETA with a staff of more than 400 people conducts research in a wide variety of areas, including building technologies, energy storage, renewable energy, manufacturing science and technology, and water desalination technologies. He is also an adjunct professor in mechanical engineering at UC Berkeley. Prior to joining LBL, Ravi was the VP of product development of Sheetak Inc., a startup developing thermoelectric energy converters. Ravi earlier worked as one of the first program directors at ARPA-E. Prior to joining ARAP-E, Ravi was the technology development manager of thermal management group at Intel. Ravi has published more than 100 archival journal papers and holds more than 35 patents. He is a fellow of ASME. His research interests include applications of nano-to-macroscale thermal science and engineering in solving large scale societal problems such as GHG free energy conversion, storage and transport. Ravi obtained his B.Tech. from IIT, Delhi and Ph.D. from Arizona State University.

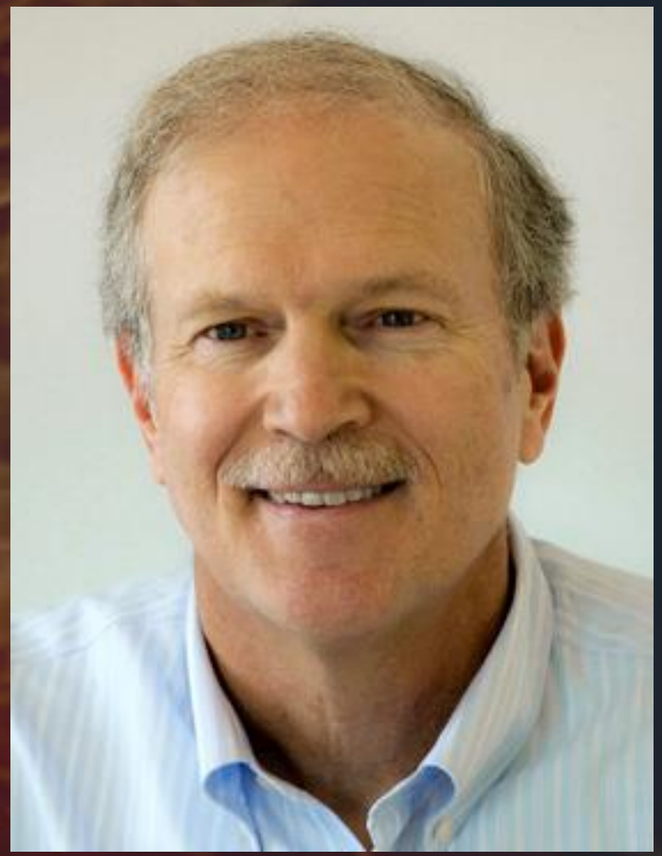
Abstract: Phase change material (PCM)-based thermal energy storage (TES) has many current and potential applications such as the heating and cooling of buildings, battery and electronics thermal management, thermal textiles, and dry cooling of power plants. In spite of such great promise, the adoption of TES has been limited, primarily due to three reasons: 1) Fixed phase change transition temperatures prevent our ability to dynamically adapt PCMs in variable ambient and use temperature applications, hence lowering their utilization. 2) A lack of precise control of heat flows over charging, hold and discharging cycles leads to suboptimal performance. 3) A lack of simple and explanatory physical models that could predict enthalpies of fusion and supercooling effects for PCMs inhibit our ability to accurately design materials and forecast TES performance.

In the first part of this seminar, the speaker will provide a broad overview of the potential impact of dynamic and tunable thermal storage and transport in the field of energy. For example, a recent paper from the Buildings Technology Office of the US Department of Energy shows that making TES perfectly tunable could increase its utilization by ~20 times, leading to dramatic reductions in levelized costs of storage (LCOS). LCOS could be further reduced by combining tunable TES with tunable transport, where nonlinear devices such as thermal switches and diodes could enable granular control of thermal transport, analogous to the electrical domain. In the second part of this seminar, the speaker will cover the latest thermophysics and technological advancements of TES and non-linear thermal transport. Topics will include analytical modeling of phase change entropy, statistical prediction of PCM supercooling as a function of thermal conductivity and size, dynamic and tunable control of phase change temperature, and effective thermal conductivities of non-linear thermal devices.

Monday, December 20

09.00 AM – 10.00 AM IST

Title: Machine Learning as a Tool to Explore and Model the Thermophysics of Heat Transfer with Phase Change



Speaker bio: **Prof. Van P. Carey**, a Professor in the Mechanical Engineering Department, holds the A. Richard Newton Chair in Engineering at the University of California at Berkeley. Carey is widely recognized for his research in the areas of micro- and nanoscale thermophysics, interfacial phenomena, and transport in liquid-vapor phase-change processes. His research interests also include development of new methods for computational modeling and simulation of energy conversion and transport processes. Carey's research has covered a variety of applications areas, including solar thermal power systems, building and vehicle air conditioning, phase-change thermal energy storage, Rankine cycle power for manned space missions, heat pipes for aerospace applications, high heat flux cooling of electronics, energy efficiency of information processing systems, and microgravity boiling. His recent research has focused on the physics of water vaporization processes on surfaces with nanoporous coatings, adaptive thermal energy storage, and use of machine learning tools in phase change heat transfer research. Carey is a Fellow of the American Society of Mechanical Engineers (ASME) and the American Association for the Advancement of Science, and he has also served as the Chair of the Heat Transfer Division of ASME. Carey has received the James Harry Potter Gold Medal in 2004 for his eminent achievement in thermodynamics and the Heat Transfer Memorial Award in the Science category (2007) from the ASME. Carey is also a three-time recipient of the Hewlett Packard Research Innovation Award for his research on electronics thermal management and energy efficiency (2008, 2009, and 2010), and Carey received the 2014 Thermophysics Award from the American Institute of Aeronautics and Astronautics.

Abstract: Development of increasingly powerful machine learning tools has provided the means for more powerful analysis of experimental data and results of computational simulations for complex physical systems. For the complex and multivariate thermophysics and transport in phase change processes, machine learning tools are particularly attractive options for analysis of data obtained experimentally or via simulation. This talk will provide an overview of some recent research studies that have applied machine learning tools to illuminate the physics of phase change processes, and/or used them to improve technologies involving phase change processes. The talk will also look in some detail at some specific examples, including boiling of aqueous water solutions, and use of phase change materials for thermal energy storage. Best strategies for using machine learning tools for analysis of phase change processes, and projections for how these tools will affect future research in this area will also be discussed.

Sunday, December 19

07.30 PM – 08.15 PM IST

Musical Event

Mr. Anil Srinivasan is an Indian pianist. Born in Chennai, India and educated at the University of Southern California and at Columbia University, New York, he is well known for his collaborative work with Carnatic vocalist Sikkil Gurucharan and for his pioneering work in music education in South India. ***Mr. Srinivasan*** was awarded ***Kalaimamani by government of Tamil Nadu*** for the year 2019. He has also been recognized with other awards including ***Rachel Morgan Prize – Best Pianist in the commonwealth*** and ***Swami Haridas Puruskar***.

Session wise schedule for Oral Presentations

17th December 2021, Forenoon (11 AM – 1.45 PM)				
Session 1: Energy and Environmental Systems			Session Chair: Prof. Dhiman Chatterjee (IIT Madras)	
Paper No	**Author(s)**	**Title**	**Affiliation**	**Time**
8	Dheeraj Chamoli, Kapil Garg and Himanshu Tyagi	Direct Contact Membrane Distillation Coupled with Solar Collector: A Numerical Study	Indian Institute of Technology Ropar	11 AM - 11.15 AM
30	Rajesh Choudhary, Aravamudan Kannan and T. Renganathan	Preparation of activated carbon from Acacia farnesiana thorn bush for adsorption of 4-Nitrophenol from aqueous solution	Indian Institute of Technology Madras	11.15 AM- 11.30 AM
33	Mithun T, Nidhish Kumar A, Rajkumar M R and Dilip D	Heat Transfer Enhancement using Multi jet Impingement System	COLLEGE OF ENGINEERING TRIVANDRUM	11.30 AM - 11.45 AM
35	Nitesh Kumar Panday and Shailendra Narayan Singh	Experimental and numerical investigation of the influence of geometrical parameters on the performance of plate heat exchangers	IIT(ISM) Dhanbad	11.45 AM - 12.00 PM
49	Pritam Das and Chandramohan V.P.	Performance improvement of truncated conical collector solar updraft tower (SUT) plant using guide vanes: Experimental study	National Institute of Technology Warangal	12.00 PM- 12.15 PM
51	Ritam Pal, Achintya Mukhopadhyay and Koushik Ghosh	An analytical study to investigate the effect of partial loss of coolant from the vicinity of nuclear fuel plate	Jadavpur University	12.15 PM - 12.30 PM
52	Aritra Jana, Ranadip Saha, Samriddha Ray, Debamita Pal, Sourav Sarkar and Achintya Mukhopadhyay	Management of Thermal Runaway in Batteries using Water Mist for Air Precooling	Jadavpur University	12.30 PM - 12.45 PM
56	Jay Prakash Bijarniya and Jahar Sarkar	CFD simulation of inside room with rooftop enveloped radiative cooler	IIT(BHU) Varanasi	12.45 PM - 1 PM
Keynote Talk 1: Prof. Gary Rosengarten (RMIT, Australia) **Title: From single droplet impingement to sprays: the effect of 'enhanced' surfaces on heat transfer**				**1 PM – 1.45 PM**

17th December 2021, Forenoon (11 AM – 1 PM)				
Session 2: Energy and Environmental Systems			Session Chair: Prof. Arul Prakash (IIT Madras)	
Paper No	**Author(s)**	**Title**	**Affiliation**	**Time**
63	Kokkula Monika, Santanu Prasad Datta, Sounak Roy, Chanchal Chakraborty, Srikanta Dinda and Satyapaul A. Singh	Numerical analysis of spiral channelled cooling plates for thermal management of pouch battery module	BITS PILANI Hyderabad campus	11 - 11.15 AM
64	Soumya V Nalluri, Preeti Suri, Swati A Patel and Raj P Chhabara	Natural convection from a confined sphere in yield stress fluids	Indian Institute of Technology Ropar	11.15 - 11.30 AM
69	Ram Deshmukh and Vaijanath Raibhole	Investigation of Heat Transfer and Fluid Flow Characteristics of Optimised Drop Shape Pin Fin Heat Sink Under Natural Convection	G H Raisoni College of Engineering and Management, MES's College of Engineering, Pune.	11.30 - 11.45 AM
72	S K Singh, S C Kaushik and S K Tyagi	Performance Investigation of Waste Heat Assisted and Evacuated Tube Collector based Solar Still	Indian Institute of Technology, Delhi	11.45 - 12.00 PM
73	Saroja Ranjan Pattanayak, Paladugu Venkaiah, Bikash Kumar Sarkar, Binayak Pattanayak and Harish Chandra Das	Modelling and control of parabolic trough field system for feed water heating application	NIT Meghalaya	12.00 - 12.15 PM
76	Mayank Kumar Gupta and Tapano Kumar Hotta	Exploration of Fractal Patterns in Cold Plate Flow Path Design to Enhance the Heat Transfer Performance of IC Chips	Vellore Institute of Technology (VIT) Vellore	12.15 - 12.30 PM
85	Vipul Vibhanshu, M R Ravi and Sangeeta Kohli	Design of Air Flow System for a Forced Draught Gasifier Cookstove	Indian Institute of Technology Delhi	12.30 - 12.45 PM
91	Lakshminarayanan Seshadri and Pramod Kumar	Study of a Waste Heat Recovery Cycle Using Super-Critical Carbon Dioxide as Working Fluid	Indian Institute of Science Bangalore	12.45 - 1 PM

17th December 2021, Forenoon (11 AM – 1.45 PM)

Session 3: Two-phase / Multiphase Flows — **Session Chair: Prof. Arup Kumar Das (IIT Roorkee)**

Paper No	Author(s)	Title	Affiliation	Time
19	Prasad Kangude and Atul Srivastava	Microscopic heat transfer mechanisms associated with single bubble based pool boiling of SiO2 water nanofluids on hydrophobic surfaces	IIT Bombay	11 - 11.15 AM
36	Soumyadip Sett, Peter Sokalski and Nenad Miljkovic	Flash Condensation for Transient Heat Dissipation	Indian Institute of Technology, Gandhinagar, University of Illinois at Urbana-Champaign	11.15 - 11.30 AM
46	Gayatri Paul, Prasanta K Das and Indranil Manna	Experimental Analysis of the Post Dryout Flow Regimes Encountered during Rewetting by Bottom Flooding using High Speed Chrono-photography	Indian Institute of Technology Kharagpur	11.30 - 11.45 AM
55	Chandan Swaroop Meena, Sanghati Roy and Arup Kumar Das	Boiling Heat Transfer Study on Curve Surfaces	CSIR-Central Building Research Institute Roorkee	11.45 - 12.00 PM
74	Niraj Sonule, Santanu Kumar Das and Amaresh Dalal	Electrocoalescence of a compound drop on a deep liquid pool under electric field	Indian Institute of Technology Guwahati	12.00 - 12.15 PM
83	Utsab Banerjee, Sachin Kumar Jain and Ashis Kumar Sen	Encapsulation of particles in aqueous ferrofluid droplets and sorting of particle encapsulated from empty droplets using a magnetic field	Indian Institute of Technology Madras	12.15 - 12.30 PM
112	Manish Bhendura, Sameer Khandekar and K Muralidhar	Estimation of Interfacial Mass Flux for Convection-induced Evaporation of Water inside a Partly-filled Enclosure	Indian Institute of Technology Kanpur	12.30 - 12.45 PM
121	Jegatheesan M, Aurabinda Swain, Soumen Kole, Prasenjit Rath and Anirban Bhattacharya	Melting and solidification of metal matrix nanocomposites during laser melting	IIT Bhubaneswar	12.45 - 1 PM
Keynote Talk 2: Prof. Peter Stephan (TU Darmstadt, Germany) **Title: Interactions between evaporative heat transfer phenomena and wetting phenomena: generic experiments and numerical simulation**				**1 – 1.45 PM**

17th December 2021, Forenoon (11 AM – 1 PM)				
Session 4: Computational/Numerical Methods			Session Chair: Prof. Amaresh Dalal (IIT Guwahati)	
Paper No	**Author(s)**	**Title**	**Affiliation**	**Time**
48	Ravibala Patil and Chandrashekhar Sewatkar	EFFECT OF THERMAL BUOYANCY ON A FLUID FLOW ACROSS SIX INLINE SQUARE HEATED CYLINDERS	College of Engineering Pune Govt. College of Engineering and Research Avasari (Kh), Pune	11 - 11.15 AM
88	Zeba Naaz, Vipul Vibhanshu, Prof. Sangeeta Kohli and Ravi M R	Comparative Assessment of Modelling Parameters for Prediction of Methane from a Downdraft Biomass Gasifier	Indian Institute of Technology Delhi	11.15 - 11.30 AM
104	Nilesh Agrawal and Dr. Seik Mansoor Ali	Numerical simulation of station blackout transients in spent fuel pool of nuclear power plants	AERB - Safety Research Institute	11.30 - 11.45 AM
151	Pradeep Gupta, Srisha Mv Rao and Pramod Kumar	Numerical Studies of a supersonic Air Ejector using Large Eddies Simulation	Indian Institute of Science	11.45 - 12.00 PM
175	Sanjoy Paul, Srisha Mv Rao and Pramod Kumar	Numerical analysis of supercritical CO2 nozzle on the ejector performance	Indian Institute of Science	12.00 - 12.15 PM
204	Bhuvaneshwar Gera, Vishnu Verma and Jayanta Chattopadhyay	Lattice Boltzmann Simulation of Oscillatory behaviour of Horizontal Vents at High Rayleigh number	RSD, BARC	12.15 - 12.30 PM
215	Subhasisa Rath	Non-Oberbeck-Boussinesq Effects in Natural Convection to Shear-Thinning Power-Law Fluids	Indian Institute of Technology Kharagpur	12.30 - 12.45 PM
230	Gloria Biswal, Subhasisa Rath and Sukanta Kumar Dash	Effect of Surface Radiation on Natural Convection Heat transfer from a Helical coil	Indian Institute of Technology Kharagpur	12.45 - 1 PM

17th December 2021, Forenoon (11 AM – 1.45 PM)

Session 5: Fluid Mechanics — **Session Chair: Prof. Kameswararao Anupindi (IIT Madras)**

Paper No	Author(s)	Title	Affiliation	Time
23	Chithramol M K, Venugopal G and Rajkumar M R	Turbulent Characteristics of Coaxial non-reacting Offset Jets	College of Engineering Trivandrum	11 - 11.15 AM
31	Adit Topiwala, Shailendra Kumar and Vinayak Kulkarni	Aerothermodynamic of Drag by Using Spike and Counter-flow Jet Techniques in Reacting Hypersonic Flows	IIT Guwahati	11.15 - 11.30 AM
40	Hrisheekesh Krishnan, Sujithkumar R, Jaivishnu K S, Aravindakshan Pillai and Lazar Chitilappilly	Lab level testing and ballistic performance analysis of a LO2/HTPB+20%Al hybrid motor configuration	Indian Space Research Organization	11.30 - 11.45 AM
45	Inzamam U. Hussain, Shailendra Kumar and Vinayak Kulkarni	Numerical Investigation of Energy Deposition based Drag Reduction Technique for Reacting Flows	Indian Institute of Technology Guwahati	11.45 - 12.00 PM
54	Anshuman Verma, Preeti Suri and Swati A Patel	Forced convection from chains of spheres	Indian Institute of Technology Ropar	12.00 - 12.15 PM
57	Keshar Kashyap, Shailendra Kumar and Vinayak Kulkarni	Effect of leading edge bluntness on the interaction of laminar boundary layer with induced shock wave	Indian Institute of Technology Guwahati	12.15 - 12.30 PM
119	Ajay Patil and Vinayak Kulkarni	Exergy Destruction and Drag Reduction for Opposing Jet Technique in Presence of Real Gas Reactions	IIT Guwahati	12.30 - 12.45 PM
134	Moon Bakaya Hazarika, Ullekh Pandey, Vanitha K., Ram Prabhu M. and Anoop P.	Studies on Ambient Temperature Variation in Launch Vehicle Compartments during Depressurization	Vikram Sarabhai Space Centre, ISRO	12.45 - 1 PM
Keynote Talk 3: Prof. Gaurav Tomar (IISc Bangalore) **Title: Dynamics of cluster of soft-membrane capsules in a channel flow**				**1 – 1.45 PM**

17th December, Afternoon (3.30 - 7.15 PM)

Session 1: Energy and Environmental Systems — **Session Chair: Prof. Sateesh Gedupudi (IIT Madras)**

Paper No	Author(s)	Title	Affiliation	Time
92	Sai Sarath Kruthiventi, Lokesh Kalapala Kalapala and Nagaraju Vellanki	Modelling and Parametric analysis of Reduction of Thermal Load inside Vehicle Cabin	koneru Lakshmaiah Education Foundation	3.30 - 3.45 PM
93	Shivam Ambekar, Prasenjit Rath and Anirban Bhattacharya	Thermal management of battery module using PCM and nanoparticle composite.	Indian Institute of Technology, Bhubaneswar	3.45 - 4 PM
96	Jibin M Joy, Amman Jakhar, Jegatheesan M, Prasenjit Rath and Anirban Bhattacharya	Three-dimensional pore scale modelling of PCM-metal foam composites for energy storage	Indian Institute of Technology Bhubaneswar	4 - 4.15 PM
99	Yogesh M. Patel, Anupam Choubey and Anil Kumar Sakhiya	A numerical and experimental based thermo-hydraulic performance analysis of a solar air heater having a forward NACA ribs roughness on the absorber plate	Indian Institute of Technology Delhi	4.15 - 4.30 PM
100	Reji Joseph, Jophy Peter, Asok Kumar N and S. Sunil Kumar	Investigation of Thermal Contact Conductance Across Pressed Bi-Metallic Aerospace Joints at Low Temperature	Liquid Propulsion Systems Centre, ISRO	4.30 - 4.45 PM
105	K. U. Aruli, K. A. Kamurudeen, Kannan Lakshminarayan and Amrit Ambirajan	Thermosyphon based thermal management of high heat flux electronics	IISc Bangalore	4.45 - 5.00 PM
107	Mayaram Sahu, Shubham Kashyap, Jahar Sarkar and Laltu Chandra	Evaluation of thermal performance of passive indirect solar water heating system using thermal oil-based hybrid nanofluids.	Indian institute of technology (BHU), Varanasi	5.00 - 5.15 PM
108	Vikash Kumar and Rashmi Rekha Sahoo	Four E's (Energetic, Exergetic, Enviro-economic) investigation of air HX assisted with various TTI using THyNF.	IIT BHU Varanasi	5.15 - 5.30 PM
Keynote Talk 4: Prof. Karen Ann Thole (Penn State University, USA) **Title: Exploring Additive Manufacturing for Cooling Channel Designs**				**6.45 – 7.15 PM**

17th December, Afternoon (3.30 - 5.30 PM)				
Session 2: Energy and Environmental Systems			Session Chair: Prof. Shaligram Tiwari (IIT Madras)	
Paper No	**Author(s)**	**Title**	**Affiliation**	**Time**
115	Vishwa Kumar, Laltu Chandra, Sudipto Mukhopadhyay and Rajiv Shekhar	Experimental Evaluation of a Pebble-bed Thermal Energy Storage for Solar Convective Furnace	Indian Institute of Technology Jodhpur	3.30 - 3.45 PM
118	G Venkata Sai Anooj, Girish Kumar Marri and Chakravarthy Balaji	Thermal performance of phase change material-based battery thermal management system with different geometries: A numerical study.	Indian Institute of Technology Madras	3.45 - 4 PM
124	Anek Pillai, Moon Bakaya Hazarika, Rishabh Goel, Harsh Prateek Gupta, Bharat K and Sreenivas N	Thermal and Hydraulic Performance Evaluation of fluid pumped space radiators with series and parallel flow paths	Indian Space Research Organisation	4 - 4.15 PM
126	Akhilesh Singh, Jahar Sarkar and Rashmi Rekha Sahoo	Heat and mass transfer characteristics of food chips in intermittent drying	Indian Institute of technology (BHU), Varanasi	4.15 - 4.30 PM
135	Hari Krishnan, Devaprabha Reji, Nevinabey Robert, Robin Pious, Sebastian Jose, Dr Rajesh Baby and Dr R Ajith Kumar	PERFORMANCE IMPROVEMENT OF SOLAR AIR HEATER USING JET IMPINGEMENT COOLING: AN EXPERIMENTAL STUDY	St. Joseph's college of Engineering and Technology, Kottayam, Kerala	4.30 - 4.45 PM
138	Milan K. Mondal, Nirmalendu Biswas, Aparesh Datta, Dipak K. Mandal and Nirmal K. Manna	Hybrid Nanofluid Based MHD Thermogravitational Convection in a Porous Cavity Heated Linearly	Department of Power Engineering, Jadavpur University, Kolkata	4.45 - 5.00 PM
139	Sumeet Kumar Dubey and Ravi Kumar K	Numerical Investigation of Thermal Energy Storage using Magnesium Nickel Hydride	Indian Institute of Technology Delhi	5.00 - 5.15 PM
140	Shubham Jain, Ravi Kumar K and Dibakar Rakshit	Thermal Performance Evaluation of Cascade Latent Heat Storage	Indian Institute of Technology Delhi	5.15 - 5.30 PM

17th December, Afternoon (3.30 - 7.15 PM)

Session 3: Measurement Techniques + Miscellaneous — **Session Chair: Prof. C Balaji (IIT Madras)**

Paper No	Author(s)	Title	Affiliation	Time
335	Rajdip Podder, Prem Kumar Badal, Gulzar Ahmed and Shine S R	An 800 node thermoregulation model for reference Indian subject.	IIST	3.30 - 3.45 PM
336	Prem Kumar Badal, Rajdip Podder, Ankith Hunagund and Shine S R	Analysis of human thermal response at transient conditions	IIST	3.45 - 4 PM
569	Gangadhara Kiran Kumar Lachireddi and Ramesh Krishnan L	Computational analysis of thermal comfort, CO2 and particle trajectory in an office room model with two different air-conditioning systems	National Institute of Technology Calicut	4 - 4.15 PM
576	Govinda Yenni, Saleem Basha, Hari Thota and Jasvanth S	An inverse estimation of thermal contact conductance of aero-space structural adhesive interface between diffuser plate and honeycomb sandwich panel	Indian Space Research Organisation	4.15 - 4.30 PM
633	Bhoopendra Pandey, Pratik N. Sheth and Yogesh K. Prajapati	Sampling and measurement of tar in the product gas of the downdraft gasifier: a case study	National Institute of Technology Uttarakhand	4.30 - 4.45 PM
688	Ila Thakur, Atul Srivastava and Shyamprasad Karagadde	Development of dual-wavelength interferometry technique for the simultaneous measurement of concentration and temperature during uni-directional solidification	IIT Bombay	4.45 - 5.00 PM
712	Sidharth Sankar Das, Anil Verma and Swarup Kumar Mahapatra	Study of Blood Flow in a Three Dimensional Bifurcated Vessel	IIT BHUBANESWAR	5.00 - 5.15 PM
714	Anish Gunjal, Gulshan Kumar, Atul Srivastava and Milind Atrey	On the tracking of freezing front during cryosurgery: Simulations and experiments with tissue-mimicking medium	IIT Bombay	5.15 - 5.30 PM
Keynote Talk 5: Prof. Atul Srivastava (IIT Bombay) **Title: Mapping the primary growth mechanisms of vapor bubble(s) and heat transfer of nano-coated surfaces of varying Wettability**				**6.45 – 7.15 PM**

17th December, Afternoon (3.30 - 5.30 PM)

Session 4: Two-phase / Multiphase Flows — **Session Chair: Prof. Rishi Raj (IIT Patna)**

Paper No	Author(s)	Title	Affiliation	Time
142	Ram Kumar Pal and Ravi Kumar K	Effect of Circumferential Grooves on Two-phase Flow in the Parabolic Trough Solar Collector	Indian Institute of Technology Delhi	3.30 - 3.45 PM
150	Arun R S and Kaushik Saha	The numerical analysis of spray formation for GDI system using dynamically coupled internal nozzle flow and ELSA spray simulation	IIT Delhi	3.45 - 4 PM
167	Rajeev Kumar Singh, Peter D. Hodgson, Niladri Sen and Subrat Das	Effect of surface roughness on water droplet's disintegration mechanism in different heat transfer regimes	Research & Development Centre for Iron & Steel, SAIL	4 - 4.15 PM
187	Abhishek Shukla and Subhra Datta	Oscillating bubbles: Nonlinear corrections to the Minnaert frequency	Department of Mechanical Engineering, Indian Institute of Technology, Delhi	4.15 - 4.30 PM
190	Kodati Srinivas, Suresh Mathew Thomas, Vasudevan R and Asraff A K	Design verification of modified outlet of a cryogenic oxidiser tank through CFD simulations	ISRO/ LPSC	4.30 - 4.45 PM
196	Laxman Kumar Malla, Praveen Dhanalakota, Pallab Sinha Mahapatra and Arvind Pattamatta	Thermal performance of a closed-loop flat plate pulsating heat pipe filled with water-based binary mixtures	Indian Institute of Technology Madras	4.45 - 5.00 PM
218	Waquar Raza, Ramesh Narayanaswamy and Krishnamurthy Muralidhar	Mathematical Modeling of Dropwise Condensation of Pure Vapor on a Horizontal Tube	Indian Institute of Technology Kanpur, School of Civil and Mechanical Engineering, Curtin University, Perth, Australia	5.00 - 5.15 PM
220	Arnov Paul and Purbarun Dhar	Morphed evaporation kinetics of sessile droplets on curved substrates	Indian Institute of Technology, Kharagpur	5.15 - 5.30 PM

17th December, Afternoon (3.30 - 7.15 PM)

Session 5: Computational/Numerical Methods — **Session Chair: Prof. Ganesh Natarajan (IIT Palakkad)**

Paper No	Author(s)	Title	Affiliation	Time
240	Vinay Kumar, Upendra Bhandarkar, Ram Kumar Singh and Atul Sharma	Cartesian Grid-based DSMC-NS Coupled Simulation Methodology for Continuum-Rarefied Gas Flows	Homi Bhabha National Institute, Mumbai and Bhabha Atomic Research Centre, Mumbai, IIT Bombay	3.30 - 3.45 PM
265	Sumeet Anand and Sumit Kumar	Thermo-fluid analysis of parabolic trough receiver using different gases	Department of Mechanical Engineering, National Institute of Technology Rourkela	3.45 - 4 PM
292	Govindha Rasu N, Sheik Ismail and Krishnaprasad V	CFD analysis of single nozzle air ejector system used in aircraft compact heat exchanger applications	VIT, Vellore, Aeronautical Development Agency, Bangalore	4 - 4.15 PM
299	R. Dheeraj and Y. Sudhakar	General pressure equation based algorithm for solving incompressible flow equations on collocated grids	Indian Institute of Technology, Goa	4.15 - 4.30 PM
307	L Sheik Ismail, V Krishna Prasad and Upendra Kumar	Fuel Sloshing Studies and Its Effects on Inverted Flight Compartment of a Typical Combat Fighter Aircraft	Aeronautical Development Agency (ADA)	4.30 - 4.45 PM
317	Muthukumar Palanisamy, Gurpreet Singh Sodhi, Tat Suraj Arun and Umapathi N	Performance Investigations of the Energy Discharge Characteristics of High-temperature Phase Change Material Capsules	Indian Institute of Technology Guwahati	4.45 - 5.00 PM
320	Megha Rajguru, Jaspal Singh, D Datta and H.P Rammohan	3D Computational Fluid Dynamics Analysis to Predict Poison Jet Growth in Moderator inside Calandria during SDS#2 actuation	NPCIL	5.00 - 5.15 PM
344	Abhirup Chaudhuri, Vinay Arya and Chirodeep Bakli	COUPLED EFFECT OF VARIABLE WETTABILITY AND BODY FORCE ON FLUID FLOW THROUGH NANOCHANNELS: A MULTISCALE APPROACH	IIT Kharagpur	5.15 - 5.30 PM
Keynote Talk 6: Prof. Marco Marengo (University of Brighton, UK) **Title: Diffuse Interface modeling coupled with Fluctuating Hydrodynamics Theory for simulation of vapour nucleation**				**6.45 – 7.15 PM**

18th December, Forenoon (10 AM - 1.45 PM)				
Session 1: Energy and Environmental Systems			**Session Chair: Prof. Shyama Prasad Das (IIT Madras)**	
Paper No	**Author(s)**	**Title**	**Affiliation**	**Time**
158	Rahul Sinha, Sunil Sunil, Ajay D Thakur and Rishi Raj	Development of an All-Season Off-the Grid Climate Control Unit for Agricultural Produce	Indian Institute of Technology Patna	10 - 10.15 AM
168	Shashikant Das, Krishan Upadhyay, Sajesh. M and Sudhakar Subudhi	Thermal sensation assessment of human body in hot and cold thermal environments	IIT Roorkee	10.15 - 10.30 AM
177	Abhishek Shukla, Roshani Singh and Rahul Dev Misra	Estimation of Ground Temperature for Installation of Earth Air Tunnel for Hot and Humid Climatic Conditions	Indian Institute of Technology, Delhi	10.30 - 10.45 AM
188	Malyadeep Bhattacharya, Shantanu Pramanik and Tanmoy Mondal	Lattice boltzmann simulation of convective heat transfer from embedded surface heaters in a laminar wall jet flow	National Institute of Technology Durgapur	10.45 - 11.00 AM
207	Somenath Gorai, Devranjan Samanta and Sarit K. Das	Numerical investigation of buoyancy-assisted and -opposed flows in the laminar regime of mixed convection through a vertical channel	Indian Institute of Technology Ropar	11 - 11.15 AM
212	Kamal Khemani, Pradeep Kumar and Ganesh Natarajan	Estimation of Thermal Load on Rocket Base Plate from Water Vapour Plume	Indian Institute of Technology Mandi	11.15 - 11.30 AM
214	Pushpanjay Kumar Singh, Shubhendu Narayan Tripathi, Ayush Kumar Shah, Santosh Kumar Sahu, Prabhat Kumar Upadhyay and Harekrishna Yadav	Numerical investigation on the flow and thermal behaviour of synthetic jet with different waveforms	Indian Institute of Technology Indore	11.30 - 11.45 AM
217	Shreesh Parvatikar, Pradeep Kumar and Santanu De	Estimation of Realistic Radiation Contribution in a Laminar hydrogen-air jet diffusion flame	Indian Institute of Technology Mandi	11.45 - 12.00 PM
227	Praveen Dhanalakota, Laxman Kumar Malla, Pallab Sinha Mahapatra and Arvind Pattamatta	Numerical modeling of the thermal performance of a two-phase flat thermosyphon	Indian Institute of Technology Madras	12.00 - 12.15 PM
229	Buchi Raju Adapa, Ananda Prasanna Revulagadda, Arvind Pattamatta and Balaji Chakravarthy	Numerical investigation on combined slot and effusion film cooling of an annular combustor liner	Indian Institute of Technology Madras	12.15 - 12.30 PM
Keynote Talk 7: Prof. Srinivasa Reddy K (IIT Madras) **Title: Integrated Renewable Energy Technologies with Energy Storage for Standalone Power Generation**				**1 – 1.45 PM**

18th December, Forenoon (10 AM - 12.30 PM)				
Session 2: Energy and Environmental Systems			**Session Chair: Prof. Arunn Narasimhan (IIT Madras)**	
Paper No	**Author(s)**	**Title**	**Affiliation**	**Time**
236	Shawon Bhattacharjee Shanto, Aparesh Datta and Sirshendu Mondal	Improved cooling system of Li-ion batteries by axial water flow through the core	National Institute of Technology	10 - 10.15 AM
242	Rajesh Akula and Balaji Chakravarthy	Characterization of PCM based heat sinks for various power surge durations and intervals: An experimental study	Indian Institute of Technology Madras	10.15 - 10.30 AM
244	Saumendra Nath Mishra, Sourav Sarkar, Aranyak Chakravarty and Achintya Mukhopadhyay	Prevention of thermal runaway propagation in Li-ion Battery Pack introducing baffles into forced air cooling system	Jadavpur University	10.30 - 10.45 AM
245	Anish Pal, Sourav Sarkar, Aranyak Chakravarty and Achintya Mukhopadhyay	Numerical simulation of natural convection in an enclosure with a pair of alternatively active heaters using OpenFOAM	Jadavpur University	10.45 - 11.00 AM
252	Alok Kumar and Suneet Singh	Parametric Analysis of Pulsating Heat Pipes for Space Applications	Indian Institute of Technology Bombay	11.00 - 11.15 AM
261	Akshita Arora, Pradeep Kumar P and Amrit Ambirajan	Sizing of Insulation Panels with a Coupled Conduction and Radiation Heat Transfer Model	Indian Institute of Space science and Technology	11.15 - 11.30 AM
262	Shammy Kumar Sah, Krishnan Murugesan and Rajasekar Elangovan	Numerical computation of time lag and decrement factor for different building wall materials	Indian Institute of Technology Roorkee	11.30 - 11.45PM
264	Monika Chouhan, Aravind G P and Deepu M	Numerical Study on Heat Transfer Characteristics in Helical Coils with Sinusoidal Wavy Walls	Indian Institute of Space Science and Technology	11.45 - 12.00 PM
270	Inderpal Singh, Atul Dhar and Parmod Kumar	Design of Compact Heat Exchanger for Channelising the Low-Temperature Waste Heat from Internal Combustion Engines using Organic Rankine Cycle	Indian Institute of Technology Mandi	12.00 - 12.15PM

18th December, Forenoon (10 AM - 1.45 PM)

Session 3: Mass Transfer + Miscellaneous — **Session Chair: Prof. Pallab Sinha Mahapatra (IIT Madras)**

Paper No	Author(s)	Title	Affiliation	Time
26	Anandu Raj, Shajal P L, Sreelal D, Yedukrishnan P S and Thettanikkal Viswanathan Harish	Mathematical Modeling of Frictional Heating in Reciprocating Sliding Conditions	College of Engineering Trivandrum	10 - 10.15 AM
95	Neil Ghosh, Anandteerth Muddapur and Srikrishna Sahu	Modelling and Simulation of Human Respiratory Droplet Transport: Cloud Evaporation Effect	IIT Madras	10.15 - 10.30 AM
97	Pavan Sharanappa Kori, Anirban Bhattacharya and Prasenjit Rath	Development of a numerical model for cell shrinkage during cryopreservation of cells	IIT Bhubaneswar	10.30 - 10.45 AM
101	Aurabinda Swain, Jegatheesan M., Soumen Kole, Prasenjit Rath and Anirban Bhattacharya	Micro-scale solidification and microsegregation during laser spot melting of binary alloys	IIT Bhubaneswar	10.45 - 11.00 AM
141	Rajeev Awasthi and Ravi Kumar K	Investigation of Temperature Polarization in Membrane Distillation with Localized Heating in Feed Channel	IIT Delhi	11 - 11.15 AM
251	Vishnuvardhan Reddy Mugi, Mulatu C. Gilago and Chandramohan V.P.	Determination of thermal properties and drying kinetics of guava slices in an indirect type solar dryer: A comparative assessment of forced and natural convection	NIT Warangal	11.15 - 11.30 AM
315	Muthukumar Palanisamy, Nayanita Kalita, Sureandhar G and Srinivasan G	Numerical analysis of drying kinetics in spherical products in a mixed mode solar dryer	IIT Guwahati	11.30 - 11.45 AM
434	Nikhil Papetla, Shyama Prasad Das, Shaligram Tiwari and Deepak Kumar Agarwal	Sloshing induced heat and mass transfer in LN2 tank	IIT Madras, LPSC, I.S.R.O.	11.45 - 12.00 PM
636	K Venkata Krishna, Neeraj Paul Manelil and M Prakash Maiya	On performance evaluation index for optimization of metal hydride based hydrogen storage devices	IIT Madras	12.00 - 12.15 PM
705	Binu T V and Sreenivas Jayanti	INFLUENCE OF INTERNAL CIRCULATION ON ABSORPTION OF ATMOSPHERIC CO2 AND SO2 IN RAIN DROP	IIT Madras	12.15 - 12.30 PM
Keynote Talk 8: Prof. Atsuki Komia (Tohuku University, Japan) **Title: Evaluation of the possibility to control mass diffusion process by a membrane with macropore patterning**				**1 – 1.45 PM**

18th December, Forenoon (10 AM - 12.30 PM)				
Session 4: Micro / Nano-scale Fluid Flow and Heat Transfer			**Session Chair: Prof. Sarith P. Sathian (IIT Madras)**	
Paper No	**Author(s)**	**Title**	**Affiliation**	**Time**
15	Gunjan Gupta and Himanshu Tyagi	Numerical Study of Methanol Steam Reformation Process in a Micro-Solar Thermal Collector for Producing Hydrogen	Indian Institute of Technology Ropar	10 - 10.15 AM
38	Niraj Kr Prasad, Amaresh Dalal and Siddhartha Sankar Ghosh	Computational study of deformation of viscoelastic (Oldroyd-B) drop flowing through microchannel with sudden constriction and expansion.	Indian Institute of Technology Guwahati	10.15 - 10.30 AM
43	Amal Nath, Lokesh Malik and Ashis Kumar Sen	Particle migration under the combined influence of relocation and acoustophoretic force in a microchannel	Indian Institute of Technology Madras	10.30 - 10.45 AM
86	Shamik Hazra, Sushanta K. Mitra and Ashis Kumar Sen	Droplet induced interfacial instability in microfluidic co-flow	Indian Institute of Technology Madras	10.45 - 11.00 AM
87	Shamik Hazra, Sushanta K. Mitra and Ashis Kumar Sen	Particle migration regimes in Shear-thinning Viscoelastic (STVE) fluids	Indian Institute of Technology Madras	11 - 11.15 AM
103	C G Jothi Prakash, Madhu Ranjan Gunjan and Rishi Raj	Bio-Inspired Honeycomb Pores as Lubricant Reservoir for Scalable and Durable Slippery Surfaces	Indian Institute of Technology PATNA	11.15 - 11.30 AM
149	Niladri Satpathi, Lokesh Malik and Ashis Sen	Droplet impact on a superhydrophilic surface surrounded by a superhydrophobic surface	Indian Institute of Technology Madras	11.30 - 11.45 AM
152	Lokesh Malik, Amal Nath and Ashis Kumar Sen	Drop trap, release and coalescence using multinodal standing wave acoustic trapping unit	Indian Institute of Technology Madras	11.45 - 12.00 PM
181	Ameeya Nayak, Vanshaj Kerni and Minakshmi Majhi	Flow characteristics and platelet adhesion of blood flow in a corrugated microchannel with the reduction and extension of shear effects.	Indian Institute of Technology Roorkee	12.00 - 12.15 PM
185	Vishal Goyal, Ajay Singh and Subhra Datta	Electro-osmosis over an arbitrarily-shaped periodic surface	Indian Institute of Technology Delhi	12.15 - 12.30 PM

18th December, Forenoon (10 AM - 1.45 PM)

Session 5: Fluid Mechanics — **Session Chair: Prof. Gaurav Tomar (IISc Bangalore)**

Paper No	Author(s)	Title	Affiliation	Time
136	Veeresha D R, Nikhil R, Chaitanya B S, Debasis Chakraborthy, Shrinivas Huilgol and Bindagi S V	Effect of change in orbital parameters on the thermal management scheme of a Nano Satellite	UR RAO SATELLITE CENTRE, ISRO, BANGALORE	10 - 10.15 AM
137	Veeresha D R, Akanksha Baggan, Abhijit Adoni, Debasis Chakraborthy, Bindagi S V and Alok Kumar Shrivastava	Thermal Control System for Magnetometer: An Instrument at the Sun-Earth Lagrange point	UR RAO SATELLITE CENTRE, ISRO, BANGALORE	10.15 - 10.30 AM
160	Vismay Kulkarni, Abhishek Singh Kashyap, Mayur Pal and Himanshu Tyagi	Numerical Analysis of a Flat Plate Solar Collector Integrated with Porous Copper Foam	Indian Institute of Technology Ropar	10.30 - 10.45 AM
180	Debarshi Debnath and Parmod Kumar	Drop impact on inclined superhydrophobic surface	Indian Institute of Technology Mandi	10.45 - 11.00 AM
192	Sharmistha Choubey, Deepak Kumar Agarwal and S Sunil Kumar	CFD Analysis of High Altitude Test Facility for Off-Design Operation	LPSC, ISRO	11 - 11.15 AM
281	Manu K Sukesan, Mihir Kaswan and Shine S R	Thermal effects on flow through micronozzles with various geometries	IIST	11.15 - 11.30 AM
295	Deepesh Vishwakarma and Narendra Gajbhiye	NUMERICAL INVESTIGATION OF LIQUID LITHIUM IN THE PRESENCE OF MAGNETIC FIELD AT DIFFERENT CONSTANT HEAT FLUX	MAULANA AZAD NATIONAL INSTITUTE OF TECHNOLOGY	11.30 - 11.45 AM
296	Arun Uniyal, Yogesh Kumar Prajapati and Lokesh Varshney	Thermal performance study of a packed bed regenerator using wire screen matrix air heater	NATIONAL INSTITUTE OF TECHNOLOGY, UTTARAKHAND	11.45 - 12.00 PM
306	L Sheik Ismail, V Krishna Prasad, C Muthu Raj and Upendra Kumar	Design and CFD Analysis of Compact Fuel Jet Pump for A Typical Combat Aircraft Fuel System applications	Aeronautical Development Agency (ADA)	12.00 - 12.15 PM
314	Mukesh Sharma, Arnab Kr. De and Krishan Chand	Extending the range of local 1/2 scaling regime in Rayleigh-Bénard convection using multi-scale random roughness	IIT Guwahati	12.15 - 12.30 PM
Keynote Talk 9: Prof. Michael Baudoin (Univ of Lille, France) **Title: Extraordinary interfacial dynamics induced by partially wetting micro particles: from inverse Saffman-Taylor instability to everlasting bubbles**				**1 – 1.45 PM**

18th December, Afternoon (3 - 8 PM)				
Session 1: Energy and Environmental Systems			**Session Chair: Prof. Himanshu Tyagi (IIT Ropar)**	
Paper No	**Author(s)**	**Title**	**Affiliation**	**Time**
273	John Geo, Philip George, Anoop P and Manokaran K	Design of parabolic heater module for high heat flux simulation through specular reflection modeling	Vikram Sarabhai Space Centre	3 - 3.15 PM
277	Akhil Sharma, Pradeep Kumar and Amrit Ambirajan	Guidelines for type and order of quadrature in discrete ordinates method for radiative transfer in plane parallel medium	Indian Institute of Space Science and Technology, Thiruvananthapuram, Indian Institute of Science, Bengaluru	3.15 - 3.30 PM
278	Nehal Jajal and Sandip Mazumder	ASSESSMENT OF A HYBRID SOLUTION APPROACH FOR THE SOLUTION OF THE RADIATIVE TRANSFER EQUATION IN COMBUSTION GASES	Ohio State University	3.30 - 3.45 PM
284	Dhruvi Patel and Purbarun Dhar	Electro-magneto-hydrodynamics of shear driven microscale flows	Indian Institute of Technology Kharagpur	3.45 - 4 PM
285	Niravkumar Parmar, Vishal Singh and Mitesh Shah	DESIGN AND EXPERIMENTAL INVESTIGATION OF LIQUID NITROGEN CRYOPOBE FOR CRYOSURGERY	A. D. Patel Institute of Technology	4 - 4.15 PM
286	Debartha Chatterjee and Sameer Khandekar	A low-cost hybrid solar simulator for longer time scales thermal applications	IIT Kanpur	4.15 - 4.30 PM
291	Vaibhav Kumar Singh, Akshay S N, Supratim Naskar and Satishchandra Wani	Electrical-thermal design of liquid cooled battery pack for electric vehicles	Cellprop pvt Ltd	4.30 - 4.45 PM
305	Mulani Feroz Osman and Deepu M	Numerical Study on Rayleigh–Bénard Convection in a Wavy Enclosure Containing CuO-Water Nanofluids	Indian Institute of Space Science and Technology	4.45 - 5.00 PM
Keynote Talk 10: Prof. Kripa Varanasi (MIT, USA) **Title: Interfacial Engineering Across Scales : A Ubiquitous Paradigm for Energy innovation**				**7.30 – 8 PM**

18th December, Afternoon (3 - 5 PM)

Session 2: Fluid Mechanics **Session Chair: Prof. Vagesh Narasimhamurthy (IIT Madras)**

Paper No	Author(s)	Title	Affiliation	Time
347	Abin Rejeesh Ad, Saurabh Unni, Upendra Bhandarkar, Shivasubramanian Gopalakrishnan and Kowsik Bodi	Two-fluid magnetohydrodynamic channel flows - Induction approximation	Indian Institute of Technology Bombay	3 - 3.15 PM
352	Chiranjeevi Phanindra B, Ashok V, Srinivasan K and Sundararajan T	Swift Optimization of Serial Radiators for Space Applications using an Approximation Technique	Indian Space Research Organization	3.15 - 3.30 PM
353	P Rijish Kumar, B Prejilkumar, K Harikumar, Sridhar Panigrahi, P Unnikrishnan Nair and N Jayan	Cavitation Performance of a Cryogenic Upper Stage Liquid Rocket Engine Pump Operating in Liquid Hydrogen	Liquid propulsion systems centre (LPSC), ISRO	3.30 - 3.45 PM
356	Susheel Kumar Sekhar, Sharmistha Choubey, Sutheesh P.M., Deepak Kumar Agarwal and T. John Tharakan	Supersonic plume interactions with transonic and hypersonic freestreams, and their impact on convective surface heating	Liquid Propulsion Systems Centre, ISRO	3.45 - 4 PM
376	Sanand T V, Harikumar K, Unnikrishnan Nair P, Jayan N, Nageswaran G and Deepak Kumar Agarwal	Observation Of Pressure Oscillations During Performance Testing Of A Rocket Engine Fuel Pump	Liquid Propulsion System Centre, ISRO	4 - 4.15 PM
383	Santanu Kumar Das and Amaresh Dalal	Three Dimensional Simulation of Droplet Impact on Liquid Pool	Indian Institute of Technology Guwahati	4.15 - 4.30 PM
386	Krishan Chand and Arnab Kr. De	Role of near-wall dynamics in roughness aided turbulent Rayleigh-Bénard convection	Indian Institute of Technology Guwahati	4.30 - 4.45 PM
411	Akhil Dass and Sateesh Gedupudi	Effect of inclination on the stability map of Coupled Natural Circulation Loop Systems	Indian Institute of Technology Madras	4.45 - 5.00 PM

18th December, Afternoon (3 - 8 PM)				
Session 3: Combustion			**Session Chair: Prof. JM Mallikarjuna (IIT Madras)**	
Paper No	**Author(s)**	**Title**	**Affiliation**	**Time**
78	Siva Kumar Bathina and Sudheer Siddapureddy	A Correlation for the Visible Flame Height of Double Pool Fires	Indian Institute of Technology Dharwad	3.00 PM - 3.15 PM
132	Akhil Ailaboina and Kaushik Saha	Numerical study of combustion and emission performance on a multi-holed gasoline direct injection engine with and without flash boiling spray	IIT Delhi	3.15 PM - 3.30 PM
155	Abhishek Sharma, Ashoke De and S. Sunil Kumar	Analysis of Self-Excited Combustion Instability in a Sub-scale Rocket Engine Using Large Eddy Simulation	Liquid Propulsion Systems Center, ISRO, Trivandrum	3.30 PM - 3.45 PM
241	Shubham Mishra, Vishnu Verma and Jayanta Chattopadhyay	Assessment of BML flamelet and EDM combustion models for turbulent premixed hydrogen combustion using FLUIDYN-MP	REACTOR SAFETY DIVISION, BARC, Mumbai	3.45 PM – 4.00 PM
310	Nandan Saha, Vishnu Verma and J Chattopadhyay	CFD Simulation of Lean Hydrogen Deflagration in Large Confined Volume of THAI Facility	BARC, Mumbai	4.00 PM - 4.15 PM
424	Kriti Raj and Chockalingam Prathap	Numerical Study on Catalyst Assisted Combustion of Premixed Oxy-Methane Mixtures in Platinum Reactor	Indian Institute of Space Science and Technology	4.15 PM - 4.30 PM
460	Thulaseedharan Krishnadath, Chokalingam Prathap, N Rajesh, Tippa Muniraja and S Senthilmurugan	Measurement of laminar flame speed of lower alkanes/oxygen enriched air mixtures at elevated pressures: Analysis using constant pressure and constant volume methods	Indian Institute of Space Science and Technology, Indian Institute of Technology, Guwahati	4.30 PM - 4.45 PM
532	Ravi Kumar and S Varun Kumar	Experimental study of gasification of wet biomass in packed bed downdraft configuration	INDIAN INSTITUTE OF TECHNOLOGY MADRAS	4.45 PM - 5.00 PM
Keynote Talk 11: Prof. Nilanjan Chakraborty (Newcastle University, UK) **Title: Direct Numerical Simulation (DNS) based analysis of premixed flame-wall interaction and heat transfer characteristics in turbulent boundary layers**				**7.30 – 8.00 PM**

18th December, Afternoon (3 - 5 PM)

Session 4: Computational/Numerical Methods **Session Chair: Prof. Atul Sharma (IIT Bombay)**

Paper No	Author(s)	Title	Affiliation	Time
364	Naman Bartwal, Somnath Roy, Shantanu Shahane and Surya Pratap Vanka	Computations of Heat Conduction in Two-Dimensional (2D) Domains Using a High-Accuracy Radial Basis Function Based Meshless Method	Indian Institute of Technology Kharagpur, University of Illinois at Urbana Champaign	3.00 PM - 3.15 PM
379	Prabhakar Bhandari, Yogesh Kumar Prajapati and Vijay Singh Bisht	Heat transfer augmentation in micro pin fin heat sink using out of plane fluid mixing	NIT UTTARAKHAND, Faculty of Technology, UTU, Dehradun	3.15 PM - 3.30 PM
385	Aditya Karanam, Bhuvaneshwar Gera, Vishnu Verma and Jayanta Chattopadhyay	Numerical Studies on Hydrogen Distribution Patterns in Nuclear Reactor Containment	Bhabha Atomic Research Centre	3.30 PM - 3.45 PM
405	Himanshu Dwivedi and Ajoy Debbarma	Numerical study of hydrodynamics and heat transfer characteristics during cooling of curve surface with water jet impingement	National Institute of Technology Hamirpur	3.45 PM – 4.00 PM
413	Shashank Terala, Sandip Mazumder, Mohsen Ehteshami, Syed Ali, Dhaval Vaishnav and Gurpreet Matharu	An Efficient Computational Model for Solidification of Water in Large Tanks	Ohio State University	4.00 PM - 4.15 PM
454	Shiva Singh and Subrata Kumar Ghosh	Single phase CFD modelling to numerically evaluate performance of compact plate heat exchanger using Al2O3-distilled water nanofluid for cooling applications.	Indian Institute of Technology (ISM) Dhanbad	4.15 PM - 4.30 PM
476	Somasekhar Reddy Dantla and Amaresh Dalal	Development of Two-phase Electrohydrodynamic Flow Solver on Unstructured Grid	IIT Guwahati	4.30 PM - 4.45 PM
479	Ajay Kumar Jaiswal, Mallikarjuna Rao P. and Pallab Sinha Mahapatra	A Novel Microchannel Based Mist Assisted Film Cooling Technique for a Flat Plate	IIT Madras	4.45 PM - 5.00 PM

18th December, Afternoon (3 - 8 PM)

Session 5: Micro / Nano-scale Fluid Flow and Heat Transfer **Session Chair: Prof. Susmita Dash (IISc Bangalore)**

Paper No	Author(s)	Title	Affiliation	Time
198	Madhusree Kole, Ram Krishna Shah and Sameer Khandekar	Heat Transfer Augmentation of Air-Ferrofluid Taylor Bubble Flow in Presence of a Magnet	Indian Institute of Technology Kanpur	3.00 PM - 3.15 PM
201	Nitesh Kumar and Dipankar Narayan Basu	Numerical Investigation on Heat Transfer Coefficient of Supercritical CO2 in a extended surface Micro Heat-sink	Indian Institute of Technology Guwahati	3.15 PM - 3.30 PM
223	Sazid Zamal Hoque, Amal Nath and Ashis Kumar Sen	Understanding the acoustic radiation forces and dynamics of a pair of equal-sized microparticles	Indian Institute of Technology Madras	3.30 PM - 3.45 PM
247	Jefin Solomon, Varun Kumar Rajendran and Karthick Subramani	Effects of thermal boundary conditions on convection flows generated by standing acoustic waves	Indian Institute of Information Technology, Design and Manufacturing, Kancheepuram	3.45 PM – 4.00 PM
259	Kiran Prakash and Sarith P Sathian	Flow-induced electrohydrodynamics in a nanochannel with finite temperature gradient	INDIAN INSTITUTE OF TECHNOLOGY MADRAS	4.00 PM - 4.15 PM
263	Abhijith Anandakrishnan and Sarith P. Sathian	Liquid structuring of confined organic coolant in nanochannels. A comparative study with water	INDIAN INSTITUTE OF TECHNOLOGY MADRAS	4.15 PM - 4.30 PM
297	Anirban Chatterjee, Ameeya Nayak and Bernhard Weigand	Electrophoretic Dispersion of power law fluid in a microcapillary	IIT Roorkee and University of Stuttgart	4.30 PM - 4.45 PM
Keynote Talk 12: Prof. Pamela M Norris (University of Virginia, USA) **Title: Designing interfaces to enhance interfacial thermal transport at the nanoscale**				**7.30 PM – 8.00 PM**

19th December, Forenoon (10 AM - 12.30 PM)				
Session 1: Energy and Environmental Systems		**Session Chair: Prof. Achintya Mukhopadhyay (Jadavpur University)**		
Paper No	**Author(s)**	**Title**	**Affiliation**	**Time**
308	Nagaraju Napa, Manish Agrawal, Bhaskar Tamma and Anirudh Reddy Bendaram	Heat transfer characteristics of electrochemical cell – A numerical study	Mahindra University	10 - 10.15 AM
309	Ullekh Pandey, Meena Balakrishnan, Kota Santosh Lakshmi, P. Anoop and B. Sundar	Thermal modelling of loop heat pipe for long duration space missions	ISRO	10.15 - 10.30 AM
319	Sunil Dodkey and Narendra Gajbhiye	Effect of pitch and tube arrangement on the thermal performance of earth-air heat exchanger – a numerical study	NIT Bhopal	10.30 - 10.45 AM
328	A Akarsh and Sumer Dirbude	Heat Transfer enhancement in a PCM-based shell-and-tube-type thermal-energy storage device with nano-particle enhancement, addition of triangular annular fins, fin pitch, and HTF flow reversal	NIT Calicut	10.45 - 11.00 AM
334	Kailash Choudhary, Chinmay Lote, Pawan Sharma, Santosh K. Sahu and Harekrishna Yadav	Investigation of Fluid Flow and Heat transfer Characteristics of Synthetic Jet Impingement at different Strouhal Number	IIT Indore	11 - 11.15 AM
340	Akula Akhil Praveen, Sharmistha Choubey, Reji Joseph and Vijayakumar G	Thermo-structural Design of a Novel AA2014 Joint between the Inter-stage of a Launch Vehicle Stage and a Liquid Oxygen Propellant Tank	LPSC, ISRO	11.15 - 11.30 AM
345	Anuj Kumar, Akash Singh, Ameya Chitre, Rohit Kothari, Vivek Saxena, Santosh Sahu and Shailesh Kundalwal	Thermal performance of PCM based heat sink with solid and hollow fins for thermal management of electronics	IIT Indore	11.30 - 11.45 AM
355	Dora Nagaraju and Udayraj	Analysis of Thermal Response of Commonly used Envelope Designs for Energy Efficient Buildings in Composite Climate of India	IIT Bhilai	11.45 - 12.00 PM
367	Vivek Saxena, Hrishav Dey, Anuj Kumar, Akhalesh Sharma, Santosh K. Sahu and Shailesh I. Kundalwal	Numerical investigation of Phase change material enhanced Li-ion battery pack using the Dual potential Multi-scale Multi-dimensional (MSMD) approach	IIT Indore	12.00 - 12.15 PM
384	G Venkatarathnam	MyCOIL – A program for the rating and optimisation of the flow path of air-cooled heat exchangers	IIT Madras	12.15 - 12.30 PM

19th December, Forenoon (10 AM - 12.30 PM)

Session 2: Energy and Environmental Systems **Session Chair: Prof. K. Srinivasa Reddy (IIT Madras)**

Paper No	Author(s)	Title	Affiliation	Time
426	Gopinath Sahu, Sameer Khandekar and Krishnamurthy Muralidhar	Comparative Analysis of Different Active and Passive Cooling Methodologies for a High-Power LED Module	IIT Kanpur	10 - 10.15 AM
428	E Ajul, E Kishor and Samarjeet Chanda	Prediction of thermal contact resistance in conforming rough metal contacts through regeneration of measured surface profile	IIT Palakkad	10.15 - 10.30 AM
429	Mahvash Afzal, Pratibha Sharma and Nandlal Gupta	Heat and Mass Transport in a Metal Hydride based Hydrogen Storage Reactor with Hexagonal Heat Transfer Enhancements	Islamic University of Science and Technology, Awantipora, IIT Bombay	10.30 - 10.45 AM
449	Vipul Choudhari, G Saravana Kumar and K Arul Prakash	Numerical analysis of Gyroid structure based cross-flow heat exchanger	IIT Madras	10.45 - 11.00 AM
450	Akshay More, Sreenivas Jayanti and K Arul Prakash	Numerical Investigation of Conjugate Heat Transfer and Thermal Stresses of Additively Manufactured Tubes in Turbulent Flow regime	IIT Madras	11 - 11.15 AM
458	Akhalesh Sharma, Rohit Kothari, Vivek Saxena, Jaykumar Joshi and Santosh Kumar Sahu	Effect of fin location on constrained melting heat transfer of phase change material in a spherical capsule: A numerical study	IIT Indore	11.15 - 11.30 AM
459	Pawan Sharma, Jaykumar Joshi, Pushpanjay K. Singh, Santosh K. Sahu and Harekrishna Yadav	Heat transfer enhancement of an impinging synthetic air jet using sharp-edged orifice	IIT Indore	11.30 - 11.45 AM
473	Keyur Kansara, Chander Veer and Shobhana Singh	Investigating Pin Fin Configurations on Automotive Exhaust Heat Exchanger Surface for Thermoelectric Generation	IIT Jodhpur	11.45 - 12.00 PM
482	Ram Kumar Maity, M Rajendrakumar and K Natesan	Reduction of thermal loading on inner vessel of a future FBR design	IGCAR	12.00 - 12.15 PM
489	Laxmikant Dhruw and Hardik Kothadia	Experimental analysis of local Nusselt number distribution over a flat plate impinged by jet of air through a circular nozzle over a larger radial distance	IIT Jodhpur	12.15 - 12.30 PM

19th December, Forenoon (10 AM – 1.45 PM)				
Session 3: Computational/Numerical Methods			**Session Chair: Prof. Ram Dayal (MNIT, Jaipur)**	
Paper No	**Author(s)**	**Title**	**Affiliation**	**Time**
483	Ram Kumar Maity, Sundararajan T and Velusamy K	A fractional time stepping template for geometric fluid advection in Volume of Fluid method	IGCAR,IITM	10 - 10.15 AM
578	Rishi Padmanabhan, Philip George, Hudedagaddi Ankita M, Anoop P and Sundar B	Thermal Analysis Package for Launch Vehicle Avionics	Vikram Sarabhai Space Center, ISRO	10.15 - 10.30 AM
588	Yadu Narendran, K. Natesan, K. Devan and A. John Arul	INVESTIGATIONS ON TOTAL INSTANTANEOUS BLOCKAGE IN A FUEL SUBASSEMBLY OF FAST REACTOR USING COUPLED THERMAL HYDRAULIC REACTOR PHYSICS MODEL	Indira Gandhi Centre for Atomic Research, Kalpakkam	10.30 - 10.45 AM
600	Shubhamshree Avishek and Sikata Samantaray	Numerical Analysis of Critical Factors Affecting the Efficacy of MA on Lungs	Institute of Technical Education and Research	10.45 - 11.00 AM
608	Nikhil Kalkote, Nived M. R. and Ashwani Assam	An Assessment of NL-LUSGS, Non-Linear Equation Solution Algorithm for Time-Accurate Marching in Compressible Flows on Hybrid-Unstructured Grid	Dassault Systems India Lab, Pune,IIT Hyderabad,IIT Patna	11 - 11.15 AM
621	Venkata Sasidhar Perakam and Maddali Ramgopal	Effect of roof insulation and cool paints on thermal comfort of a naturally ventilated building located in a hot and humid climate	IIT Kharagpur	11.15 - 11.30 AM
691	Pranit Joshi	Designing airflow return system for lighting fixtures	Signify Innovation India Ltd.	11.30 - 11.45 AM
702	Gattu Suneel, J K Gayen and K V Ravi	Influence of Electrodes Orientation on Processing Capacity of Joule Heated Ceramic Melter	DAE	11.45 - 12.00 PM
707	Sanjid C S, Janani Srree Murallidharan and Atul Sharma	Performance of Sharp-versus-Diffuse Interface-based Level Set Method on a Staggered-versus-Co-located grid	Indian Institute of Technology Bombay	12.00 - 12.15 PM
713	Animesh Patari, Shantanu Pramanik and Tanmoy Mondal	Comparison of Various RANS Models for Predicting Near-wall Flow and Heat Transfer Characteristics of a Turbulent Wall Jet	NIT Durgapur, MNNIT Allahabad	12.15 - 12.30 PM
Keynote Talk 13: Prof. Arup Kumar Das (IIT Roorkee) **Title: Multiscale modelling of contact line dynamics using combined Volume of Fluid - Molecular Dynamics simulation**				**1 – 1.45 PM**

19th December, Forenoon (10 AM - 12.30 PM)				
Session 4: Two-phase / Multiphase Flows			**Session Chair: Prof. JananiSree Muralidharan (IIT Bombay)**	
Paper No	**Author(s)**	**Title**	**Affiliation**	**Time**
235	Nimisha Srivastava and T. Jayachandran	A two-phase numerical comparison between a submerged nozzle and an external nozzle for a solid rocket motor	Indian Institute of Technology Madras	10 - 10.15 AM
249	I. Thangamani, Anu Dutta, Vishnu Verma, N.K Maheshwari and J Chattopadhyay	ANALYTICAL MODELING OF STEAM-AIR BUBBLE DYNAMICS IN SUB-COOLED WATER POOL	BARC,and Homi Bhabha National Institute, Mumbai	10.15 - 10.30 AM
271	Anant Singhal, Deepak Agarwal, Atul Srivastava and Milind Atrey	Numerical Investigation of Steam Injection in Subcooled Water with Potential Application in Semicryogenic Engine	LPSC	10.30 - 10.45 AM
280	Ankush Jaiswal and Sameer Khandekar	Heat Transfer During Drop-on-drop Impact on a Heated Superhydrophobic Substrate	IIT Kanpur	10.45 - 11.00 AM
293	Akshay Thakur and Parmod Kumar	Collision of steam bubbles in a vertical rectangular channel containing subcooled liquid	IIT Mandi	11 - 11.15 AM
300	Sachin Tom and Dr. Mangarjuna Rao P	Numerical Study of Sodium Flow Boiling Characteristics in a Narrow Tubular Channel by Developing an Eulerian-Eulerian Model	HBNI ,IGCAR, Kalpakkam	11.15 - 11.30 AM
337	Akhil Jaiswal, Venkat Raghavendra, Amrit Ambirajan, Alok Kumar Shrivastava, Pramod Kumar and Pradip Dutta	Flight Experiment of PCM coupled heat pipe aboard GSAT-29 spacecraft	URSC, ISRO, Bengaluru	11.30 - 11.45 AM
354	Venugopal Venkitesh and Susmita Dash	Enhancement of quenching heat transfer using extended surfaces	Indian Institute of Science	11.45 - 12.00 PM
358	Sharey Guleria and Parmod Kumar	Experimental analysis of direct contact condensation during vertical injection of steam on subcooled water pool	Indian Institute of Technology Mandi	12.00 - 12.15 PM
360	Santosh Kumar Panda, Basanta Kumar Rana and Parmod Kumar	Film flow and air entrainment around partially submerged rotating roller with a steady flow of air: A numerical approach	KIIT University, Bhubaneswar, Odisha	12.15 - 12.30 PM

19th December, Forenoon (10 AM - 1.45 PM)				
Session 5: Micro / Nano-scale Fluid Flow and Heat Transfer			**Session Chair: Dr. Ganesh Guggilla (TU Darmstadt)**	
Paper No	**Author(s)**	**Title**	**Affiliation**	**Time**
250	Sobin Alosious, Sridhar Kumar Kannam, Sarith P Sathian and Billy D Todd	Study of interfacial thermal resistance in boron nitride nanotube (BNNT)-water interface.	IIT Madras	10 - 10.15 AM
303	Ganesh Meshram, Sasidhar Kondaraju and Suman Chakraborty	Numerical Investigation of Wettability and its Effects on Flow through Textured Micro-channels using Lattice Boltzmann method	IIT Bhubaneswar	10.15 - 10.30 AM
324	Subhashis Patari and Pallab Sinha Mahapatra	Water imbibition through paper: barrier, evaporation, and swelling effect	IIT Madras	10.30 - 10.45 AM
326	Dheeraj K V S and Sarith P Sathian	Thermal Transport in MoS2 and 2-D Black Phosphorous	IIT Madras	10.45 - 11.00 AM
363	Arnab Lahiri, K Renji, Shannkar Narayan Y.S, Mahendar Pal Singh, Shanmuga Sundaram N and Bhanumathy Y.R	Numerical Study of Thermal Characteristics of Micro Heat Pipe: Role of Various Operating Parameters on Maximum Heat Transport Capability	U.R.Rao Satellite Centre, ISRO	11 - 11.15 AM
423	Rupresha Deb, Bhaskarjyoti Sarma and Amaresh Dalal	Magnetic-Field mediated nanoparticle laden droplet propulsion on a wire	IIT Guwahati	11.15 - 11.30 AM
452	Aswin Raveendran and Ranjith S Kumar	Numerical Investigation on Hydrodynamics of Non-parallel hydrophobic Microchannel	College of Engineering Trivandrum	11.30 - 11.45 AM
463	Apurba Roy and Purbarun Dhar.	Streaming potential modulated electro-magneto-hydrodynamics of the capillary filling of magneto-viscoelastic fluids	IIT Kharagpur	11.45 - 12.00 PM
582	Somarya Bhattacharyya, Amaresh Dalal and Ganesh Natarajan	NUMERICAL INVESTIGATIONS OF MODIFIED TESLA STRUCTURES WITH APPLICATION TO MIXING	NIT Durgapur, IITGuwahati, and IIT Palakkad	12.00 - 12.15 PM
684	Tushar Srivastava, Sasidhar Kondaraju and Santosh Kumar Jena	Droplet impact on inclined solid surfaces	IIT Bhubaneswar	12.15 - 12.30 PM
Keynote Talk 14: Prof. Ming Chang Lu (NTU, Taiwan) **Title: Heat Transfer in Semicrystalline Polymer Nanofibres**				**1 – 1.45 PM**

19th December, Afternoon (3 - 6.30 PM)				
Session 1: Energy and Environmental Systems		**Session Chair: Prof. Ranjan Ganguly (Jadavpur University)**		
Paper No	**Author(s)**	**Title**	**Affiliation**	**Time**
491	Rajeev Pandey, Manoj Kumar and J. S. Saini	Experimental Heat Transfer and Friction factor study with Correlation development for a Rectangular duct having Staggered Racetrack-shaped perforated V-up baffle blocks.	DIT University	3 - 3.15 PM
496	Prashant Srivastava and Amitesh Kumar	Comparative analysis of cryoablation in nano-phantom and normal-phantom with multihole nozzle	IIT (BHU) Varanasi	3.15 - 3.30 PM
498	Vishnu M and Arul Prakash K	Three-dimensional heat transfer and fluid flow analysis of Double forward-facing stepped channel with obstacles	IIT MADRAS	3.30 - 3.45 PM
499	Rahul Radhakrishnan, Sekarapandian Natarajan, Ashok Kannaiyan, Mehmet Karaca and Jayaraman Kandasamy	On the accuracy of RANS turbulence models to predict the influence of freestream hot gas turbulent Intensity on flat plate film cooling	VIT Vellore	3.45 - 4 PM
506	Ayaj Ahamad Ansari, Ganpat Ram, Randeep Ravesh, Pradipta Kumar Panigrahi and Malay Kumar Das	Influence of magnetic field on THF hydrate formation in the presence of Fe3O4 Nanoparticles	IIT Kanpur	4 - 4.15 PM
510	Amit Arora	Flow modifications and heat transfer augmentation due to the placement of winglet-type vortex generators in plain finned tube arrays	MNIT Jaipur	4.15 - 4.30 PM
513	Vishnu Viswanath, Deepak Agarwal, John Tharakan and Sunil Kumar	Thermodynamic response of a larger, multi-species ullage of a cryogenic propellant tank during pressurization and slosh excitations	ISRO	4.30 - 4.45 PM
519	Kalpana, Geleta Fekadu, Sajesh M and Sudhakar Subudhi	Performance analysis of a compact liquid desiccant cooling system	IIT Roorkee	4.45 - 5 PM
523	H.I. Shaikh, Sudheer Siddapureddy and S.V. Prabhu	Experimental study of local heat transfer coefficient with multiple air jet impingement on flat plate	IIT Dharwad	5 - 5.15 PM
525	Auronil Mukherjee and Supratim Saha	Effect of fillet on fluid flow and heat transfer characteristics in a grooved channel: A Numerical study	IIT Madras	5.15 - 5.30 PM
Keynote Talk 15: Prof. Evelyn Wang (MIT, USA) **Title: Nanoengineering Evaporating Devices for Energy and Water Applications**				**6 – 6.30 PM**

19th December, Afternoon (3 - 5.30 PM)				
Session 2: Energy and Environmental Systems			**Session Chair: Prof. Dipankar Basu (IIT Guwahati)**	
Paper No	**Author(s)**	**Title**	**Affiliation**	**Time**
527	Akshay Wagh, Sripriya Ramamoorthy and Shankar Krishnan	Effective Thermal Conductivity of Hollow Strut-based Periodic Cellular Solids	IIT Bombay	3 - 3.15 PM
528	Sudipta Saha, Aranyak Chakravarty, Ritabrata Saha, Achintya Mukhopadhyay and Swarnendu Sen	Impact of pulsating heating on the system dynamics of a natural circulation system	Jadavpur University	3.15 - 3.30 PM
543	Smita Sontakke, Parth Patel and Hardik Kothadia	A comparative experimental study of thermo-hydraulic performance with vortex flow generator and twisted tape insert	IIT Jodhpur	3.30 - 3.45 PM
545	Muthukumar Palanisamy and Abhishek Parida	Thermal Performance Comparisons of ECT and Helical-Coiled based Metal-Hydride Reactor	Indian Institute of Technology Guwahati	3.45 - 4 PM
556	Rony C Varghese, Anoop P and Sundar B	Thermal Study on Trimethyl Aluminum Canister Payload in Sounding Rocket	VSSC	4 - 4.15 PM
559	Aravind Vk, Akshay Rb, Vishnu K, Ali Shabeeb Kk and Mohan G	Pore scale Simulation of Cyclic Performance of Metal Hydride Hydrogen Storage Bed	Sree Chitra Thirunal College of Engineering, Thiruvananathapuram	4.15 - 4.30 PM
563	Ashok Kumar Gond, Dipankar Narayan Basu and Amaresh Dalal.	Thermalhydraulic Assessment of Supercritical CO2 filled Double-cooled Channel	IIT Guwahati	4.30 - 4.45 PM
566	Satish Kumar and Krishnan Murugesan	Effect on thermal performance ground heat exchanger in winter season when set point temperature of the room is varied hourly	IIT Roorkee Uttarakhand	4.45 - 5 PM
577	Deboprasad Talukdar and Suchismita Chatterjee	Parametric study of natural convection flow under the non-Boussinesq condition in a vertical channel with conducting side-walls	University of Hyogo, Graduate School of Information Science, Kobe, Japan	5 - 5.15 PM
595	Ram Kumar Maity, M Rajendrakumar and K Natesan	Integrated steady and transient pool thermal hydraulic analysis of primary sodium circuit	Indira Gandhi Centre for Atomic Research, Kalpakkam	5.15 - 5.30 PM

19th December, Afternoon (3 - 6.30 PM)

Session 3: Two-phase / Multiphase Flows — **Session Chair: Prof. Shamit Bakshi (IIT Madras)**

Paper No	Author(s)	Title	Affiliation	Time
361	Utsav Bhardwaj, Vikram Singh and Bahni Ray	Parametric Investigation of the Below-cloud Scavenging of Atmospheric Aerosols by Raindrops	The University of Queensland – IIT Delhi Academy of Research, IIT Delhi	3 - 3.15 PM
370	Satwik Modi and Shubhankar Chakraborty	Optimization of Hydrodynamic Performance of a Venturi Scrubber through Numerical Analysis	Indian Institute of Information Technology, Design and Manufacturing, Kancheepuram	3.15 - 3.30 PM
377	Dr Simhachala Rao Chikkala and Dr Anand A R	Bubble flow characteristics in subcooled flow boiling in microchannel heat sinks	ISRO, U.R.Rao Satellite Centre, Bangalore	3.30 - 3.45 PM
390	Jyothsna K Moorthy and Pramod Kumar	Effect of electromagnetic stirring on solidification of A356 Alloy	PES University	3.45 - 4 PM
401	Utsav Bhardwaj, Rabindra Kumar and Shyama Prasad Das	Geyser Boiling in a Pulsating Heat Pipe Unit Cell	The University of Queensland – IIT Delhi Academy of Research (UQIDAR), IIT Delhi, IIT Madras	4 - 4.15 PM
412	Ibrahim Mustefa Mohammed and Ravi Kumar	Recent Advancements in A Film-Wise Condensation Over Outside of Single Horizontal Tubes	IIT Roorkee	4.15 - 4.30 PM
417	Mohd Abdullah Khan, Prathap C., Manu K Vasudevan, V. Ratna Kishore, Vishnu Viswanath and Deepak K. Agarwal	Experimental and Numerical investigation of direct contact condensation of steam jet in stagnant subcooled water	IIST	4.30 - 4.45 PM
440	Arvind Kumar and Hardik Kothadia	Experimental Analysis of Subcooled Flow Boiling at Subatmospheric Pressure	Indian Institute of Technology Jodhpur	4.45 - 5.00 PM
447	Harshal Mahamure, Vagesh Narasimhamurthy and Lihao Zhao	Assessment of parallelization techniques for an Eulerian-Lagrangian multiphase flow algorithm	Indian Institute of Technology Madras, Tsinghua University, Beijing, China	5.00 - 5.15 PM
474	Santosh Kumar Panda, Basanta Kumar Rana and Parmod Kumar	Understanding of gas-liquid interfacial dynamics caused by horizontal rotary roller: A numerical approach	KIIT University, Bhubaneswar	5.15 - 5.30 PM
Keynote Talk 16: Prof. Prashant Valluri (University of Edinburgh, UK) **Title: Multiphase Flows Speak the Language of Instabilities!**				**6 – 6.30 PM**

19th December, Afternoon (3 - 5.30 PM)				
Session 4: Fluid Mechanics			**Session Chair: Prof. BSV Patnaik (IIT Madras)**	
Paper No	**Author(s)**	**Title**	**Affiliation**	**Time**
414	Sumanta Laha, Indranil Ghosh and Prasanta Kumar Das	Numerical Analysis of the Blood Flow Hemodynamic Through Defective Bi-Leaflet Mechanical Heart Valve by Fluid Body Interaction Model	Indian Institute of Technology Kharagpur	3 - 3.15 PM
433	Abhay Mane, Niraj Kumar, Supriya Sarkar, Anand T.N.C and Shamit Bakshi	Computational study on the effect of gas nozzle expansion configurations on the gas flow field for supersonic gas-atomization process	Indian Institute of Technology Madras	3.15 - 3.30 PM
487	Ankit Tiwari, Dr Chockalingam Prathap, S. Rambabu and Dr P. Parthasarathy	NUMERICAL INVESTIGATION OF FREE CONVECTION HEAT TRANSFER IN POROUS MEDIA	Indian Institute of Space Science and Technology, National Institute of Technology Karnataka	3.30 - 3.45 PM
494	Amrita Pathak, Jubajyoti Chutia and Vinayak Kulkarni	External and Internal Flow Analysis for Scramjet Engine	Indian Institute of Technology Guwahati	3.45 - 4 PM
497	Archana Kumari and Amitesh Kumar	Heat transfer enhancement by using turbulent wall jet with a partial wavy wall	IIT(BHU) Varanasi	4 - 4.15 PM
521	Gokul S and Vagesh D. Narasimhamurthy	Characteristics of laminar-turbulent bands in plane Couette flow	Indian Institute of Technology Madras	4.15 - 4.30 PM
526	Vinay Ram Gazula, Dinesh Sai Devarasetty and Satya Pramod Jammy	Accelerating a Hypersonic CO2 Reaction Solver	SRM University AP	4.30 - 4.45 PM
530	Niraj Kumar, Abhay Mane, Supriya Sarkar, T N C Anand and Shamit Bakshi	Numerical study of molten metal flow through the melt delivery tube during gas-atomization	IIT MADRAS	4.45 - 5.00 PM
560	Satya Pramod Jammy, Sri Kalyan Mani Deepak Gogula, Sujan Bahadur Thapa and Suchet Bahadur Thapa	Sonic Jet Injection into a Supersonic Turbulent Crossflow	SRM University AP	5.00 - 5.15 PM
568	Gaurav Sharma and Aneesh A.M.	Analysis of Hypersonic Rarefied Reactive Flow Over RAM-C II Forebody Using hy2Foam Solver	Birla Institute of Technology and Science, Pilani	5.15 - 5.30 PM

19th December, Afternoon (3 - 5.30 PM)				
Session 5: Combustion			**Session Chair: Prof. Anand Krishnasamy (IIT Madras)**	
Paper No	**Author(s)**	**Title**	**Affiliation**	**Time**
534	Yaswanthram G, Muniraja Tippa and Prathap Chockalingam	A study on data processing techniques of expanding spherical flames at constant pressure conditions.	Indian Institute of space science and technology, Indian Institute of Technology Guwahati	3 - 3.15 PM
579	V Meysiva, Manish Dhiman, Pratap Sathiah and Vagesh D Narasimhamurthy	Flame Acceleration Simulations in Gas Explosions based on Porosity/Distributed Resistance Modelling	Indian Institute of Technology Madras	3.15 - 3.30 PM
584	Krishna Kant Dwivedi, Alagani Harish, Vasudevan Raghavan and S Varunkumar	Effect of temperature on bubbling fluidized bed hydrodynamics with swirling air distributor	Indian Institute of Technology Madras	3.30 - 3.45 PM
591	N Rajesh and C Prathap	Investigation on the effects of pressure and Hydrogen addition on laminar burning velocity and flame stability of n-Dodecane-Hydrogen-air mixtures.	Indian Institute of Space Science and Technology	3.45 - 4 PM
593	Nandan Saha, Shubham Mishra, Vishnu Verma and Jayanta Chattopadhyay	Modelling Fast Hydrogen Deflagration in Partially Obstructed Acceleration Tube of ENACCEF and the Model Constant of Eddy Dissipation Model	BARC	4 - 4.15 PM
611	Anup Kundu, Mahesh Kumar Yadav, Rahul Dhamija, Divyam Kalra, Harshit Bansal, Sukhpreet Singh, Shashank Chauhan, Parvinder Kumar and Kunwar Bali	Hydrogen Leakage in a Confined Warehouse: Distribution Pattern and Identification of Explosion Locations	Punjab Engineering College, Chandigarh	4.15 - 4.30 PM

20th December, Forenoon (9 AM - 12.30 PM)				
Session 1: Energy and Environmental Systems		**Session Chair: Prof. Pramod Kumar (IISc Bangalore)**		
Paper No	**Author(s)**	**Title**	**Affiliation**	**Time**
617	Syed Jiaul Hoque, Pramod Kumar and Pradip Dutta	Concentrating Solar Powered Transcritical CO2 Power Generation Cycle for the Union Territory of Ladakh, India	Indian Institute of Science Bangalore	10.15 - 10.30 AM
618	Vikas Gaur and Dr. Surendra Kumar Singh	NUMERICAL INVESTIGATION ON MELTING AND HEAT TRANSFER CHARACTERISTICS OF PHASE CHANGE MATERIAL IN A PARALLELOGRAM ENCLOSURE	M.B.M. Engg. College, J. N. V. University, Jodhpur	10.30 - 10.45 AM
622	Prahar Sarkar, Gourab Banerjee, Pranibesh Mandal, Sourav Sarkar, Achintya Mukhopadhyay and Swarnendu Sen	COOLING CHARACTERISTICS OF AIR JET IMPINGING ON A ROTATING CIRCULAR DISK	Jadavpur University	10.45 - 11.00 AM
625	Jaykumar Joshi, Pawan Sharma, Akhalesh Sharma and Santosh Kumar Sahu	Effect of Elliptical Nozzle Geometry on a Heat Transfer Characteristics of a Concave Surface	IIT INDORE	11 - 11.15 AM
629	Venu Madhav Hanumanthugari, Sujita Srichandana Dey, Venkata Raghavendra and Pramod Kumar	CFD Simulations of a PCM coupled heat pipe with thermal enhancers	IISc Bangalore, ISRO Bangalore	11.15 - 11.30 AM
635	Bibhu Bhusan Sha, Rajiva Lochan Mohanty and Mihir Kumar Das	Thermo-hydraulics performance of isothermally heated tube composed of flat and circular surface	IIT BHUBANESWAR	11.30 - 11.45 AM
641	Juri Sonowal, Muthukumar Palanisamy and Dr. Anandalakshmi R.	Comparative Study of Different Tube Geometry of Evacuated Tube Solar Collector	IIT Guwahati	11.45 - 12.00 PM
642	Deepak Kumar, Aditya Kumar and Sudhakar Subudhi	Magnetohydrodynamic Natural Convection in an Enclosure Filled with Fe3O4/H2O Nanofluid Containing an Electronic Component	NIT Uttarakhand	12.00 - 12.15 PM
645	Pradeep Kumar Singh, Jaykumar Joshi and Santosh Kumar Sahu	Experimental investigation to identify the effect of thin metal foam on heat transfer characteristics of a heated plate	IIT INDORE	12.15- 12.30 PM
Keynote Talk 17: Prof. John Bischof (University of Minnesota, USA) **Title: Bioheat Transfer and Biopreservation**				**9 – 9.45 AM**

20th December, Forenoon (9 AM - 12.30 PM)

Session 2: Energy and Environmental Systems — **Session Chair: Prof. Atul Shrivastava (IIT Bombay)**

Paper No	Author(s)	Title	Affiliation	Time
651	Amit Arora	Effect of Geometric design of Longitudinal Vortex Generators on thermal augmentation in a fin-and-tube heat exchanger	National Institute of Technology Jaipur	10.15 - 10.30 AM
659	Sharanjit Singh, Chandan Nashine and Manmohan Pandey	A Numerical Study of Transient Characteristics of Miniature Loop Heat Pipes	Indian Institute of Technology Guwahati	10.30 - 10.45 AM
663	Chandan Mukherjee and Sudipto Mukhopadhyay	Numerical Design of an Experimental Rig for Assessment of Thermal Insulation	Indian Institute of Technology Jodhpur	10.45 - 11.00 AM
664	Avanish Anand, Rohit Kumar and Manmohan Pandey	Numerical Simulation of a Compact Miniature Parallel Channel Heat Sink for Electronic Cooling	Indian Institute of Technology Guwahati	11 - 11.15 AM
670	Disha Dewangan and Jasinta Poonam Ekka	Hybrid Power System: A Clean Renewable Energy Resource for the Development of Rural Areas in India	GGV, Bilaspur	11.15 - 11.30 AM
675	Mithun Srivan M M, Keerthi Varman H and Sri Hari Vikram T	Performance enhancement investigations in a solar parabolic trough collector using vortex generators	Anna University, Chennai, SASTRA University Thanjavur	11.30 - 11.45 AM
695	Subramanya, D W Tijare, Neeraj K Satya, Akimaradi B S, Thamizh Selvan, Santram, V Jaikumar, Tanneru Goutam and Alok Shrivatsav	Performance of passive radiant cooler of IMAGER payload through seven year designed mission life of a meteorological spacecraft	U R Rao Satellite Centre Bengaluru	11.45 - 12.00 PM
703	Govind Maurya, Suneet Singh and Lalit Kumar	Stability of Rayleigh-Benard Convection in Trapezoidal Cavities	Indian Institute of Technology Bombay	12.00 - 12.15 PM
715	Sourabh Karmarkar, Reji Joseph and Vijayakumar G	Mathematical Model of Rapid Depressurization of a High-Pressure Gas Bottle and Estimation of Residual Gas	LPSC ISRO	12.15 - 12.30 PM

Keynote Talk 18: Prof. Ravi Prasher (UC Berkeley, USA)
Title: Dynamic and Tunable Thermal Storage and Transport

9 – 9.45 AM

20th December, Forenoon (10.15 AM - 12.30 PM)				
Session 3: Two-phase / Multiphase Flows			**Session Chair: Prof. Rajneesh Bhardwaj (IIT Bombay)**	
Paper No	**Author(s)**	**Title**	**Affiliation**	**Time**
492	Chintala Anvesh, Srikanth T and Jasvanth V S	Characterization of Sintered Porous Wick for Use in Loop Heat Pipe	U.R.Rao Satellite Centre, ISRO	10.15 - 10.30 AM
508	Md Naim Hossain and Koushik Ghosh	Effect of different non-uniform heat flux profiles on thermo-hydraulic characteristics of thermosyphon	JADAVPUR UNIVERSITY	10.30 - 10.45 AM
561	Satya Pathak and Karuppanna Velusamy	A STUDY ON TWO PHASE PRESSURE DROP IN ONCE THROUGH STEAM GENERATOR USED IN SFR	HBNI,IGCAR, Kalpakkam	10.45 - 11.00 AM
639	Pravin Omprakash Sharma, Surendra Deochand Barewar, Sandesh Surendra Chougule and Deepak Rajendra Unune	Enhancing the heat transfer during pool boiling through ZnO nanofluid and Ag/ZnO Hybrid Nanofluid: An Experimental Investigation	The LNM Institute of Information Technology Jaipur, M.I.T. Academy of Engineering Pune	11 - 11.15 AM
646	Sanjeev Sajjan and Ashok Dewangan	Vapor Condensation of Iso-Butane over Plain Tube and 24 fpi finned tube placed horizontally	VCE warangal	11.15 - 11.30 AM
673	Narender Kumar, Aniket D Monde, Amit Shrivastava and Prodyut R Chakraborty	A numerical investigation of thermal behaviour of CEG/copper foam/paraffin based composite phase change material	Indian Institute of Technology Jodhpur	11.30 - 11.45 AM
704	Awad Bin Saud Alquaity	Influence of Spatter Size on Spatter Transport in an Additive Manufacturing Build Chamber	KFUPM	11.45 - 12.00 PM
716	Pravinkumar Tank, Gajendra Kumar, Arunkumar Sridharan and S V Prabhu	Experimental study of local boiling heat transfer coefficient in the uniformly spaced transverse grooved horizontal tube with R-123	Indian Institute of Technology Bombay	12.00 - 12.15 PM

20th December, Forenoon (10.15 AM - 12.30 PM)				
Session 4: Fluid Mechanics			Session Chair: Prof. Baburaj AP (IIT Madras)	
Paper No	**Author(s)**	**Title**	**Affiliation**	**Time**
592	Pradeep Jadhav and Vagesh D. Narasimhamurthy	Wake Dynamics of turbulent flow over a normal flat plate : a DNS study	Indian Institute of Technology Madras	10.15 - 10.30 AM
619	Kain Dipendrasingh, Srinivas Mvv and Arun Kumar	Study of Flow and Heat Transfer Properties for a 2D geometry of linear Gas Turbine Blade cascade at Transonic Flow Condition	Indian Institute of Technology Jodhpur	10.30 - 10.45 AM
674	Narasimha Varadhan Madhavan, Vagesh D Narasimhamurthy and Abhinav Singh	Wake dynamics of normal flat plates: effect of perforation orientation	Indian Institute of Technology Madras, GE Renewable Energy	10.45 - 11.00 AM
676	Sanjeet Kumar, Sripriya Ramamoorthy and Shankar Krishnan	Airflow study in metal foams: direct simulation and experiment	IIT Bombay	11 - 11.15 AM
679	Ks Santhosh and Dr. S. Anil Lal	Prediction of Temperature Distribution in a Hypersonic Re-entry Capsule using DSMC Method	College of Engineering Trivandrum	11.15 - 11.30 AM
680	Abhishek Singh and Parmod Kumar	Impact of droplet on superhydrophobic curved surface	Indian Institute of Technology Mandi	11.30 - 11.45 AM
692	Sree Raj V, Rutvik Solanki, Vamsi Chalamalla and Sawan Sinha	Numerical simulations and analysis of flow past vertical-axis wind turbines employing the actuator line method	Indian Institute of Technology Delhi	11.45 - 12.00 PM
693	Tanmay Agrawal, Narsing K Jha and Vamsi K Chalamalla	Towards understanding air curtain flows using RANS based numerical simulations	Indian Institute of Technology Delhi	12.00 - 12.15 PM

20th December, Forenoon (9 AM - 12.30 PM)

Session 5: Machine Learning /AI Techniques in Heat and Fluid Flow **Session Chair: Prof. Balaji Srinivasan (IIT Madras)**

Paper No	Author(s)	Title	Affiliation	Time
129	Rajat Chourasia, D. Sathyanarayanan, Abhijit Avinash Adoni, Debasis Chakraborty and S V. Bindagi	Physics Informed Neural Network: Application to spacecraft thermal modelling	Thermal Systems Group, U. R. Rao Satellite Centre, Dept. of Space, Govt. of India, Bengaluru	10.15 - 10.30 AM
131	Tonmoy Sharma, Vijay Kumar, Kumar Nishant Ranjan Sinha and Rishi Raj	Deep Learning Time-Frequency Representations of Boiling Acoustics for Accurate Prediction of Transition between Heat Transfer Regimes	Indian Institute of Technology Patna	10.30 - 10.45 AM
183	Neeraj Kavan Chakshu, Hamid Tamaddon and Perumal Nithiarasu	Deep Neural Network for solving forward and inverse problems in heat transfer	Swansea University	10.45 - 11.00 AM
205	Sushrut Ranade and Chakravarthy Balaji	Thermal parameter estimation in a two-dimensional irregular heat conducting body using the Bayesian approach	Indian Institute of Technology Madras	11 - 11.15 AM
226	Suraj Kumar and Balaji Chakravarthy	Sequential prediction of thermal conductivity, heat capacity and thermal diffusivity using Bayesian inference in high vacuum	Indian Institute of Technology Madras	11.15 - 11.30 AM
231	Tonmoy Sharma, Vijay Kumar, Kumar Nishant Ranjan Sinha and Rishi Raj	Physics Informed Deep Learning for Acoustic Detection of Departure from Nucleate Boiling	Indian Institute of Technology Patna	11.30 - 11.45 AM
255	Deepa Gupta, Probir Saha and Somnath Roy	Surrogate Modeling for Prediction of Thermal Performance of Perforated micro-pin Fins using Artificial Neural Network	Indian Institute of Technology Kharagpur	11.45 - 12.00 PM
512	Sufia Khatoon, Supreet Singh Bahga and Jyoti Phirani	Estimation of flux in a disc brake system using accelerated Bayesian inference	Indian Institute of Technology Delhi	12.00 - 12.15 PM
Keynote Talk 19: Prof. Van P Carey (UC Berkeley, USA) **Title: Machine Learning as a Tool to Explore and Model the Thermophysics of Heat Transfer with Phase Change**				**9 – 9.45 AM**

Trackwise E - Posters

Track - Combustion

Paper Number	Author(s)	Paper Title	Affiliation
90	Manish Gupta, Sangeeta Kohli and Anjan Ray	Estimation of Higher Heating Values of Biomass from Basic analysis on Dry Ash-Free Basis	INDIAN INSTITUTE OF TECHNOLOGY DELHI
170	Amit Yadav, Varghese Thannickal, Assiz Mp, John Tharakan and Sunil Kumar S	Comparative Combustion Performance of Swirl Coaxial Injectors	LPSC/ISRO
369	Prakash Ghose, Tarak Kumar Sahoo and Rishitosh Ranjan	Effect of ignition temperature at air-inlet and radiation on temporal soot growth of turbulent diffusion flame	KIIT Deemed to be University
409	Ankit Gupta, Prathap Chockalingam, Yash Asati and Vishnu Raj	Investigation of the flow field at the exit of a nozzle and annular unconfined swirl burner at the cold flow conditions using particle image velocimetry	Indian Institute of Space Science and Technology
420	Yash Asati, Akram Mohammad, Ratna Kishore Velamati and Chockalingam Prathap	Numerical Investigation on the Lewis Number Effects on the Turbulent Premixed Swirl Stabilized Propane-Air Flames	Indian Institute of Space Science and Technology
605	Muthu Saravanan S. and Dr. Mangarjuna Rao P.	Numerical Simulation of Sodium Spreading under Pool Fire Scenario in SFR Cells Using the Viscous Gravity Current Model	IGCAR
620	Nandini Dandugula and Dr. Mangarjuna Rao P.	Numerical Analysis of the Characteristics of Diesel Pool Fire in a Vented Compartment	IGCAR

Track - Computational/Numerical Methods

Paper Number	Author(s)	Paper Title	Affiliation
3	Sreejith S Pillai, Geetika Srivastava, Nithila Rai, Kumara M, Sudhir S Kamble and Radhakrishnan J K	A numerical method to optimise warm-up time of thick film platinum heaters by designing applied voltage profile	DRDO
22	Subhasisa Rath and Gloria Biswal	Entropy Generation Due to Natural Convection from a Pair of Two Tilted Square Cylinders	Indian Institute of Technology Kharagpur
24	Mayuresh Kulkarni, Lakshmi D.V.N and Satheesh A	Computational Analysis of Horizontal type Mixed Mode Forced Convective Solar Dryer	Vellore Institute of Technology, Tamilnadu.
79	Sachin Komble, Chandrashekhar Sewatkar and Govind Kulkarni	Solar Drying Characteristics of Grapes Using a Heat and Mass Transfer Based Mathematical Model.	College of Engineering Pune,Government College of Engineering and Research,Pune,Pimpri Chinchwad College of Engineering, Pune
80	Ravi Singh, Achintya Pramanick and Subhas Rana	Investigation of counter flow vortex tube with insulation and its effects on the thermal performance using a computational fluid dynamic approach	National Institute of Technology, Durgapur
162	Sumedh Soman and Dr. Siddappa Bhusnoor	Analysis of Compression Ignition Engine Performance and Emission Parameters using Simulink at different engine operating conditions	KJ Somaiya College of Engineering
184	Alok Kumar Ray, Dibakar Rakshit, Ravikumar Kandasamy. and Hal Gurgenci	A numerical investigation of charging a high temperature latent heat storage unit: A variable domain methodology	IIT Delhi
191	Koustav Bandyopadhyay and Sasmita Bal	Heat transfer enhancement in microchannel with different surface undulations	Kalinga Institute of Industrial Technology,Alliance University, Bangalore
287	Pothi Raj R, Rajasekar K and Raja B	Numerical investigation on heat transfer characteristics during spray evaporation of water	Indian Institute of Information Technology, Design and Manufacturing, Kancheepuram
289	Sarath K P and Manu K V	Three-dimensional Flow Evolution in Diverging Channel	Indian Institute of Space Science and Technology
318	Muthukumar Palanisamy, Umapathi N, Gurpreet Singh Sodhi and Tat Suraj Arun	Numerical Study on Optimization of the Discharging Characteristics of Three-PCM Cascaded Latent Heat Storage System with Non-uniform Fin Distribution	Indian Institute of Technology Guwahati

321	Megha Rajguru, Jaspal Singh, Prashant Rahatgaonkar, D Datta and H.P Rammohan	3D Computational Fluid Dynamics Analysis to Estimate Temperature Distribution of Spent Fuel Bundle during Dry Transfer Operation	NPCIL
357	Subbarao Rayapati and Hindol Banerjee	Computational investigation of nickel and chromium based super alloys as gas turbine blade materials	NITTTR,Kolkata
393	Dr Srinivasa Rao Gurrala	Variation in CFD Parameters for Afterburners with Standard V-Gutter and Modified V-Gutter	Indian Naval Academy Ezhimala
398	Vivek Praveen, Pritam Das and Chandramohan V.P.	A numerical analysis on performance enhancement of solar updraft tower plant by a fillet near the chimney base	National Institute of Technology Warangal
531	Venkatesh G, Malikarjuna Rao P and Meenakshi Reddy R	Numerical investigations of heat transfer characteristics in a wedge duct with oblong fins	G. Pulla Reddy Engineering College
539	Vikrant Chandrakar and Jnana Ranjan Senapati	Conjugate natural convection with surface radiation from a vertical hollow cylinder with a finite wall thickness	National Institute of Technology, Rourkela
630	Ashutosh Patel and Pramod Kumar	Performance analysis of an aerostatic thrust bearing	Indian Institute of Science
660	Amit Kumar Shaw and Sanjeev Soni	Lattice Boltzmann Method based computation of Tumor Size Dependent Thermal Damage during plasmonic photothermal therapy	Academy of Scientific and Innovative Research (AcSIR)

Track - Energy and environmental Systems

Paper Number	Author(s)	Paper Title	Affiliation
18	Naga Kishore Surisetty, Venkateswara Rao T. and Deva Kumar M.L.S	Heat Transfer Coefficient of Water Wall for Commercial Circulating Fluidized Bed Combustion (CFBC) boilers	JNT University Anantapur
20	Vaibhav Talandage, Ashok Pise and Avinash Waghmare	Heat Transfer Augmentation with Thermal Energy Storage System in Paraffin Wax, Using Al2O3 Nanomaterial	Government College Of engineering Karad
25	Sivasubramaniam A P, Mayilsamy K and Murugesan P	HEAT TRANSFER ENHANCEMENT OF HORIZONTAL WING CUT USING CONCENTRIC TUBE	Paavai Engineering College
37	Sanjay D. Barahate and P. A. Rajiwade	Convective Heat Transfer Enhancement by Array of Jets Impingement	K K Wagh Institute of Engineering Education and Research, Nashik, India
44	Vimal Patel, K. Bheemalingeswara Reddy, Ravi Patel and Vikram Rathod	Hydrodynamic Performance Investigation of Horizontal Axis Water Rotors	Sardar Vallabhbhai National Institute of Technology, Surat
66	Ronanki Suresh and Santanu Prasad Datta	A Real Gas Property-Based Thermodynamic Investigation of Ejector Based Refrigeration System for Automotive Applications	BITS-PILANI, HYDERABAD CAMPUS
84	Ravi Beniwal, Kapil Garg and Himanshu Tyagi	Parametric study of hybrid vapour absorption refrigeration system (VARS) with humidification-dehumidification (HDH) desalination	Indian Institute of Technology Ropar
94	Vidula Athawale, Amman Jakhar, Jegatheesan M, Prasenjit Rath and Anirban Bhattacharya	Effect of natural convection on melting characteristics of encapsulated PCM	IIT Bhubaneswar
106	Satish Upadhyay, Laltu Chandra and Jahar Sarkar	Computational Fluid Dynamics Analysis of Turbulent Hybrid-Nano-Oil Flow Through a Long Heated Tube	Indian Institute of Technology (BHU) Varanasi
110	Auritro Samanta and Samiran Samanta	Waste Heat Recovery of A Diesel Engine Exhaust by A Combined Power and Cooling System Comprising of Reheat Organic Rankine Cycle and Absorption Refrigerator	KALINGA INSTITUTE OF INDUSTRIAL TECHNOLGY, BHUBANESWAR
114	Ashrit Tayade, Sisir Sanagala and P Srinivasan	CFD Analysis of Air Cooled IC Engine Fins in the presence of an Obstruction placed upstream at Low Ambient Temperatures	Birla Institute of Technology and Science, Pilani
123	Sanjay Gaikwad and Mukund Nalawade	Numerical Investigation of Heat Transfer and Fluid Flow Characteristics in Divergent Minichannels with Water as Working Medium	Army Institute of Technology, Pune
127	Ravi Kumar, Manoj Kumar and Anil Kumar Patil	Energy efficiency of sensible energy storage system with multi-tubular passages and coil inserts	DIT University Dehradun

144	Shreyas Kotian, Nachiket Methekar, Nishant Jain, Pranit Vartak, Pritish Naik and Siddappa Bhusnoor	Theoretical Investigation of Thermo-hydraulic characteristics of Shell and Tube Heat Exchanger	KJ Somaiya College of Engineering
163	Yogita Yerne and Siddappa Bhusnoor	Thermal Performance Analysis of Wickless Heat Pipe Heat Exchanger using De-Ionized (DI) Water as Working Fluid	K J SOMAIYACOLLEGE OF ENGINEERING
179	Bhavanisankar Gosukonda and Chennu Ranganayakulu	Multi-Objective Optimization of the Vapour Cycle System of an Aircraft Environmental Control System using Exergy Analysis	Independent Consultant
197	Pranab Sutradhar, Tanuj Srivastava and Dr Dipankar Narayan Basu	Numerical study of supercritical natural circulation loop under condition of different inclination and diameter	Indian Institute of Technology Guwahati,Indian Institute of Technology, Guwahati
200	Shuvendu Shivam and Sushil Kumar Dhiman	THERMAL PERFORMANCE AND FLOW CHARACTERISTICS OF ELLIPTICAL FINNED TUBE HEAT EXCHANGER WITH NOVEL FIN DESIGN	Birla Institute of Technology, Ranchi
211	Ikhtedar Husain Rizvi and Udayraj	Estimation of Human Body Core Temperature from Measured Heart Rate using Kalman Filter Models	Indian Institute of Technology Bhilai
232	Mulatu C. Gilago, Vishnuvardhan Reddy Mugi and Chandramohan V.P.	Performance evaluation of natural and forced convection indirect type solar dryers during drying ivy gourd: An experimental study	National Institute of Technology Warangal
237	Vandana Kumari Jha and Soubhik Kumar Bhaumik	Thermal Performance Enhancement in Cross-Flow Helical Tube Heat Exchanger by Modification of Tube Cross-Section	IIT (ISM) Dhanbad
238	I Thangamani, Vishnu Verma and J Chattopadhyay	EFFECT OF INTAKE LOCATION OF CONTAINMENT FILTERED VENTING SYSTEM ON ACTIVITY TRANSPORT IN CONTAINMENT AND SOURCE TERM	Bhabha Atomic Research Centre
266	Randeep Ravesh, Ayaj Ahamad Ansari, Pradipta Kumar Panigrahi and Malay Kumar Das	Prediction of hydrate growth front using electrical resistance in a cylindrical reactor	IIT Kanpur
267	Vipin Kumar Sharma, Sunil Kumar Thamida and B. Naveen Kumar Reddy	Engineering study of water jacket system in place of spiral heat exchanger at mining and mineral ore processing industry	Indian Institute of Technology, Tirupati

274	Himanshu Dahire and Srinivasa Ramanujam Kannan	EFFECT OF MOISTURE ON CONVECTION HEAT TRANSFER THROUGH ROOFTOP SOLAR CHIMNEY	IIT Bhubaneswar
275	Himanshu Dahire and Srinivasa Ramanujam Kannan	RADIATIVE TRANSFER ANALYSIS OF ROOF-TOP SOLAR CHIMNEY BY TREATING MOIST AIR AS PARTICIPATING MEDIA	IIT Bhubaneswar
301	Soumya R. Nayak and Ashok Kumar Barik	Numerical investigation of heat transfer characteristics of a double pass solar air heater with an eccentric absorber plate	College of Engineering and Technology, Bhubaneswar-751029, India
304	Sudhir Kumar, Narendra Gajbhiye and Harshad Raghuwanshi	Thermal Performance of Square, Circular and Rectangular Earth-tube Air Heat Exchanger System - A Numerical Study	Maulana Azad National Institute of Technology Bhopal
316	Muthukumar Palanisamy, Suraj Arun Tat, Gurpreet Singh Sodhi and Umapathi N	Numerical Investigation of a Multi tube Combined Latent and Sensible Heat Thermal Storage System	Indian Institute of Technology Guwahati
339	Tanuj Singh, Ravi Beniwal, Kapil Garg and Himanshu Tyagi	Thermodynamics Analysis of an Atmospheric Water Harvesting System	Indian Institute of Technology Ropar
342	Susheel Bhandari, Deepak Pal and Govind Verma	Experimental studies on thermal performance evaluation of hybrid solar cooker using phase change materials and PV technology	G.B.Pant University of Ag. and Technology
368	Nitin Bagre, Ashok D. Parekh and Vimal K. Patel	A numerical analysis on the influence of various working fluids over the thermal performance of the vortex tube	Sardar Vallabhbhai National Institute of Technology, Surat
371	Danvendra Singh, Mohammed Asfer, Obaied Mussad, Turkey Al Otaibi, Mohammad T Haweel, Om Prakash and Balkrishna Mehta	Electrical Power output enhancement of Photovoltaic cells using ferrofluid based cooling	National institute of technology Patna,Shaqra University, KSA
381	Ritwik Mandal	ASSESSMENT OF SHUTDOWN SYSTEMS' PERFORMANCE DURING POSTULATED LBLOCA FOR 700MWE PHWRS	Nuclear Power Corporation of India Limited
388	Chandrapal Singh Rajpoot, Bhaskar Ranjan Tamuli, Sujit Nath and Dipankar Bhanja	Heat Source Conditions and PCM Chamber Orientation Effect on the Performance of A Latent Heat Thermal Energy Storage System	NIT Silchar
397	Dr.Prashant W. Deshmukh, Vijaykumar Suryawanshi, Anuja Sonawane, Siddhant Sinhasane and Prajakta Sonawane	Numerical study of Heat Transfer Characteristics of an Impinging Synthetic Jet	College of Engineering, Pune
406	Vivek Mishra, Saroj Panda, Biswanath Sen, M.P. Maiya and B.P.C. Rao	Heat transfer analysis of air-cooled nuclear fuel storage vault	Fast Reactor Fuel Cycle Facility, IGCAR, Kalpakkam
422	Hari Krishnan, Rajesh Baby and S Ajith Kumar	INVESTIGATIONS ON THE EFFECT OF CHANNEL'S SPAN WISE ASPECT RATIO ON THE HEAT TRANSFER CHARACTERISTICS OF AN UPWARD SOLAR AIR HEATER	St. Joseph's college of Engineering and Technology, Kottayam, Kerala

431	Madri Venus, J Ramarajan and S Jayavel	Heat transfer enhancement using jet impingement with attachments on the target surface	Indian Institute of Information Technology, Design and Manufacturing, Kancheepuram
448	Shankar Durgam, Pranav Ingle and Shashank Gupta	NUMERICAL INVESTIGATION ON THERMAL BEHAVIOUR OF LITHIUM-ION CELL IN DIFFERENT FLUID MATERIALS	College of Engineering Pune
453	Someshwar Bhakre, Pravin Sawarkar, Vilas Kalamkar and Tushar Umate	Numerical analysis of photovoltaic panel integrated with PCM and water container	Visvesvaraya National Institute of Technology, Nagpur
464	Tina Thomas, Naga Satya Padmaja and Chaithanya Murthy	THERMAL DESIGN AND ANALYSIS OF CONICAL SCANNING EARTH SENSOR FOR POLAR SUN SYNCHRONOUS SATELLITE.	URSC, ISRO
469	Rutuja Bilaskar, Shankar Krishnan and Sripriya Ramamoorthy	Experimental and Numerical Investigation of a Piezoelectric Air-Mover System for Electronics Cooling	Indian Institute of Technology Bombay
481	Anil Kumar, Amman Jakhar, Rajesh Nandal and Rajkumar Duhan	Thermal Performance of Different Types of CuO hybrid nanofluids for a plate type heat exchanger	Chaudhary Devi Lal state institute of engineering and technology, Sirsa,GL Solutions,Department of Mechanical Engineering, MDU
485	Shankar Krishnan and Parth Solanki	OPTIMIZATION OF THERMOELECTRIC MODULE ASSISTED SELF-HEAT RECUPERATORS	IIT Bombay
486	Dheeraj Kumar and Amaresh Dalal	Heat Transfer Analysis of Finned Tube Heat Exchanger with Non-Newtonian fluid and Longitudinal Vortex Generator	Indian Institute of Technology, Guwahati
507	Vageesh Shukla, Nrependra Kumar and Manoj Kansal	Methodology for Estimation of Source Term Release from Fuel during Severe Accidents in Pressurised Heavy Water Reactors	NPCIL

535	Abhisek Ganguly, Shantanu Pramanik, Orkodip Mookherjee and Sayantan Sengupta	On the Critical Heat Flow Features of Submerged, Low Reynolds Number Jets Impinging on a Protruded Heat Source	National Institute of Technology, Durgapur
544	Jishnu M and Arul Prakash K	Effect of suction/blowing on the heat transfer and fluid flow characteristics past rectangular cylinder with fillet at low Reynolds number	INDIAN INSTITUTE OF TECHNOLOGY MADRAS
546	Vivek Mathew Jose, Dr. Shijo Thomas and Dr. Biju T Kuzhiveli	Effect of cross flow on the heat transfer characteristics of steady jets	NIT Calicut
555	Karthikeyan B, Saravanan R and Praveen Kumar G	Energy and Exergy Analysis of Natural Refrigerant Pair in a Cascade System for Combined Cooling and Heating Application	CO2 Research and Green Technologies Centre, Vellore Institute of Technology, Vellore 632014, India
570	Shankar Durgam, Ajinkya Bhosale and Vivek Bhosale	HEAT FLUX OPTIMIZATION FOR HEAT SOURCES ON CONDUCTIVE SUBSTRATES FOR HEAT TRANSFER ENHANCEMENT	College of Engineering Pune
572	Gangadhara Kiran Kumar Lachireddi and Bakhirathan Asokan	An Analytical and Experimental Investigation on Natural Convection in a Mini-channel Cylindrical Heat Sink for COB LED Application	National Institute of Technology Calicut,National Institute of Technology - Calicut
580	Akshobhya Aeri, Prerak P Bharadwaj, Suhas S, Varun N Rao and Babu Rao Ponangi	Generation of Design Data for Offset Fins in Compact Heat Exchangers for Aerospace Applications	PES University
583	Anwesha Das, Shirsa Nandy, Shinjini Das, Nirmalendu Biswas and Nirmal K. Manna	Magnetohydrodynamic Convection in a Grooved Channel Embedded with a Conducting Cylinder	Jadavpur University
585	Gudla Babji and Pujari Dr. Arun Kumar	Effects of internal rib geometry on film cooling performance	Indian institute of petroleum and energy, visakhapatnam
589	Ronakkumar Patel, Vishal Singh and Mitesh Shah	EXPERIMENTAL AND NUMERICAL STUDIES ON 3D PRINTED STACK FOR STANDING WAVE THERMOACOUSTIC REFRIGERATOR	A. D. Patel Institute of Technology
594	Sukruth Rajesh, Mridu Sai Charan A S, Prashanth Murali and Jyothiprakash K H	Generation of Design Data for Wavy Fins used in Compact Heat Exchangers for Aerospace Applications	PES University
597	Unnikrishnan K S, Charles Divyateja B and Rohinikumar B	Modelling and Numerical Simulation of Nano-enhanced Finned PV-PCM System	NIT Calicut, Kerala
615	Biju J Koshy, Mohan G and Prakash Maiya	Numerical Simulation of Hydrogen Transport in Metal Hydride Based Coupled Beds	Sree Chitra Thirunal College of Engineering, Thiruvananathapuram
623	Tina Thomas, Dhananjay Tijare, Raghavendra Kumar and Arjun Dey	A Modular Thermal Design for Battery in Small Satellites	URSC, ISRO
628	Abhishek Kundu, Anupam Sinha, Gautam Biswas and Murugan Thangadurai	Heat transfer enhancement using rectangular-winglet-type vortex- generators on the annular fins	Motilal Nehru National Institute of Technology, Allahabad

634	Gadi Udaybhanu, Rajalingam A and Shubhankar Chakraborty	Computational investigation of the thermohydraulic performance of a flexible heat pipe for various bending angle, filling ratios and materials	Indian Institute of Information Technology Design and Manufacturing Kancheepuram
647	Shankar Durgam, Priyanka Datir, Dipak Savant and Ganesh Tapkir	Performance analysis of phase change material to reduce the thermal losses in Lithium-ion Batteries	College of Engineering Pune
653	Arjun Venugopal, Dr. Jacob T Varghese and Basil George Thomas	Numerical Study on Heat Transfer through Modified Rectangular Fins using ANSYS Fluent	Saintgits College of Engineering (Autonomous), Kottayam, Kerala, India.
657	Shankar Durgam, Mohan Khond, Ajinkya Bhosale and Vivek Bhosale	Prediction of limiting conditions for passive cooling of heated blocks in a vertictal channel: A computational investigation	College of Engineering Pune
667	Shubhanshu Rai and Shobhana Singh	Numerical investigation of turbulent heat transfer enhancement in partially corrugated tube using water based nanofluid	IIT Jodhpur
671	Bhuwanesh Kumar, Ravi Kumar and Akhilesh Gupta	Effect of initial surface temperature on rewetting of a hot circular tube during air atomized spray cooling	I.I.T. ROORKEE
694	Dr.Prashant Deshmukh, Dr.Subhash Lahane and Dr.Satyajit Kasar	Heat Transfer and Friction Factor Characteristics of Turbulent Flow through a Circular Tube fitted with Square Ribs	COLLEGE OF ENGINEERING, PUNE
699	Jangyadatta Pasa and Venugopal Arumuru	Impingement Heat Transfer Enhancement by Synthetic Jet Array	Indian Institute of Technology Bhubaneswar
710	Jitendra Singh Pal, Sapali Shivalingappa Nagappa, T. R. Anil and Shikalgar Niyaj Dilavar	Assessment of Exergy Loss Rate in Marine Boiler to Analyse the Performance of Waste Heat Plant by the Exergy Method	Tolani Maritime Institute
717	Pankaj Srivastava, Nitin Agrawal, Ruma Dhaka and Jugal Kishore Bajpai	Design of Heat Spreader and Heat Sink for Electronic Packaging	DRDO
719	Ashkan Bagherzadeh and Masoud Darbandi	A Numerical Study on Effect of Rib Shape on Cooling Performance in a Square Channel	Sharif University of Technology

Track - Fluid Mechanics

Paper Number	Author(s)	Paper Title	Affiliation
7	Vineeth V K and Devendra Kumar Patel	Comparison of wake characteristics behind a custom designed airfoil performing different types of flapping oscillations	Vellore Institute of Technology, Vellore, Tamil Nadu
12	Vijaya Kumara V M, Aswatha M and K N Seetharamu	Natural Convection in a Porous Trapezoidal Enclosure with Non-uniform Heating	Bangalore Institute of Technology
16	Pavan Kumar Yadav and Subhankar Sen	Effect of mass ratio on the response of an upstream truncated circular cylinder	IIT ISM Dhanbad
41	Anand Raj Hariharan	Numerical investigation of transverse injection into a supersonic crossflow through different injector geometries at different dynamic pressure ratios	ASIET
47	Hidam Nganthoiba Singh, Shailendra Kumar and Vinayak Kulkarni	On Drag and Heat flux by Integration of Cavity and Counter-jet in Reacting Non-equilibrium Flows	Indian Institute of Technology, Guwahati
75	Vivek S and Amaresh Dalal	Three-Dimensional Simulations of Bubble Rise in a Sinusoidal Channel	Indian Institute of Technology, Guwahati
113	Raghvendra Dwivedi, Vandana Jain and Krishnamurthy Muralidhar	Simulation of spreading of a water droplet on a partially wetted substrate at a low Weber number using an improved contact angle model	IIT Kanpur
172	B Venkatshivaram Jadav, Amit Kumar Singh, Vidya G, Patil M.M and Ashok V	Numerical analysis of re-entry module - Apex cover separation aerodynamics at subsonic Mach number	VSSC,ISRO
174	Amit Singh, Ankur Nagpal and Vidya G	Windward Centreline laminar heating rates of Space Shuttle orbiter configuration at STS-2 flight re-entry condition and its comparison with flight data	VSSC/ISRO
222	Varun Hassija and Suneet Singh	Transient Analysis of a Parallel Channel Single Phase Natural Circulation Loop	Department of Energy Science and Engineering, IIT Bombay
224	Dibyendu Ghosh, Saikat Datta and Prasanta Kumar Das	Nanobubble Formation in a Viscous Liquid due to Rotation of a Nanoparticle - a Molecular Dynamics Study	Indian Institute of Technology, Kharagpur
276	Saddam Hossain Mullick, Debabrata Dasgupta and Pranab Kumar Kundu	Influence of central angle on buoyancy driven thermal flow behaviours inside a circular porous enclosure heating from below	MNNIT Allahabad
294	Manu K Sukesan and Shine S R	Plume interaction study on a cluster of heated Micronozzles	IIST
325	Fahd Bin Abdul Hasis, Abilash P. M., Paul P. George, Jayan N., Nageswaran G. and M. S. Suresh	Experimental study of lift-off dynamic seal for LOX-kerosene engine	Liquid Propulsion Systems Centre, ISRO

372	Surendra Singh Rathore, Balkrishna Mehta, Pradeep Kumar and Asfer Mohammad	Effect of Oblique Porous Plugs on the Pressure Drop and Heat Transfer in the Partially Porous Channel	Indian Institute of Technology Bhilai
375	Ribhu Pal and Prince Raj Lawrence Raj	Numerical Studies of Shock-Wave/Boundary-Layer Interaction over Blunted Cone/Flare at Hypervelocity Speed	IIEST, Shibpur.
387	Shantanu Dutta, Sukumar Pati and Koushik Ghosh	Effects of Thermal boundary conditions in a Porous enclosure with Gambrel roofing-A numerical study	Elitte college of Engineering, Kolkata,NIT Silchar,Jadavpur university
475	Kiran Mohan, Vishak Sasidharan, Nandakumar V and Suresh Kumar C	Comparative Study on the Suitability of Liquid Rocket Propellants for use in Electric Pump Fed Rocket Upper Stages	LPSC/ISRO
495	Sarvesh Kumar and Amitesh Kumar	Effect of sidewall on heat transfer characteristics of a three dimensional wall jet	IIT(BHU) Varanasi
500	A J Sharjad, B S Bijo and S Kumar Ranjith	NUMERICAL STUDY ON THE EFFECT OF MULTIPLE INJECTORS ON THRUST VECTORING PERFORMANCE OF A CONVERGENT-DIVERGENT NOZZLE	College of Engineering Trivandrum
511	Vivek Saxena, Rohit Kothari, Santosh K. Sahu and Shailesh I. Kundalwal	An analytical approach for predicting the effective thermal conductivity of coated metal foam infiltrated with phase change material	Indian Institute of Technology Indore
517	Aranyak Chakravarty, Swarnendu Sen and Achintya Mukhopadhyay	Computational prediction of pressure drop during incompressible flow across porous screens	Jadavpur University
574	Madhu Aneja and Sapna Sharma	Heat and Mass Transfer in a Localized Heated Porous Cavity to Casson Fluid	Thapar Institute of engineering and technology, Patiala
601	Rajvinder Kaur, Sapna Sharma and Avinash Chandra	Forced convection heat transfer from a semi-circular permeable cylinder to air	Thapar Institute of Engineering and Technology, Patiala
610	Debabrat Biswal, Bahni Ray and Debabrata Dasgupta	Stability of charged and uncharged pendant droplet at tip of different size needles	Indian Institute of Technology Delhi
643	Akshat Patel, Surendra Sisodia, Vivek Singh, Prasanta Das, Rakesh Bhavsar and Vikas Lakhera	Thermal Simulations of Thermoelectric Coolers	Space Applications Centre, Ahmedabad, Gujarat, India
685	Thirumoorthy M, Ravi M R and Sangeeta Kohli	Cookstove Testing: Effect of Suction Pressure of Emission Hood on the Cookstove - an Analytical Study	Indian Institute of Technology Delhi

Track - Machine Learning AI Techniques in Heat and Fluid Flow

Paper Number	Author(s)	Paper Title	Affiliation
81	Vishal Bhagwat, Dhanapal Kamble, Parshuram Chitragar and Akshay Jadhav	Predicting Interfacial Heat Transfer Coefficient in CO2-Mould Sand Casting of Steel Using Machine Learning Algorithms	Vidya Pratishthan's Kamalnayan Bajaj Institute of Engineering and Technology Baramati, Pune
210	Prabhav B Shukla, Manoj Mydur, Subhash Nayak and V Krishna	Design Optimization of Ejectors Using ANN and GA	PES University
228	Vijay Kumar, Kumar Nishant Ranjan Sinha, Tonmoy Sharma and Rishi Raj	Acoustic Detection of Departure from Nucleate Boiling as a Precursor to the Critical Heat Flux	Indian Institute of Technology Patna
248	Dinesh Reddy Koppula and Konda Reddy Bogala	An inverse method to estimate temperature-dependent viscosity of a liquid	RGUKT
467	Narasimhan Sankar, J Ramarajan and S Jayavel	Prediction of wind turbine performance using machine learning technique	Indian Institute of Information Technology Design and Manufacturing, Kancheepuram
604	Gaurav Kumar and Abhishek Raj	Artificial Neural Network aided prediction of the biophysical Properties of Cells utilizing constriction based microchannels	Indian Institute of Technology Patna, Bihar, India

Track - Mass Transfer

Paper Number	Author(s)	Paper Title	Affiliation
60	Geo Sebastian and Shijo Thomas	Spectrally selective multi-functional floating absorber with heat localization, 2-D water transport and improved evaporation potential for enhanced freshwater productivity	National Institute of Technology Calicut
689	Nitesh Kumar, Johnty Ryan, Neeraj Paul Manelil, M Prakash Maiya and Durga Das	Effect of airflow rate on water production from desiccant solar still	Indian Institute of Technology Madras

Track - Measurement Techniques

Paper Number	Author(s)	Paper Title	Affiliation
403	Vimal Kishor, Atul Belekar, Suneet Singh and Atul Srivastava	Simultaneous Mapping of Temperature and Velocity Fields Using Thermographic PIV Technique	IIT Bombay
461	Arpana Prasad and Jasvanth V.S.	Experimental setup to measure thermal diffusivity of solid rod sample using Ångström method at different temperatures	U R Rao Satellite Centre (URSC),Indian Space Research Organization (ISRO)
477	Dr. K.R. Aharwal and Yogendra Rathor	Experimental analysis on performance of solar air heater combined with staggered element in inclined rib using liquid crystal thermography technique	MANIT BHOPAL
602	Nandakumar R, Amzad Pasha and Partha Sarathy U	Effect of thermocouple for sodium leak detection for an annular plenum in heat exchanger	Indira Gandhi Centre for Atomic Research
696	Subramanya and Tanneru Goutam	Experimental Evaluation and Characterisation of PID Controller for Spacecraft Thermal Testing	U R Rao Satellite Centre

Track - Micro/Nano scale Fluid and Heat Transfer

Paper Number	Author(s)	Paper Title	Affiliation
89	Tumuluri Kanthimathi and P Bhramara	HEAT TRANSFER PERFORMANCE OF HYBRID (Fe3O4 + SiC) NANOFLUID – AN EXPERIMENTAL STUDY	Jawaharlal Nehru Technological University, Hyderabad
111	Sarang Nath	Thermal Considerations in Poiseuille Flows through Microchannels with Electrical Joule Heating and Buoyancy Effects	Technical University of Denmark
117	Vinayak Gaikwad and Suhas Mohite	Performance analysis of microchannel heat sink with converging secondary channels	Textile and Engineering Institute, Ichalkaranji
173	Ameeya Nayak, Ainul Haque and Bernhard Weigand	Effective pressure drop and electroosmotic mixing in micro slits due to a slip length variation and micro corrugation	IIT Roorkee,Mechanical Engineering, Institute of Aerospace Thermodynamics, Germany
176	Anurag Maheswari and Yogesh Kumar Prajapati	Numerical analysis of Heat Transfer Performance of Double Layer Microchannel Heat Sink with Semi-circular bumps and slits	Department of Mechanical Engineering, NIT Uttarakhand
182	Rajalingam A and Shubhankar Chakraborty	Estimation of hydrodynamic performance of microchannel heat sink with microstructures of various size and shapes – A comprehensive study	Indian Institute of Information Technology Design and Manufacturing Kancheepuram
225	Karan Dhuper, Siddhartha Duttagupta and Lalit Kumar	Numerical Analysis of Forced Convection of Nanofluid inside a Microchannel	Indian Institute of Technology, Bombay

332	Prabhakar Bhandari and Yogesh Kumar Prajapati	Experimental investigation of variable tip clearance in square pin fin microchannel heat sink	National Institute of Technology Uttarakhand
346	Avinash Kumar, Vinay Arya and Chirodeep Bakli	DECODING THE ALTERATION OF THERMAL CONDUCTIVITY OF NANOFLUIDS FROM MOLECULAR PERSPECTIVE	INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR
374	D Sathish Kumar and S Jayavel	Numerical Analysis of Nano-Fluid Based Wavy Wall Microchannel Heat Sink for Electronic Cooling Applications	IIITDM KANCHEEPURAM
484	Amit Hegde and Harikrishnan A R	The effect of high zeta potential and finite ionic size on the thermal behaviour of pseudoplastic flows over hydrophobic surfaces	BITS Pilani Pilani Campus
614	Tejas Goyal, Syed Ahsan Haider and Abhishek Raj	Poroelastic Modelling for Biological Cells	Indian Institute of Technology, Patna
627	Santhosh Kumar M, Surya Solur G M, Gaurav Reddy G A, Praveen Kumar H D, Babu Rao Ponangi and Chaitra Rao R	NUMERICAL ANALYSIS OF CARBOXYL GRAPHENE NANO-COOLANT IN AUTOMOBILE RADIATOR	PES University
661	Nikhil Jacob and Lijo V	Response of a Choked Micro channel to a Downstream Large Amplitude Pressure Disturbance	GEC Thrissur
665	Rahul Urunkar and Sharad Patil	NUMERICAL STUDY ON PERFORMANCE EVALUATION OF MULTI-TUBULAR SODIUM ALANATE HYDRIDE REACTOR BY ENHANCING HEAT AND MASS TRANSFER CHARACTERISTICS USING NANOFLUIDS	Department of Mechanical Engineering, RIT, Rajaramnagar, affiliated to Shivaji University, Kolhapur, Maharashtra, India
666	Rohit Kumar and Manmohan Pandey	Effect of Geometry in Conjugate Heat Transfer and Fluid Flow through Triangular Copper Miniature Channels	INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI

Miscellaneous

Paper Number	Author(s)	Paper Title	Affiliation
178	Ameeya Nayak and Bharat Soni	Effective pressure drop and electrokinetic flow influence on blood flow in a rectangular micro slit with sudden expansion	IIT Roorkee
260	Greeshma Jacob, Iven Jose and Sujatha S	Computational and Experimental Investigation on the Breast Tumor Depth Characteristics Performed using Infrared Thermography	CHRIST DEEMED TO BE UNIVERSITY
581	Naveen, Ranjith Kumar and Priyadarshini	NUMERICAL INVESTIGATION ON THE STRUCTURAL BEHAVIOUR OF REINFORCED CONCRETE BEAM EXPOSED TO ELEVATED TEMPERATURES	College of Engineering, Trivandrum
683	Joaquim Porunnolil Jossy and Aneesh A.M.	Numerical investigation on the human voice production using a simplified static larynx model	BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE-PILANI

Track - Two-Phase / Multiphase

Paper Number	Author(s)	Paper Title	Affiliation
11	Lalu Uppumthara, Jyothish Abraham, Venugopal G, Muhammed Arif M and Rajkumar M R	Experimental investigation on effect of wettability pattern in the condensation heat transfer performance of vertical square aluminium tube	College of Engineering Trivandrum
14	Naveen Janjanam and Rajesh Nimmagadda	FORCED AND MIXED CONVECTION EFFECT OF Al2O3/WATER NANOFLUID ON THE CONJUGATE THERMAL PERFORMANCE OF STEPPED LID-DRIVEN CAVITY UNDER TURBULENT FLOW CONDITIONS	Koneru Lakshmaiah Education Foundation
17	Sandip Khobragade and Jaya Krishna Devanuri	Impact of flow direction and mass flow rate on the melting process for simultaneous charging and discharging based latent heat storage system	National Institute of Technology Warangal
27	Abhishek Singh Kashyap and Himanshu Tyagi	Numerical Simulation of Latent Heat Thermal Energy Storage Incorporated Solar Water Heater	Indian Institute of Technology Ropar
82	Purnendra Verma and A. K. Nayak	CHF studies on the bottom facing heated flat surface, simulating the calandria vessel of Indian PHWR during core meltdown accident	Bhabha Atomic Research Centre
128	Avinash Upadhyay, Nirbhay Kumar, Manabendra Pathak and Rishi Raj	Numerical Simulation of Bubble Behavior during Pool Boiling with Foaming Solutions	Indian Institute of Technology Patna
143	Anand Kumar, Anandteerth Muddapur and Srikrishna Sahu	Experimental investigation of Urea-water solution (UWS) spray impingement on a heated flat surface	Indian Institute of Technology Madras
165	Avulam Naveen Kumar, Shantanu Pramanik and Tanmoy Mondal	Two Phase Modeling of Mixed Convection in Nanofluids inside a Lid-driven Cavity for Various Aspect Ratios	Department of Mechanical Engineering, National Institute of Technology Durgapur,Department of Applied Mechanics, Motilal Nehru National Institute of Technology Allahabad
206	G Srinivasan and B Raja	Numerical estimation of sublimation front during spin freeze-drying of skimmed milk in a vial	Indian Institute of Technology, Guwahati,Indian Institute of Information Technology Design and Manufacturing Kancheepuram, Chennai, India
234	Ramesh M.R. and Sateesh Gedupudi	Numerical study of falling film evaporation on a horizontal tube bundle	Indian Institute of Technology, Madras
256	Adinarayana K.N.V., Dr. Mangarjuna Rao P and Dr Seik Mansoor Ali O S	Development of Numerical model for Analyzing Two-Phase NaturalCirculation Loops	IGCAR
290	Umesh Madanan and Shivam Prajapati	Computational study on jet break-up behavior of a high-density liquid jet entering a quiescent immiscible liquid pool	Indian Institute of Technology Kanpur,National Institute of Technology Agartala

302	Thilak B. and Dr. Mangarjuna Rao P.	Analysis of Heat Transfer and Phase Change Phenomenon Between Liquid Sodium and Fuel Vapor Under Energetic CDA in SFR	IGCAR, Kalpakkam
312	L Sheik Ismail, V Krishna Prasad and H P Vinay	Performance prediction of Combat Aircraft Fuel Jettisoning System using Modeling and Simulation Approach	Aeronautical Development Agency (ADA)
365	Sampath Bharadwaj Kota and O.S. Seik Mansoor Ali	NUMERICAL STUDIES ON THE EFFECTS OF GEOMETRICAL AND OPERATIONAL CONDITIONS ON THE CHUGGING PHENOMENON	Atomic Energy Regulatory Board
366	Anoop B. and Dr Mangarjuna Rao P.	Simulation of Sodium Aerosol Behaviour in Cover Gas Space Using Multiphase Models	HBNI, IGCAR, Kalpakkam
373	Prasant Kumar Panigrahi, K Velusamy, K Natesan and K Devan	CFD INVESTIGATION OF WALL FAILURE MECHANISM IN EAGLE ID1 TEST FOR REACTOR SAFETY EVALUATION	HBNI - INDIRA GANDHI CENTRE FOR ATOMIC RESEARCH
435	Prakasha Chandra Sahoo, Jnana Ranjan Senapati and Basanta Kumar Rana	Droplet impact and spreading around the thin solid vertical cylinder: A numerical approach	National Institute of Technology, Rourkela
441	Syamkumar G, Baiju V and Gineesh T G	NUMERICAL SIMULATION OF ANNULAR FLOW CONDENSATION INSIDE SQUARE MINICHANNEL USING VOF METHOD	TKM College of engineering,TKM College of Engineering
451	Bikash Pattanayak and Hardik Kothadia	Experimental study of high temperature droplet evaporation on heated surface using IR visualization technique	Indian Institute of Technology Jodhpur
509	Md Naim Hossain, Aranyak Chakravarty and Koushik Ghosh	Influence of transient heat input on pool boiling behaviour	JADAVPUR UNIVERSITY
542	Amrita Sharma, Shobhana Singh, Bobin Mondal and Hardik Kothadia	The effects of snowflake-shaped fin configurations on PCM solidification	IIT Jodhpur
549	M G and Shatrughan Jaiswal	Surface tension effect on Rayleigh-Taylor instability in a viscous stratified two fluid layers system	IIT Guwahati
552	M G and Shatrughan Jaiswal	Effect of density ratio on evolution of Rayleigh-Taylor instability in a two fluid layers system with variable viscosity	IIT Guwahati
607	Rahul Kumar Mondal and Parmod Kumar	A parametric study of water draining from a rectangular tank using multiple outlets	IIT MANDI
648	Chandan Nashine and Manmohan Pandey	Thermo-Hydraulic Modeling of Miniature Loop Heat Pipes	Indian Institute of Technology Guwahati
682	Ashutosh Kumar Singh, Kamal Kumar Yadav, Lipika Kabiraj and Aditya Saurabh	Analysis of ligaments formed during sheet atomization of non-Newtonian fluids	Indian Institute Of Technology, Kanpur

List of Sponsors

Teledyne FLIR

Intel
Semiconductor company

TSI
Understanding, Accelerated

List of Sponsors

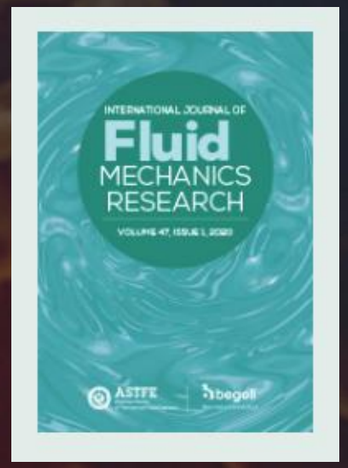
ANSYS
Software Company

Begell House
The home for science and engineering™

COMSOL
Multiphysics

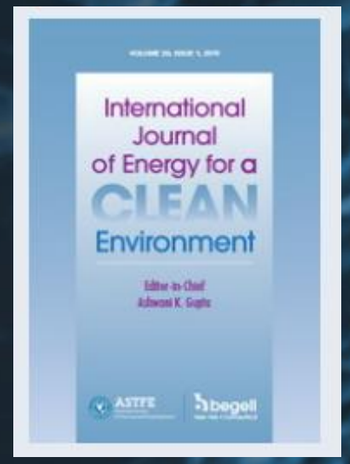
BEGELL HOUSE DIGITAL LIBRARY

Papers selected for both Oral presentation as well as E-Posters shall be published in the Begell House Digital Library as IHMTC conference proceedings. Those authors who opt for publishing their papers as proceedings in the BH digital library should complete the Copyright transfer form and upload along with the final manuscript files in the Easy Chair portal. Selected high quality papers will be considered for publication as Special Issues in the following Begell House Journals after revision:



International Journal of Fluid Mechanics Research

Computational Thermal Sciences: An International Journal



International Journal of Energy for a Clean Environment

Committee Members

Organizing Committee

PATRON	Dr. Bhaskar Ramamurthi Director, (IIT Madras)
CO-PATRON	Dr. A Seshadri Sekhar Head, Mech.Engg. Dept.
ORGANIZING CHAIRMAN	Dr. T Sundararajan
ORGANIZING VICE CHAIRMAN	Dr. M P Maiya
ORGANIZING SECRETARIES	• Dr. Ashis Kumar Sen • Dr. Arvind Pattamatta
TREASURER	Dr. Pallab Sinha Mahapatra

Core Members

Dr. K Arul Prakash	Dr. Shyama Prasad Das
Dr. Kameswararao Anupindi	Dr. B S V Prasad Patnaik
Dr. Vagesh D Narasimhamurthy	Dr. Balaji Srinivasan
Dr. K Srinivas Reddy	Dr. Dhiman Chatterjee
Dr. J M Mallikarjuna	Dr. C Balaji
Dr. Sateesh Gedupudi	

Student Volunteers

Sazid Zamal Hoque	Niladri Sekhar Satpathi
Praveen Dhanalakota	Dr. Tejaswi Josyula
Hemanth D	Anand Prasanna
Dr. Laxman Malla	Dr. K Srinivasa Sagar
M Vishnu	Ajay Jaiswal
Prasanna Kumar	Pratyusha
Pratheek Suresh	Sayan Majumder
Monika M	Hemagni Deka
Harikrishna RB	

ACKNOWLEDGEMENT

IHMTC 2021 Organizing Committee would like to thank ALPCORD NETWORKS for facilitating Conference website hosting and conference registration. The Organizing committee would also like to thank Easy Chair for facilitating with the uploading of Papers.