

"Catalyzing Clean Energy for Net Zero Gas Turbines"

# Asian Congress on Gas Turbine 2024



AUGUST 21-23, 2024 Indian Institute of Technology, Kanpur, India









## IIT Kanpur

The Indian Institute of Technology Kanpur (IIT Kanpur), established in 1959, is one of India's foremost institutions of higher learning, renowned for its contributions to engineering, science, and technology. Located in Kanpur, Uttar Pradesh, the institute is celebrated for its academic rigor, innovative spirit, and significant research achievements.

Nestled within a sprawling 1,000-acre campus, IIT Kanpur is not only a hub of intellectual and technological advancements but also a heaven of natural beauty. The campus is adorned with lush greenery, serene water bodies, and expansive open spaces that provide a



tranquil environment for learning and innovation. This integration of nature with cutting-edge facilities fosters a holistic approach to education and research.



The institute's state-of-the-art laboratories, advanced research centres, and comprehensive residential and recreational facilities support the development of students and researchers. The natural surroundings enhance this environment,

offering a refreshing contrast to the rigorous academic pursuits.

IIT Kanpur is committed to advancing knowledge and fostering innovation, producing graduates equipped to address global challenges. Its global alumni network excels in various fields, reflecting the institute's impact on technology and society. IIT Kanpur continues to be a beacon of progress, blending natural beauty with academic excellence.

### **ACGT 2024**

The upcoming ACGT 2024 conference will be held at IIT Kanpur, India on August 21-24, 2024. ACGT is a significant event for those interested in gas turbines. Since 2005, this conference has been a key platform for showcasing the latest research from Asia in this field. It's co-organized by respected groups like KSFM, GTSJ, CSET, and IIT Bombay, ensuring a diverse range of expertise.

Given the global push for net zero emissions, ACGT 2024's focus on "Catalyzing Clean Energy for Net Zero Gas Turbines" is timely. The conference will explore how this gas turbines technology can help create a more sustainable energy landscape. Attendees can expecttalks and sessions discussing the latest advancements and trends in this area.

ACGT 2024 will be an excellent opportunity for networking and learning about cutting-edge research. It's an important event for advancing gas turbine technology and working towards a greener future that everyone can understand and benefit from.

## Organizing Committee

#### **International**

- ➤ Dr. Hong Guang Jin Institute of Engineering Thermophysics China
- > Dr. Wei Guang Huang Shanghai Advanced Research Institute China
- > Dr. Tong Seop Kim Inha University, Korea
- > Dr. Wontae Hwang Seoul National University, Korea
- > Dr. ken-ichi Funazaki Iwate University, Japan
- > Dr. Toshinori Watanabe University of Tokyo, Japan
- > Dr. Xiao Feng Sun Beihang University, China
- > Dr. Seung Jin Song Seoul National University, Korea
- > Dr. Naoki Tani IHI Corporation, Japan

#### Local

- > Dr. Abhijit Kushari Indian Institute of Technology Kanpur, India
- > Dr. A M Pradeep Indian Institute of Technology Bombay, India
- > Dr. Ashoke De Indian Institute of Technology Kanpur, India
- > Dr. T Chandrasekar Indian Institute of Technology Bombay, India
- > Dr. Chetan Mistry Indian Institute of Technology Kharagpur, India
- > Dr. Rajesh Ranjan Indian Institute of Technology Kanpur, India
- > Dr. Vaibhav Arghode Indian Institute of Technology Kanpur, India
- > Dr. Santanu De Indian Institute of Technology Kanpur, India
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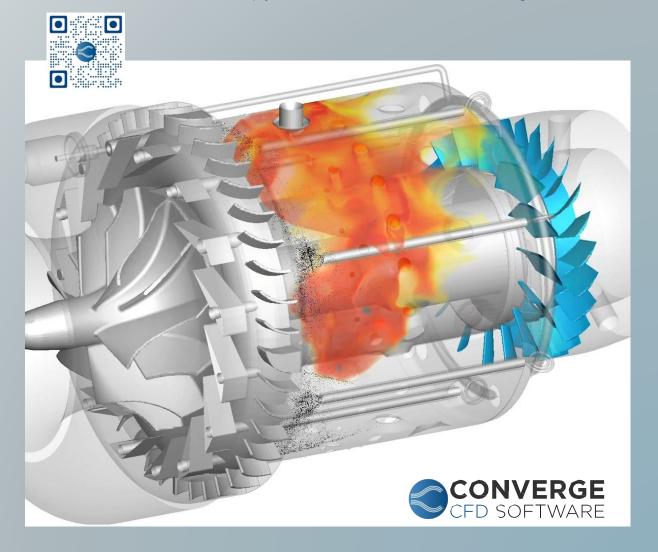


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## Welcome Message



Prof. Abhijit Kushari Organizing committee Indian Institute of Technology Kanpur

organizing On behalf of the committee, it is our distinct pleasure to extend a warm welcome participants, esteemed guests, and distinguished speakers to the Asian Congress on Gas Turbines (ACGT 2024), which will be scheduled on August 21-23, 2024. Hosted by the esteemed Indian Institute ofTechnology Kanpur (IIT Kanpur), in

collaboration with the Korean Society for Fluid Machinery (KSFM), Gas Turbine Society of Japan (GTSJ), Chinese Society of Engineering Thermophysics (CSET), and our esteemed partners at the Indian Institute of Technology Bombay (IIT Bombay), we are honored to convene this gathering to delve into the pivotal role of gas turbines in achieving net-zero emissions.

ACGT is a biennial conference that serves as a premier platform for fostering collaboration, innovation, and knowledge exchange among researchers, industry experts, and policymakers in the field of gas turbines and emissions reduction. Under the overarching theme of "The Role of Gas Turbines Toward Net Zero," ACGT 2024 promises to be a beacon of inspiration and a catalyst for transformative change as we strive towards a more sustainable future.

Throughout the conference, we invite you to engage in thought-provoking discussions, share your latest research findings, and forge new collaborations that will shape the trajectory of gas turbine technology in the years to come. Together, let us reaffirm our commitment to sustainability and work towards building a greener, more resilient world for future generations.

Once again, we extend our heartfelt welcome to each and every one of you. May your participation in ACGT 2024 be both enriching and inspiring.

## **Invited speakers**



R K MISHRA
Scientist-G & former Regional Director
Regional Center for Military
Airworthiness (GTRE), CEMILAC
Bangalore, India

"Certification Challenges in Gas Turbine Engine for Fighter Aircrafts"



G. Sivaramakrishna
Scientist 'G'
Gas Turbine Research Establishment,
Bangalore
India

"Design & Development of Indigenous Aero Gas Turbine Engines at GTRE- Current Status & Way Forward"

#### **SCHEDULE**

	Time	Event	Venue
	8:00 to 9:00	Registration	OL
	9:00 to 10:30	Inauguration and Keynote session	OA
	10:30 to 11:00	High Tea	OL
	11:00 to 12:00	Session 1	OA
	12:00 to 13:00	Session 2	OA
Day 1, August 21,	13:00 to 14:00	Lunch	OL
2024, Wednesday	14:00 to 15:00	Session 3	OA
	15:00 to 16:00	Session 4	OA
	16:00 to 16:20	Tea break	OL
	16:20 to 17:20	Session 5	OA
	17:45 to 18:30	Lab visit	
	18:30 to 19:30	Free time	
	19:30 to 21:30	Dinner	OL
	9:00 to 10:00	Keynote session	OA
	10:00 to 11:00	Session 6	OA
	11:00 to 11:20	Tea break	OL
	11:20 to 12:20	Session 7	OA
	12:20 to 13:20	Session 8	OA
Day 2, August 22,	13:20 to 14:10	Lunch	OL
2024, Thursday	14:10 to 15:10	Session 9	OA
2021, Thursday	15:10 to 16:10	Session 10	OA
	16:10 to 16:30	Tea break	OL
	16:30 to 17:30	Session 11	OA
	17:30 to 18:30	Lab visit	
	18:30 to 19:30	Free time	
	19:30 to 21:30	Gala Dinner	OL
	9:00 to 10:00	Pannel Discussion	OA
	10:00 to 11:00	Session 12 & 13	OA/OSR
	11:00 to 11:20	Tea Break	OL
	11:20 to 12:20	Session 14 & 15	OA/OSR
	12:20 to 13:20	Session 16 & 17	OA/OSR
Day 3, August 23,	13:20 to 14:20	Lunch	OL
2024, Friday	14:20 to 15:20	Session 18 & 19	OA/OSR
	15:20 to 16:20	Session 20 & 21	OA/OSR
	16:20 to 16:45	Event Conclusion	OA
	16:45 to 17:00	Tea Break	OL
	17:00 to 19:30	Free Time	
	19:30 to 21:30	Dinner	OL

OL- Outreach Lawn, OA- Outreach Auditorium, OSR- Outreach Seminar Room







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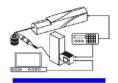


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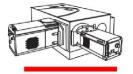
Thermal stages and thermal probe stations for optical and electrical experiments. Under controller environment and L2 setup, -190 to 1000 degree Celsius











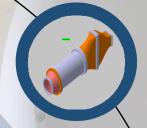
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	Day 1	
Time	Event	Venue
8:00-15:00	Registration	OL
9:00	Inauguration & Keynote Session-1 (Dr. R.K. MISHRA - CEMILAC, Bangalore, India)	OA
10:40	Tea Break	OL
	Session 1	
11.00	Combustion-1	0.4
11:00	Combustion Dynamics Study of Biofuels in A Swirl Stabilized Combustor  Satender Singh (IIT, Madras)	OA
11:20	Effect Of Hydrogen Enrichment on Soot Formation in Laminar Ethylene Diffusion Flames	OA
	Kundan Kumar (IISc, Bengaluru)	
11:40	Response Of Partially Premixed Swirl Flame to Transverse Acoustic Excitation	OA
	Ravi Gupta (IISc, Bengaluru)	
	Session 2	
	Structures-1	
12:00	Ti-900: An Alloy for Gas Turbine Compressor Blades Application  Dipayan Chakraborty (IIT, Tirupati)	OA
12:20	Investigation The Mechanical Properties of Hot-Rolled Aluminium Alloy Plate 7075-T651: Insights for Aerospace Application	OA
	Nguyen Tien Quyet (Viettel group)	
12:40	Topology Optimization and Additive Manufacturing Simulation in Ansys  Satyen Badakh (IIT, BHU)	OA
13:00	Lunch	OL
	Session 3	
	Combustion-2	
14:00	Numerical Investigation on The Aerodynamic Characteristics of a Lean- Burn Gas Turbine Fuel Injector	OA
	Preetam Jamod (IIT, Jammu)	
14:20	Injector Exit Geometry Variations on The Spray Characteristics of An Effervescent Injector	OA
	Darshil Kantilal Sojitra (IIST, Thiruvananthapuram)	
14:40	The Numerical Simulation of Dynamics of a Droplet Upon Impacting an Inclined Surface	OA
	Arnab Chakraborty (TCS research)	

Session 4		
	Heat transfer-1	
15:00	A Study on The Development of An Afterburner for A Supersonic Micro Gas Turbine for Small High-Speed UAVs	OA
	DongEun Lee (University of Science and Technology, South Korea)	
15:20	Depressurized Boiling Flow Analysis in Nozzle for Cryogenic Gas- Liquid Two-Phase Flow Measurement	OA
	Sakai Shin (University of Tokyo, Japan)	
15:40	Estimation Of Non-Gray Radiative Heat Flux with Soot in Lox-Methane Rocket Thrust Chamber	OA
	Pradeep Kumar (IIT, Mandi)	
16:00	Tea Break	OL
Session 5 Turbomachinery-1		
16:20	Design And Analysis of Purge Flow Path on The Performance of The High Pressure Transonic Axial Turbine	OA
	Pitchai Pillai Sharmila (IIT, Madras)	
16:40	Analysis Of The 3D Flow Structure Within Gas Turbine Blade Lattice Cooling Channels Using Magnetic Resonance Velocimetry  Jumin Hong (Seoul National University, South Korea)	OA
17:00	Coupled Transition and Turbulence Models for Low Pressure Turbine Flows Using Multi-Objective Data-Driven Frameworks	OA
	Harshal Deepak Akolekar (IIT, Jodhpur)	
	Day 1 Technical sessions concluded	
17:45	Lab Visit	
19:30	Dinner	
	Venue: OL	

## Engineering Support and consulting



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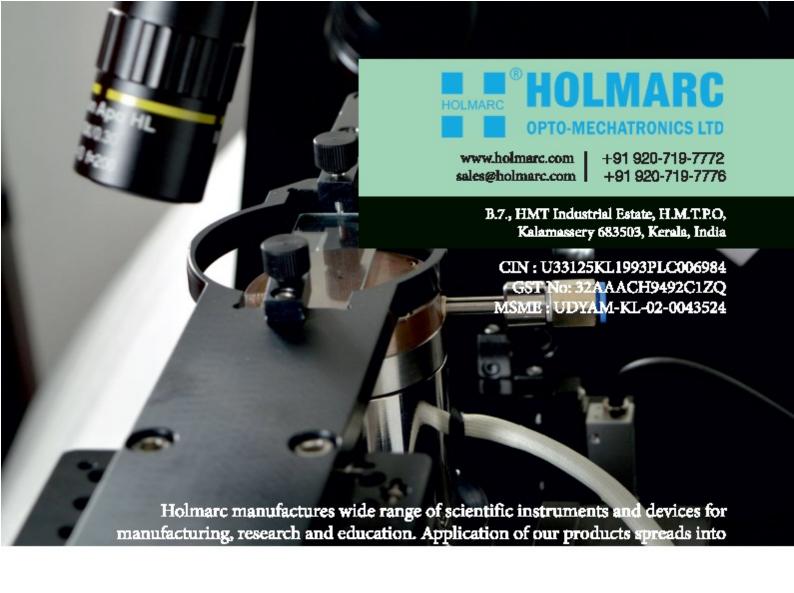
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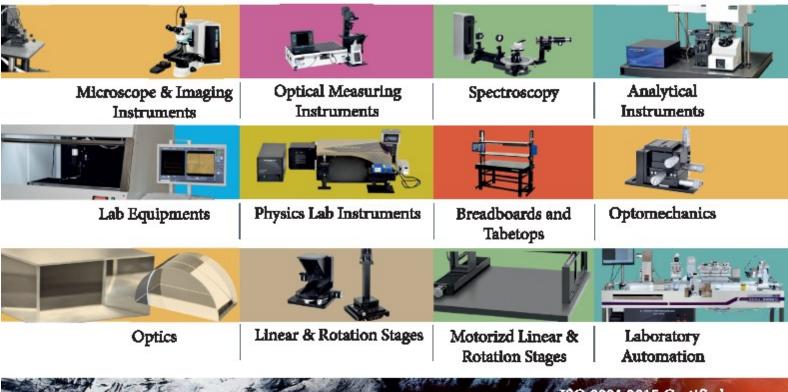
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	Day 2	
8:00-15:00	Registration	OL
9:00	Keynote Session 2 – Sivaramakrishna SC "G", GTRE, Bangalore, India	OA
	Session 6	
10:00	Intake/Exhaust	OA
10.00	Effects Of Inlet Distortion on Boundary Layer Ingesting Propulsion	OA
	System Performance	
	Seisuke Hirayama (University of Tokyo, Japan)	
10:20	Experimental Investigation of IR signature On Circular and Serpentine	OA
	Nozzles	
	Dinesh Durai (IIT, Kanpur)	
	Tarun Kurakula (IIT, Kanpur)	
10:40	Experimental Investigation of Secondary Fluidic Velocity Influence on	OA
	Primary Jet Mixing for Active Flow Control	
11.00	Lohitvel Gopikannan (Anna University, Chennai)	O.I.
11:00	Tea break	OL
	Session 7 Turbomachinery -2	
11:20	Numerical Simulations of a Transonic Axial Compressor with Roughness	OA
11.20	Near the Onset of Stall	OA
	1,002 0.00 0.100 0.100	
	Pradeep A.M. (IIT, Bombay)	
	Harshal Deepak Akolekar (IIT, Jodhpur)	
11:40	Effects Of Additive Manufacturing-Induced Thickened Leading Edge on	OA
	Aerodynamic Performance of Compressor Blade	
	Youngeon Ko (Seoul National University)	
	Seung Jin Song (Seoul National University)	
12:00	Numerical Investigations on Delay in Onset Of Inflection For S-Shaped	OA
	Compressor Airfoil Flow Characteristics	
	·	
	Chetan Mistry (IIT, Kharagpur)	
	Session 8 Combustion-3	
12:20	Effect Of Hydrogen Addition Over the Flame Characteristics of	OA
12.20	Methane-Air Partially Premixed Swirl Flame	OA
	Trictimite First artistry Frontines Swift Fishio	
	Ravi Gupta (IISc, Bengaluru)	
12:40	Engine Fire Extinguishing Agent Concentration Studies and Validation for	OA
	Pusher-Propeller Aircraft	
	Vinay C A (CSIR National Agreenage Laboratories Raycalore)	
13:00	Vinay C A (CSIR-National Aerospace Laboratories, Bangalore) Investigation Of Combustion Attributes of Jet Diffusion Flame with	OA
15.00	Swirlers in A Coaxial Burner	OA
	Sowrish Vijaay S (MIT, Chennai)	

13:20	Lunch	OL
	Session 9 Machine learning/Control systems	
14:10	Deep Convolutional Neural Network to Predict Mechanical Properties for Random Distribution of Long-Fiber Composite Materials	OA
	Manas Kishor Thakur (IIT, Ropar)	
14:30	Design And Development of a Flight Control System for A V/STOL UAV For Marine Surveillance Applications with Tilt-Wing Mechanism	OA
14:50	Rhythm Mahesh Galrani Theoretical And Methematical Analysis of Lift and Drog Characterization	OA
14:30	Theoretical And Mathematical Analysis of Lift and Drag Characterization for CFD And MDO Applications of a Diamond Shaped Oblique Wing With A 90-Degree Rotation  Mohan Suraj Ilapogu	OA
	Session 10	
1.7.10	Heat transfer -2	
15:10	Large Eddy Simulations on Fan-Shaped Film Cooling Hole with The Turbulence Inflow Using Digital Filtered Method	OA
	Seokmin Kim (University of Science and Technology, South Korea)	
15:30	Modelling Radiative Heat Transfer for A Kerosene Flame Using Spectral Line Based WSGG (SLW) Method for Can Combustor	OA
	Pradeep Kumar (IIT, Mandi)	
15:50	Fluid Flow and Heat Transfer Investigation of Multi-Jet Impingement Under Different Conditions Of Crossflow With Turbulators	OA
	Anurag Yadav (IIT, Roorkee)	
16:10	Tea Break	OL
	Session 11	
1.6.20	Combustion-4	
16:30	Numerical Investigation of CH <sub>4</sub> - H <sub>2</sub> – Air Combustion In A Jet Engine Combustor	OA
16.50	Samarth Jain (IIT, Roorkee)	0.4
16:50	Effect Of Multi-Element Spray Interactions on The Spray Characteristics of a Pressure Atomizer	OA
	Harsh Saria (IIST, Thiruvananthapuram)	
17:10	A Numerical Simulation of Post-Impact Dynamics of a Droplet On A  Moving Surface	OA
	Arnab Chakraborty (TCS research)	
	Day 2 Technical sessions concluded	
17:30	Lab Visit	
19:30	Gala Dinner	OL





	Day 3		
8:00-13:00	Registration		
9:00	Panel discussion		
	Session 12	Session 13	
	Turbomachinery-3	Combustion-5	
	Venue: OA	Venue: ORS	
10:00	Optimization Of High-Speed LP	Effect Of Fuel Injection Velocities on Pure Ammonia Combustion in A Novel Burner	
	Turbine Blade Profile Using CAD- Based Parametrization and Meta-	Ammonia Combustion in A Novel Burner	
	Modelling Algorithms		
	Wiodening / tigoritimis		
	Chetan S Mistry (IIT, Kharagpur)	Muddada Srinivasarao (IIT, Kharagpur)	
10:20	Non-Axisymmetric End-Wall	Experimental And Computational Analysis	
	Contouring and Off- Design	on Effect of Lean Primary Zone Operation	
	Performance of a Turbine Cascade	on Combustion Performance of Model Gas	
		turbine Combustor	
	Krishma Rajesh Mehta (IIT, Madras)	Muthuselvan (CSIR, NAL)	
10:40	Design Of an Open Circuit Transonic	Correlation For Swirl Number in	
	Annular Cascade Turbine Test Facility	Combined Counter-Rotating Swirl	
		Generators	
11.00	Vaibhav Kumar Mishra (IIT, Bombay)	Vivek Sahu (IIT, Jammu)	
11:00	Session 14	k. Venue: OL Session 15	
	Heat transfer -3	Combustion-6	
	Venue: OA	Venue: OSR	
11:20	Numerical Study on The Influence of	Modelling Of N-	
	Different Types of Curved Holes on	Dodecane/Ammonia/Methane Blend in A	
	• •		
	Film Cooling Effectiveness	Swirl Burner Using Flamelet Model	
	Film Cooling Effectiveness		
	Film Cooling Effectiveness  Santhosh Senguttavan (Sungkyunkwan	Swirl Burner Using Flamelet Model	
11:40	Film Cooling Effectiveness  Santhosh Senguttavan (Sungkyunkwan University, South Korea)	Swirl Burner Using Flamelet Model  Richie Shaji Mathew (IIT, Hydrabad)	
11:40	Film Cooling Effectiveness  Santhosh Senguttavan (Sungkyunkwan University, South Korea)  2D Numerical Heat Transfer Analysis	Swirl Burner Using Flamelet Model  *Richie Shaji Mathew (IIT, Hydrabad)  Validation Of Chemical Kinetic Reaction	
11:40	Film Cooling Effectiveness  Santhosh Senguttavan (Sungkyunkwan University, South Korea)	Swirl Burner Using Flamelet Model  *Richie Shaji Mathew (IIT, Hydrabad)  Validation Of Chemical Kinetic Reaction  Models with Nh3/H2 Oxidation Chemistry	
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12:40	Experimental Study of Dluff Dody	Numarical Duadiation and Compution
12:40	Experimental Study of Bluff-Body Stabilized Flames in Lean Premixed	Numerical Prediction and Separation Control of Flows In A Low Pressure
	Mode	Turbine Cascade At Transonic Conditions
	Wiode	Turome Cascade At Transome Conditions
	Keshav Yadav (IIT, Kanpur)	Aishna Jain (IIT, Bhilai)
13:00	Investigation On Scaling of High	Aerodynamic Design of A Low-Pressure
	Thermal Intensity Reverse Flow –	Axial Turbine Stage
	Porous Media Combustor in Non-	
	Premixed Mode	S N Agnimitra Sunkara (CSIR-National
13:20	Sandeep Kumar Rajput (IIT, Kanpur)	Aerospace Laboratories, Bangalore) unch
15:20	Session 18	Session 19
	Combustion-8	Turbomachinery-5
	Venue: OA	Venue: OSR
14:30	Investigation Of Internal and External	Performance Of Series Hybridized
	Aerodynamics for Multi-Swirler	Turbofan Engine
	Injector Varying the Vane Angle of	
	Swirler	Apurva Danabhai Chavda (IIT, Bombay)
	Preetam Jamod (IIT, Jammu)	
14:50	Large Eddy Simulation Using the	Structural Integrity Assessment of Gas
	Stochastic Fields Approach Applied	Turbine Compressors Under Transient
	To A Swirled Stabilized Gas Turbine	Thermal Conditions
	Combustor	
	V · 1 Cl · · M · d · /HT V	HA Minh Duc (Viettel group)
15:10	Krishna Chaitan Marthi (IIT, Kanpur)  Influence Of Quench Air and Fuel	Sub Idla Chamatanistics of A Contribucal
13.10	Injector Flow on The Non-Reacting	Sub Idle Characteristics of A Centrifugal Compressor
	Flow Field in A Rich-Quench-Lean	Compressor
	Combustor	Keerthi M C (IIT, Dharwad)
	Kundan Kumar (IISc, Bengaluru)	Sujeet Kumar Jaiswal (IIT, Dharwad)
	Session 20	Session 21
	Combustion- 9	Structures/ Manufacturing -3
15:30	Venue: OA High Repetition Rate Measurements of	Venue: OSR Effect Of Non-Linear Spring Force on
13.30	Temperature and Water Vapor	Rotor-Bearing System Subjected to
	Concentration in A Non-Premixed Swirl	Harmonic Excitations
	Stabilized Combustor Using TDLAS	
		Jasnoor Singh (IIT, Ropar)
	Gokul Krishnan K G (IIST,	
15:50	Thiruvananthapuram) Experimental Study on Flame Behaviour	
13.30	Of LPG-Air Flame In Mini Scale	Algorithm to Predict the Composition of
	Combustor	Ultra-High Strength Steel with YS
		>1900Mpa
	Koushik Samanta (Jadavpur University)	
1610		Saniya Kumari (IIT, BHU)
16:10	Analysis and Optimization of Swirl	-
	Injector for Efficient Combustion in Jet Engine	
	Ramesh Kumar (UPES Dehradun)	
16:20	Vote of Thanks	
	Day 3 Technical sessions concluded	

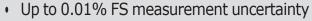


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