

# CV

## Personal Information

*Education, professional / research experience*

**Name:** SUBRATA SARKAR

**Department:** Mechanical Engineering

**Current Position:** Professor

### Academic

Degree	University	Year of Passing	Class
Bachelor of Engineering (Mechanical Engineering)	Bengal Engineering College Calcutta University, India	1984	First Class
Master of Engineering (Mechanical Engineering)	Indian Institute of Science, Bangalore, India	1986	First Class with Distinction
Doctor of Philosophy (Aerospace Engineering)	Indian Institute of Technology, Madras, India	1995	--

### Details of Employment

#### Teaching Experience

Designation	Organisation	Duration
Professor (Higher Academic Grade)	Indian Institute of Technology Kanpur	2015-Present
Professor	Indian Institute of Technology Kanpur	2007-2015
Associate Professor	Indian Institute of Technology Kanpur	2001-2007
Visiting Research Fellow	University of Surrey, UK	2001-2003
Assistant Professor	Indian Institute of Technology Kanpur	1997-2001
Assistant Professor	Bengal Engineer College, Calcutta University	1996-1997
Senior Lecturer	Bengal Engineer College, Calcutta University	1994-1996
Lecturer	Bengal Engineer College, Calcutta University	1988-1994

## Industrial Experience

Designation	Organisation	Nature of Work	Period
Development Engineer.	M/s. Worthington Pump India Ltd. (Research and Development Section)	Development / modification of pumps and allied problems on fluid mechanics.	Feb'1986 - Aug'88.

**Research Experience:** Turbomachinery, Computational Fluid Dynamics, Heat Transfer, Turbulence, DNS and LES.

### **Current Areas of Research:**

- LES/DNS for complex transitional and turbulent flows.
- Immersed boundary method for complex flows.
- CFD Applied to Turbomachinery.
- Blade-wake interactions and unsteady flows.
- Film Cooling of Turbine Blades.
- Vortex-induced instability.
- Flow separation and control.
- Development of efficient flow solvers.
- Turbulence Modeling of Compressible Flows.
- Experimental Investigation and Flow Analysis through Turbomachinery

## **Teaching**

### **UG Courses Taught:**

<i>Title</i>	<i>Institution</i>
ME231: Fluid Mechanics	IIT Kanpur
ME401: Energy System II	IIT Kanpur
ME301: Energy System I	IIT Kanpur
ESO201: Thermodynamics	IIT Kanpur
ESO214: Fluid Mechanics and Rate Process	IIT Kanpur
ME471: Mechanical Engineering Lab .	IIT Kanpur
Turbomachinery	B.E. College
Thermodynamics	B.E. College
Non-Conventional Energy	B.E. College
Gas Dynamics	B.E. College

**PG Courses Taught:**

<i>Title</i>	<i>Institution</i>
ME 631: Viscous Flow Theory	IIT Kanpur
ME 647 Introduction to Turbulent Flows	IIT Kanpur
ME 617 Advanced Theory of Turbomachinery	IIT Kanpur
ME 630 Numerical Heat and Mass Transfer	IIT Kanpur
ME 634 Advanced CFD	IIT Kanpur
Computational Fluid Dynamics and Heat Transfer	B.E. College
Advanced Thermodynamics	B.E. College

**New Course Introduced:**

ME 617 Advanced Theory of Turbomachinery (IIT Kanpur).

Computational Fluid Dynamics and Heat Transfer (B.E. College)

<i>Supervision of Bachelor/Master thesis</i>
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<b>Mtech:</b>	55 (IITK) & 4 (B.E. College)	Total: 59
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<b>B.tech Project:</b>	22 (IITK) & 30 (B.E. College)	Total: 52
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<i>PhD Supervision</i>
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No.	Name	Completion	Thesis Title
1	Ishita Jain	In-progress	Upstream boundary layer in excitation of a laminar separation and breakdown.
2	Ravi Kumar	In-progress	Status of boundary layer on a LPT Blades in flutter
3	Shubham Katiyar	In-progress	LES on flow and heat transfer on a compressor blade.
4	Anjali Dwivedi	In-progress	Performance of mist film cooling.
5	Pradeep Singh	In-progress	Effect of surface roughness on the separated boundary layer.
6	K. Anand	2015	Laminar Separation and Transition of Flow Over a Constant Thickness Aerofoil Model for Varying Angles of Attack and Flap Deflection.
7	K. Muralidhar Nair	2015	Self-sustained Cavity Oscillations in Compressible Flow and Associated Acoustics.
8	A. Samson Ratna Kumar	2014	Experimental Investigations on Excitation of a Laminar Separated Shear Layer over a Leading Edge.
9	Harish Babu	2014	Effect of Periodic Wake on Leading Edge Flow and Heat Transfer through LES.
10	Nirmal Kant Singh	2012	Prediction and Control of a Laminar Separation Bubble.
11	Pankaj Saha	2012	Analysis of flow and heat transfer in a channel with periodically placed built-in vortex generators in laminar and turbulent regimes.

12	Sudipto Sarkar	2009	LES of Wake Boundary layer Interactions using Immersed Boundary Methods.
13	Sudipta De	2004	Numerical Simulation of Vortex Induced Instability.

### Knowledge Dissemination

1. Created Web-based book on **Fluid Machinery** for the senior undergraduate students, co-authored with Prof. G. Biswas and Prof. S.K. Som (under MHRD sponsored NPTEL Project: <http://acadob.nptel.iitk.ac.in/>)
2. A book on **Theory of Turbomachinery** is under progress.
3. A book on **Computational Fluid Dynamics** is under progress.

### Publications

#### Papers in Refereed Journals

1. **Sarkar, S.**, 2020, "Large Eddy Simulation of Flows of Engineering Interest: A Review", 50 Years of CFD in Engineering Sciences, Runchal A. (eds). Springer Singapore, pp. 363-400, doi.org/10.1007/978-981-15-2670-1\_11.
2. **Sarkar, S.**, 2019, "Flow structures and thermal field with modulated jet near the semi-circular leading edge", *Proc. IMechE Part A: Journal of Power and Engineering*, DOI:10.1177/0957650919873172.
3. **Sarkar, S.** and Ranakoti, G., 2017, "Effect of vortex generators on film cooling effectiveness", *Journal of Turbomachinery, Transactions of the ASME*, **139** (6), 061009, DOI: 10.1115/1.4035275.
4. Anand, K. and **Sarkar, S.**, 2017, "Features of a Laminar Separated Boundary Layer near the Leading-edge of a model aerofoil for different Angles of Attack: An Experimental Study", *Journal of Fluids Engineering, Transactions of the ASME*, **139** (2), 021201, DOI: 10.1115/1.4034606.
5. Nair, K. M. and **Sarkar, S.**, 2017, "LES of Self-Sustained Cavity Oscillation for Subsonic and Supersonic Flows", *Journal of Fluids Engineering, Transactions of the ASME*, **139** (1), 011102, DOI: 10.1115/1.4034371.
6. Saha, P., Biswas, G., Mandal, A.C. and **Sarkar, S.**, 2017, "Investigation of coherent structures in a turbulent channel with built-in longitudinal vortex generators", *International Journal of Heat and Mass Transfer*, **104**, pp. 178-198, DOI: 10.1016/j.ijheatmasstransfer.2016.07.105.
7. Samson, A. and **Sarkar, S.**, 2016, "Effects of Free-stream Turbulence on Transition of a Separated Shear Layer Over the Leading-edge of a Constant Thickness Aerofoil": *Journal of Fluids Engineering, Transactions of the ASME*, **138**(2), 021202-021202-19, DOI:10.1115/1.4031249.
8. **S. Sarkar**, Harish Babu and Jasim Sadique, 2016, "Interactions of separation bubble with oncoming wakes by LES", *Journal of Heat Transfer, Transactions of the ASME*, **138**(2), 021703-021703-12, doi:10.1115/1.4031645.
9. Samson, A. and **Sarkar, S.**, 2016, "An Experimental Investigation of a Laminar Separation Bubble on the Leading edge of a Modeled Aerofoil for different Reynolds Numbers", *Proc. IMechE . Part C: Journal of Mechanical Engineering Sciences*, **230**(13), 2208-2224, DOI: 10.1177/0954406215594826

10. K.M. Nair, S. Sarkar and Z. Labana, 2015 "Self-sustained oscillation for a three dimensional transonic cavity using LES" *Springer-Verlag Berlin Heidelberg* (also presented in FMFP 2014).
11. **S. Sarkar**, Harish Babu, 2015, "Large Eddy Simulation on the Interactions of Wake and Film-Cooling Near a Leading Edge", *Journal of Turbomachinery, Transactions of the ASME*, **137 (1)**, 011005-011005-11, DOI: 10.1115/1.4028219.
12. K. Anand and **S. Sarkar**, 2015, "Experimental Investigation of Separated Shear Layer from a Leading Edge Subjected to various Angles Of Attack with Tail Flap Deflections" *Sadhana, Academy Proceedings in Engineering Sciences*, **40**, Part 3, pp. 803-817, DOI: 10.1007/s12046-015-0341-2.
13. Pankaj Saha, Gautam Biswas and **S. Sarkar** 2014, "Comparison of winglet-type vortex generators periodically deployed in a plate-fin heat exchanger – A synergy based analysis", *Int. Journal of Heat and Mass Transfer (IJHMT)*, **74**, 292-305.
14. Ankita Sarkar, Yashwanth B. L and **S. Sarkar**, 2012, Analysis of Blast Induced Intracranial Pressure Dynamics in Cerebrospinal Fluid Leading to Traumatic Brain Injury, *International Journal of Emerging Multidisciplinary Fluid Sciences*, **3**, No. 2+3, pp. 135-144.
15. Pankaj Saha and G. Biswas and **S. Sarkar**, 2012, "Shear improved smagorinsky model pertaining to large eddy simulation applied on lid-driven cavity flows", *International Journal of Advances in Engineering Sciences and Applied Mathematics*, **4(3)**:165–171
16. **S. Sarkar** and R. Mandal, 2012, Effects of Synthetic Jet in Suppressing Cavity Oscillations, *World Academy of Science, Engineering and Technology*, **6(7)** 110-18.
17. N.K. Singh and **S. Sarkar**, 2011, DNS of a Laminar Separation Bubble, *World Academy of Science, Engineering and Technology*, **81**, 439-443.
18. Sudipto Sarkar and **S. Sarkar**, 2010, Simulation of vortex dynamics in a cylinder wake by the Immersed Boundary technique, *Progress in Computational Fluid Dynamics*, **10(3)**, pp. 129-145.
19. **S. Sarkar** and Sudipto Sarkar, 2010, Vortex dynamics of a cylinder wake in proximity of a wall, *Journal of Fluids and Structures*, **26**, pp. 19-40.
20. **S. Sarkar**, 2009, Influence of wake structure on unsteady flow in an LP turbine blade passage, *Journal of Turbomachinery, Transactions of the ASME*, **131**, 041016 (14 pages).
21. **S. Sarkar** and Sudipto Sarkar, 2009, Large-Eddy Simulation of Wake and Boundary Layer Interactions Behind a Circular Cylinder, *Journal Fluids Engineering, Transactions of the ASME*, **131**, 091201 (13 pages).
22. **S. Sarkar**, 2008, Identification of flow structures on a LP turbine blade due to periodic passing wakes, *J. Fluids Engineering, Transactions of the ASME*, **130**, 061103 (10 pages).
23. **S. Sarkar**, 2007, Large-eddy simulation of wake convection and unsteady flow in a LP turbine blade passage, *Progress in Computational Fluid Dynamics*, **7(7)**, pp. 387-403.
24. **S. Sarkar**, 2007, The effects of passing wakes on a separating boundary layer along a low-pressure turbine blade through large-eddy simulation, *Proc. IMechE Part A: Journal of Power and Energy*, **221**, pp. 551-564.
25. **S. Sarkar** and P. R. Voke, 2006, Large-eddy simulation of unsteady surface pressure on a LP turbine blade due to interactions of passing wakes and inflexional boundary layer, *Journal of Turbomachinery, Transactions of the ASME*, **128**, pp. 221-231.
26. T. K. Sengupta, S. De and **S. Sarkar**, 2003, Vortex-induced instability of an incompressible wall-

- bounded shear layer, *Journal of Fluid Mechanics*, **493**, pp. 277-86.
27. **S. Sarkar** and P. R. Voke, 2003, LES of passing wakes influencing transition on turbine blades, ERCOFTAC Series, *Direct and Large-Eddy Simulation V*, Kluwer Academic Publishers.
  28. **S. Sarkar**, 2001, Analysis of Transitional Flow and Heat Transfer Over Turbine Blades: Algebraic Versus Low-Reynolds-Number Turbulence Model, *Proc. IMechE Part C: Journal of Mechanical Engineering Science*, **215**, pp. 1003-18.
  29. **S. Sarkar**, K. Das and D. Basu, 2001, Film Cooling on Turbine Guide Vane: A Numerical Analysis with Multigrid, *Proc. IMechE Part A: Journal of Power and Energy*, Vol 215 pp39-53.
  30. T. K. Sengupta, D. Sridar, **S. Sarkar**, and S. De, 2001, Spectral Analysis of Flux Vector Splitting Finite Volume Methods, *International Journal for the Numerical Methods in Fluids*, **37**, pp. 149-174.
  31. **S. Sarkar**, K. Das, and D. Basu, 2000, Navier-Stokes Analysis of an Internally Cooled Turbine Blade, *Proc IMechE, Part A: Journal of Power and Energy*, **214**, 585-598.
  32. **S. Sarkar**, 2000, Numerical Simulation of Supersonic Slot Injection into a Turbulent Supersonic Stream, *International Journal of Turbo and Jet-Engines*, **17**(3), pp. 227-240.
  33. **S. Sarkar** and T. K. Bose, 1997, Numerical Study of Slot-Film Cooling: A Three-Dimensional Calculation, *Journal of Energy, Heat and Mass Transfer*, **19**(3), pp. 199-206.
  34. **S. Sarkar** and T. K. Bose, 1996, Numerical analysis of slot-film cooling: effectiveness and flow-field, *Journal of Fluids Engineering, Transactions of the ASME*, **118**, pp. 864-867.
  35. **S. Sarkar** and T. K. Bose, 1996, Numerical Analysis of Slot-Film Cooling: A Parametric Study, *Journal of Aeronautical Society of India*, **48**(1), pp. 80-90.
  36. **S. Sarkar** and T. K. Bose, 1995, Numerical simulation of a two-dimensional jet-crossflow interactions related to film cooling applications: effects of blowing rate, injection angle and free-stream turbulence, *Sadhana, Journal of Indian Academy of Science*, **20**(6), pp. 915-935.
  37. **S. Sarkar** and T. K. Bose, 1995, Comparison of different turbulence models for prediction of slot film cooling: flow and temperature field, *Journal of Numerical Heat Transfer, Part B*, **28**, pp. 217-238.
  38. **S. Sarkar**, 1992, Performance prediction of a mixed-flow impeller, *Proc. IMechE Part A: Journal of Power and Energy*, **206**, pp. 189-196.
  39. **S. Sarkar**, 1992, Performance study of a mixed flow impeller covering an unsteady flow-field, *Proc. IMechE Part A: Journal of Power and Energy*, **206**, pp. 83-93.
  40. **S. Sarkar**, 1990, Measurement of losses in a mixed-flow pump impeller using hot-wire anemometer, *Journal of Institute of Engineers (India)*, **71**, pp. 65-79.

#### **Papers Published in Refereed International / National Conferences**

1. Singh, P., and **Sarkar, S.**, 2019, Shear Layer Excitation near the Leading-Edge due to Uniformly Distributed Roughness Element, Proceedings of the 16th Asian Congress of Fluid Mechanics, Bangalore, India.
2. Katiyar, S., and **Sarkar, S.**, 2019, Excitation of Boundary Layer on the Suction Surface of C-D Compressor Blade, Proceedings of the 16th Asian Congress of Fluid Mechanics, Bangalore, India.

3. Dwivedi, A., and **Sarkar, S.**, 2019, Interaction of Downwash Vortex with Mist Film Cooling Jet in Crossflow, Proceedings of the 16th Asian Congress of Fluid Mechanics, Bangalore, India.
4. Katiyar, S., and **Sarkar, S.**, 2018, "Aero-thermal analysis of a compressor blade at low Reynolds number through LES", International Conference on Computational Methods for Thermal Problems, THERMACOMP, India, Issue 223309, 2018, Pages 785-788 (**Best paper award**).
5. Dwivedi, A., and **Sarkar, S.**, 2018, " Film cooling enhancement by introduction of mist on a flat plate", International Conference on Computational Methods for Thermal Problems, THERMACOMP, India, Issue 223309, Pages 117-121 (**Ronald W. Lewis Award**).
6. **Sarkar, S.**, and Babu, H., 2018, "Excitation of a laminar separation bubble and heat transfer characteristics: A large-eddy simulation", International Conference on Computational Methods for Thermal Problems, THERMACOMP, India, Issue 223309, Pages 734-738.
7. Katiyar, S., and **Sarkar, S.**, 2018, Transitional Flow Analysis of a C-D Stator Compressor Blade through LES, Proceedings of the Asian Congress on Gas Turbines, Paper No. ACGT2018, TS88, Morioka, Japan.
8. Singh, P., and **Sarkar, S.**, 2018, Influence of wall roughness on the laminar separation bubble, Proceedings of the Asian Congress on Gas Turbines, Paper No. ACGT2018, TS50, Morioka, Japan.
9. **S Sarkar** and K. S. Jadhav, 2017, "Absolute and Convective Instabilities of a Separated Boundary Layer Near the Leading Edge of an Aerofoil", Proceedings of the ASME Turbo Expo, Article No. GT2017-65265, Vol. 2D-2017, USA, (doi:10.1115/GT2017-65265)
10. Anjali Dwivedi, Ankit Verma and **S Sarkar**, 2017, "Flow and Heat Transfer Analysis of Mist-Film Cooling on a Flat Plate", ASME 2017 Gas Turbine India Conference, Vol. 1, Article No. GTINDIA2017-4568, Bangalore. (doi:10.1115/GTINDIA2017-4568)
11. Srivastava, S., and **Sarkar, S.**, 2017, "Flow and Heat Transfer Past a Cylinder in Proximity of a Wall", International Heat and Mass Transfer Conference, Paper No. IHMTC2017-01-1329, India.
12. **S. Sarkar**, 2016, "Performance of a Compressor Blade at Low Reynolds Number Condition by LES", Proceedings of the Asian Congress on Gas Turbines, Paper No. ACGT2016 121, IIT Mumbai, India.
13. **S. Sarkar**, 2016, " LES: Effect of Reynolds Number on a High-Lift LPT Blade", Proceedings of the Asian Congress on Gas Turbines, Paper No. ACGT2016 124, IIT Mumbai, India.
14. **S. Sarkar** and P. Gupta, 2015, "Thermal Analysis of a Turbine Blade: Effect of Film Cooling and Internal Convective Cooling" ASME Gas Turbine India Conference, Paper No. GTIndia2015-1296, Hyderabad, India.
15. **S. Sarkar** and Ganesh Ranakoti, 2015, "Effect of Vortex Generators on Film Cooling Effectiveness", ASME Gas Turbine India Conference, Paper No. GTIndia2015-1392, Hyderabad, India.
16. **S. Sarkar** and Harish Babu, 2015, "Effect of Jet Pulsing on Film Cooling near the Leading Edge of a Model Aerofoil by LES", Proceedings of CHT-15, ICHMT International Symposium on Advances in Computational Heat Transfer, Paper No. CHT-15-139, Rutgers University, USA.
17. Harish Babu and **S. Sarkar**, 2015, "LES of Jet-Crossflow Interactions: Flow Structures and Heat Transfer Characteristics", Proceedings of CHT-15, ICHMT International Symposium on Advances in Computational Heat Transfer, Paper No. CHT-15-109, Rutgers University, USA.
18. Anand K, **S. Sarkar** and Thilakan, N., 2014, "Experiments on Leading-edge Induced Separates

Shear Layer Under Various Imposed Gradients" ASME Gas Turbine India Conference, Paper No. GTIndia2014-8177, Delhi, India.

19. K.M. Nair, **S. Sarkar** and Z. Labana, 2014, "Self-sustained oscillation for a three dimensional transonic cavity using LES", 5<sup>th</sup> International and 41<sup>st</sup> National Conference on Fluid Mechanics and Fluid Power, Paper ID- 288. (**Awarded the Best Paper**).
20. **S. Sarkar, 2014**, "Unsteady Flows in Turbomachinery: Challenges and Success", Symposium on Turbomachines, 5-6th April, 2014 MNNIT Allahabad, India (**Keynote Speaker**).
21. **S. Sarkar** and Anand K, 2014, Experimental Investigation of Separated Shear Layer over a Flat Plate for Various Angles of Attack and Tail Flap Deflections, Proceedings of the ASME Turbo Expo, Vol. 5C, Paper No.GT2014-26113, Düsseldorf Germany.
22. **S. Sarkar** and Samson Ratnakumar Annapureddy, 2014, Aerodynamic Investigation on the Interactions of Laminar Separation Bubble and Secondary Jets, Proceedings of the ASME Turbo Expo, Vol. 5C, Paper No.GT2014-26115, Düsseldorf Germany.
23. **S. Sarkar** and Harish Babu, 2014, Large Eddy Simulation on the Interactions of Wake and Film-Cooling Near a Leading Edge, Proceedings of the ASME Turbo Expo, Vol. 2D, Paper No.GT2014-26117, Düsseldorf Germany.
24. K. Anand and **S. Sarkar**, 2013, Experimental Investigation of Separated Shear Layer form a Leading Edge subjected to various Angles of Attack with Tail Flap Deflections, 40th National Conference on Fluid Mechanics and Fluid Power, NIT Hamirpur. India
25. A. Samson and **S. Sarkar**, 2013, Experimental Study on the Effect of Freestream Turbulence on the Development of an Inflectional Boundary Layer from the Semi-circular Leading Edge of a Flat Plate, Proceedings of ASME Gas Turbine India Conference, Bangalore, India.
26. Harish Babu and **S. Sarkar**, 2013, Numerical Simulations of Flow over a Film Cooled Semi-Circular Leading Edge, The 14th Asian Congress of Fluid Mechanics - 14ACFM, Vietnam.
27. K.M. Nair and **S. Sarkar**, 2013, Self- sustained cavity oscillation for a wide range of Mach numbers, 14th Asian Congress of Fluid Mechanics - 14ACFM, Vietnam.
28. A. Samson, K. Anand and **S. Sarkar**, 2013, Experimental Investigation on the Interactions of Separation Bubble with Injected Jets in the Downstream, 14th Asian Congress of Fluid Mechanics - 14ACFM, PP. 272-276, Vietnam.
29. Samson R Kumar A and **S. Sarkar**, 2012, Aerodynamic Measurements on the Interaction of Secondary Jets and Separation Bubble, ASME Gas Turbine India Conference Pages 63-72, Mumbai, India.
30. **S. Sarkar, 2012**, Large Eddy Simulation of Wake-Induced Transition over a Highly-Loaded LPT Blade, International conference on application of fluid Engineering, India (**Keynote Speaker**).
31. Harish Babu and **S. Sarkar**, 2012, Study of Inlet Perturbations on Excitation of a Laminar Separation Bubble through LES, 9th International Conference on Heat Transfer, Fluid Mechanics and Thermodynamics, Malta.
32. **S. Sarkar** and R. Mandal, 2012, Effects of Synthetic Jet in Suppressing Cavity Oscillations, World Academy of Science, Engineering and Technology, Issue 67, Zurich, Switzerland.
33. Samson R Kumar A, **S. Sarkar** and K. Anand, 2012, Experimental Investigation of a Separation Bubble on a Flat Plate with Semi-circular Leading Edge for different Reynolds Numbers, 9th International Conference on Heat Transfer, Fluid Mechanics and Thermodynamics, Malta.



34. Harish Babu and **S. Sarkar**, 2011, Effect of Free-Stream Turbulence on Separation Bubble, IUTAM Symposium on Bluff Body Flows, India.
35. **S. Sarkar** and R. Mandal, 2011, Control of Cavity Flow Oscillations using Pulsed Fluidic Injection, IUTAM Symposium on Bluff Body Flows, India.
36. Pankaj Saha, G. Biswas and **S. Sarkar**, 2011, Coherent structure in vortex dominated flows, Paper No: 104, IUTAM Symposium on Bluff Body Flows, India.
37. Pankaj Saha, G. Biswas and **S. Sarkar**, 2011, Shear Improved Smagorinsky Model for Large Eddy Simulation applied to Lid- driven cavity flows”, Proceedings of the 21<sup>st</sup> National and 10<sup>th</sup> International ISHMT-ASME Heat and Mass Transfer Conference, Paper No: ISHMT-IND-01-031, IIT Madras, India.
38. S. Sarkar and R. Mandal, 2011 Study of Cavity Oscillation and its Control using Synthetic Jet, 5th Symposium on Applied Aerodynamics and Design of Aerospace Vehicle (SAROD 2011), India.
39. **S. Sarkar** and Jasim Sadique, 2011, Interactions of Separation Bubble with Oncoming Wakes by LES, Proceedings of the ASME Turbo Expo, Article No. GT2011-46057, Vancouver, Canada, Vol. 7, pp. 1645-56.
40. **S. Sarkar**, R. N. Mehrotra, 2011, Use of CFD Analyses to Predict the Aero-Thermal Behaviour of a Film Cooled Land Based Gas Turbine Blade, International O&M Conference, New Delhi, India.
41. **S. Sarkar**, 2010, Lager-Eddy Simulation: A Preview, Workshop on Computational Fluid Dynamics, Centre for Modeling, Simulation and Design, University of Hyderabad, India (**invited paper**).
42. Yashwanth B. L, A. Sarkar and **S. Sarkar**, 2010, Analysis of blast induced intracranial pressure dynamics in cerebrospinal fluid leading to traumatic brain injury, 37th National & 4th International Conference on Fluid Mechanics and Fluid Power, IIT Madras, India.
43. **S. Sarkar**, Yashwanth B. L, 2010, Study of self-sustaining cavity oscillations using LES, 37th National & 4th International Conference on Fluid Mechanics and Fluid Power, IIT Madras, India.
44. **S. Sarkar**, Ch. Niranjan Reddy and Jasim Sadique, 2010, LES of flow separation over a flat plate with semicircular leading edge using immersed boundary method, 37th National & 4th International Conference on Fluid Mechanics and Fluid Power, IIT Madras, India.
45. **S. Sarkar** and Sudipto Sarkar, 2010, LES of Flow past two Circular Cylinders in Staggered, Tandem and Side-By-Side Arrangements, Proceedings of 8th Asian CFD Conference, Hong-Kong.
46. N. K. Singh and **S. Sarkar**, 2010, Numerical Simulation of Flow behind Vortex Generators on a Flat Plate, Proceedings of 8th Asian CFD Conference, Hong-Kong.
47. **S. Sarkar**, 2009, Turbulent Flows of Engineering Interest, International Conference on Turbulence, IIT Kanpur, India (**invited paper**).
48. **S. Sarkar**, 2009, Lager-Eddy Simulation for Some Flows of Engineering Interest, 11th Annual CFD Symposium, Aeronautical Society of India, Bangalore (**invited paper**).
49. Sudipto Sarkar and **S. Sarkar**, 2009, Ground effect of a circular and an elliptic cylinder in the vicinity of a plane wall, **FMFP-09**, Pune, India.
50. N.K. Singh and **S. Sarkar**, 2009, Large Eddy Simulation of a Laminar Separation Bubble: Applicability of SGS Models, **FMFP-09**, Pune, India.
51. **S. Sarkar** and N. K. Singh, 2008, Large Eddy Simulation of a Laminar Separation Bubble: Smagorinsky and Dynamic Models, 6th International Symposium on Turbulence and Shear Flow Phenomena TSFP-6, Seoul, South Korea, Pages 569-574.

52. **S. Sarkar** and N. K. Singh, 2008, Large Eddy Simulation of a Separation Bubble, *FMFP 2008*, Bangalore, India.
53. **S. Sarkar** and Sudipto Sarkar, 2008, LES of Flow over Circular and Elliptic cylinder in Proximity of Wall, 6th International Symposium on Turbulence and Shear Flow Phenomena, TSFP-6, Seoul, South Korea, Pages 1231-1236.
54. **S. Sarkar** and Sudipto Sarkar, 2008, Wake and Boundary Layer Interactions as Shape Changes from a Circular to an elliptic cylinder, *FMFP 2008*, Bangalore, India.
55. **S. Sarkar**, 2008, Influence of wake structure on unsteady flow in an LP turbine blade passage, Proceedings of the ASME Turbo Expo, (Paper No. GT2008-50809), Vol. 6, pp. 1933-43, Berlin, Germany.
56. **S. Sarkar**, 2007, Influence of wake structure on unsteady flow in a LP turbine blade passage, International Gas Turbine Congress 2007, Tokyo, Japan.
57. **S. Sarkar**, 2007, Boundary layer structures on a low-pressure turbine blade due to periodic passing wakes, Proceedings of *7th Asian CFD Conference*.
58. **S. Sarkar** and Sudipto Sarkar, 2007, Large eddy Simulation of cylinder boundary layer interactions, Proceedings of *7th Asian CFD Conference*.
59. **S. Sarkar** and A. Sadhu, 2007, LES of unsteady boundary layer along a compressor blade at low Reynolds number, Proceedings of *7th Asian CFD Conference*.
60. D. S. Kulkarni, **S. Sarkar**, B. N. Rajani and Sekhar Majumda, 2007, Prediction of airfoil characteristics for a wide range of angle of attack using low-Reynolds number k-e and V2f turbulence models, Proceedings of *7th Asian CFD Conference*.
61. **S. Sarkar**, 2007, Effects of wake structure on a separating boundary layer along a low-pressure turbine blade, *4th International Conference on Theoretical, Applied, Computational and Experimental Mechanics, ICTACEM 2007*.
62. Sudipto Sarkar and **S. Sarkar**, 2007, Immersed boundary method for simulating complex flows, Numerical Methods for Fluid Dynamics (ICFD 07), 9th International Conference, the University of Reading, U.K., March 26-29.
63. Sudipto Sarkar and **S. Sarkar**, 2007, Simulation of flow over a circular cylinder for a wide range of Reynolds numbers using Immersed Boundary Technique, National Conference of Research Scholars in Mechanical Engineering, I.I.T. Kanpur, India.
64. D.S.Kulkarni, **S. Sarkar**, Sekhar Majumdar, 2007, Prediction of airfoil characteristics for a wide range of angle of attack using different turbulence models, Indo-Australian Workshop on CFD Approach on Fluid Flow, Heat and Mass transfer & Symposium on CFD Applications in Multidisciplinary Areas, I.I.T. Roorkee, India.
65. **S. Sarkar**, 2005, Large-eddy simulation of flow structure over a LP turbine blade interacted by passing wakes, 8th Annual CFD Symposium, Aeronautical Society of India, Bangalore (**invited paper**).
66. **S. Sarkar**, 2005, Wake-induced transition of a highly loaded LP turbine blade through large-eddy simulation, Proceedings of the ASME Turbo Expo, Article No. GT2005 68895, Vol. 3, pp. 1067-1078, USA.
67. **S. Sarkar** and P. R. Voke, 2005, Large-eddy simulation of unsteady surface pressure on a LP turbine blade due to interactions of passing wakes and inflexional boundary layer, Proceedings

of the ASME Turbo Expo, Article No. GT2005 68867, Vol. 6, pp. 1435-1446, USA.

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69. **S. Sarkar**, and P.R. Voke, 2003, LES of Passing Wakes Influencing Transition On Turbine Blades, ERCOFTAC Workshop, DLES-5, Munich University of Technology, Germany.
70. **S. Sarkar**, and P. R Voke, 2002, LES of wake interactions with LP turbine blades, LESUK2 Consortium, Second Workshop, University of Loughborough, UK.
71. A. Mukherjee and **S. Sarkar**, 2001, Calculation of Wake-Induced Unsteady Flow and Heat Transfer in a Turbine Cascade, Fifth ISHMT-ASME Heat and Mass Transfer Conference and sixteenth National Heat and Mass Transfer Conference, pp.1433-39.
72. **S. Sarkar**, D. Basu, K. Das, 2000, Prediction of Transitional Flow and Heat Transfer Over Transonic Turbine Cascade, 34th National Heat Transfer Conference, ASME Paper No. NHTC2000-12045, Pennsylvania, August 20-22.
73. **S. Sarkar**, D. Basu, K. Das, 2000, Three-Dimensional Navier-Stokes Analysis of Transonic Turbine Cascades Using Multigrid Algorithm, 22nd Congress of the International Council of Aeronautical Science, Harrogate, U.K.
74. **S. Sarkar**, K. Das, D. Basu, 2000, Heat Transfer Analysis in Film-Cooled Turbine Cascades Using Multigrid Method, American Society of Mechanical Engineers, Fluids Engineering Division, Article No. FEDSM2000-11067, Volume 253, 2000, Pages 581-586, USA.
75. **S. Sarkar**, K. Das, D. Basu, 2000, Viscous Calculation for Turbomachinery Application with multigrid Algorithm, Fourth ISHMT-ASME Heat and Mass Transfer Conference and Fifteenth National Heat and Mass Transfer Conference, India.
76. **S. Sarkar**, D. Basu, K. Das, 1999, Multigrid Based Prediction of Transitional Flow and Heat Transfer Over Transonic Turbine Cascades, Third International Conference of Fluid Mechanics and Heat Transfer, Dhaka, pp. 312-319.
77. **S. Sarkar**, K. Das, D. Basu, 1999, Aero-Thermal analysis of radially cooled turbine blade with multigrid method, 26th National Conference on Fluid Mechanics and Fluid Power, I.I.T. Kharagpur, pp. 387-396.
78. **S. Sarkar**, D.Basu, K. Das, 1999, Development of an efficient flow solver using Multigrid Algorithm, International Conference on Mathematical Modelling of Non-Linear Systems, I.I.T. Kharagpur, Vol.1, pp. 249-266.
79. **S. Sarkar**, D. Basu, and K. Das, 1999, Simulation of Secondary Flows in Cascades using Multigrid Method, Proc. of National Aerodynamics Conference, VSSC, Thiruvananthapuram.
80. **S. Sarkar**, D. Basu and K. Das, 1998, Efficient Solution of Euler Equations with a Multigrid Algorithm, 25th. National and 1st. International Conference on Fluid Mechanics and Fluid Power, IIT Delhi, Vol. 1, pp. 191-200.
81. **S. Sarkar**, and Mahesh. K. R., 1998, Numerical Simulation of Film Cooling: Effects of Velocity Distribution at the Hole Exit, Fourth National Conference on Air Breathing Engines and Aerospace Propulsion, I.I.Sc., Bangalore, pp. HT6-12.
82. **S. Sarkar**, 1997, Navier-Stokes Analysis with Different Turbulence Models for Film-Cooled Turbine Cascades, Third ISHMT-ASME Heat and Mass Transfer Conference and Fourteenth

National Heat and Mass Transfer Conference, IIT Kanpur, pp. 815-820.

83. **S. Sarkar**, 1997, Three-Dimensional Euler and Navier-Stokes Analysis of a Transonic Turbine Cascade, The Seventh Asian Congress of Fluid Mechanics, IIT Madras, pp. 717-720.
84. **S. Sarkar**, 1997, A Navier-Stokes Solver for Turbomachinery Film Cooling, International Conference on Advances in Mechanical and Industrial Engineering, Roorkee, pp. 545-552.
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86. **S. Sarkar**, 1996, Prediction of Transonic Flow and Heat Transfer over Transonic Turbine Cascades, Third National Conference on Air Breathing Engines and Aerospace Propulsion, IIT Madras, pp. 333-342.
87. **S. Sarkar**, and T. K. Bose, 1996, Numerical Simulation of Film Cooling on a Turbine Cascade, Third National Conference on Air Breathing Engines and Aerospace Propulsion, IIT Madras, pp. 343-350.
88. **S. Sarkar**, 1996, Numerical Analysis of Three-Dimensional Turbine Cascade Flows, 2nd. National Conference on Fluid Machinery, June 28-29.
89. **S. Sarkar**, 1996, Three-Dimensional Navier-Stokes and Euler Calculations for a Transonic Turbine Cascade, 9th. International Symposium on Transport Phenomena in Thermal-Fluids Engineering, (ISTP-9), Singapore, pp. 442-447.
90. **S. Sarkar** and T. K. Bose, 1995, Numerical study of film cooling: a three-dimensional calculation, Second ISHMT-ASME Heat and Mass Transfer Conference and Thirteen National Heat and Mass Transfer Conference, Suratkal, India.
91. **S. Sarkar** and T. K. Bose, 1995, A Three-dimensional calculation of film cooling on a turbine cascade, International Symposium on Advanced Energy Conversion System and Related Technology (RAN95), Nagoya, Japan.
92. **S. Sarkar** and T. K. Bose, 1995, Navier-Stokes analysis applied to film-cooled turbine cascades, Proc. Ninth International Conference on Numerical Methods in Laminar and Turbulent Flow, Atlanta, U.S.A, Vol. 9, Part 2, pp. 881-886.
93. **S. Sarkar** and T. K. Bose, 1995, Slot injection: Numerical simulation of influence of free-stream turbulence on film cooling, First Asian Computational Fluid Dynamics Conference, Hong-Kong, pp. 561-566, Jan 16-19.
94. **S. Sarkar** and T. K. Bose, 1995, A Navier-Stokes analysis of steady two-dimensional transonic cascade flows, First Asian Computational Fluid Dynamics Conference, Hong-Kong, pp. 881-886.
95. **S. Sarkar** and T. K. Bose, 1994, A Navier-Stokes analysis of flow and heat transfer in turbine cascades with bleeding, Second National Conference on Air Breathing Engines and Aerospace Propulsion, VSSC, Thiruvananthapuram, India.
96. **S. Sarkar**, 1990, Flow investigations in a high specific speed mixed flow pump impeller, Proc. of 17th National conference on FMFP, Warangal, India.

1. An **LES** (Large-Eddy Simulation) **Solver** has been developed and transferred to **ADA** to study the flow structures and associated acoustics pertaining to the unmanned air vehicle (**UAV**) project, 2010-15.
2. An **LES** (Large-Eddy Simulation) **Solver** has been developed and transferred to **GTRE** for aero-thermal analysis and design of **gas turbine units** and stator-rotor interactions including cooling of rotating blades, 2010-15.
3. A three-pad **foil air journal bearing** has been developed and designed as per the requirements of HAL for the air cycle machines in an aircraft. This foil air journal bearing would replace the conventional bearing and has several advantages such as *high rotational speed, high reliability, no auxiliary lubrication system and thus low maintenance*. An analysis of fluid flow and heat transfer has been carried out to assure the desired load bearing capacity and the technology was transferred to HAL. It was later fabricated and successfully tested (2006-08).
4. A **foil air thrust bearing** has been developed and designed as per the requirements of HAL. The technology will be transferred to HAL (2014-16). This will replace the conventional thrust bearing and can rotate at 1,00,000 rpm.
5. During 1990s, a considerable number of **Re-rolling Mills and Galvanizing Plants** in Howrah District, West Bengal were closed pertaining the Government regulation of environmental pollution as the SMP measured from the exhaust of the chimneys was beyond the allowed limit. A **model cyclone separator as an antipollution device** was designed and transferred to the Govt. of West Bengal, small and medium-scale industrial unit. This brought about 100 *Re-rolling Mills and Galvanizing Plants in Howrah* back into action, 1995-1997 (PI/B.E.College).

## Funding

### Sponsored Projects

1. "Large-eddy simulation of transitional flow over a low pressure turbine blade", Sponsored by Ministry of Defense, **GATET, 2010-2015**, (PI).
2. "A study of the effects of wake passing on turbine blade film cooling", Sponsored by Ministry of Defense, **GATET, 2010-2015**, (PI).
3. "Numerical simulations of flow and heat transfer around film-cooled gas turbine blades with different turbulence models", Sponsored by Ministry of Defense, **GATET, 2010-2015**, (PI).
4. "Study of flow structures and associated acoustics in a cavity using LES", Sponsored by **ADA** Bangalore, India, **2010-2013**, (PI).
5. "Analysis of gas injection system and gas heavy metal separation system target for accelerator driven system", Sponsored by **BRNS, 2009-2012**, (CoPI).

6. "A study of the effects of wake passing on turbine blade film cooling", Sponsored by **AR&DB**, Government of India, **2008-2012**, (PI).
7. "Under Fist," Optical diagnostic equipment for velocity and Turbulence (time-resolved) measurement for turbomachinery applications", Sponsored by **DST**, Government of India, **2006-2009**, (PI).
8. "LES of wake interactions over a LP turbine blade", Sponsored by **AR&DR**, Government of India, **2004-2007**, (PI).
9. "Numerical simulation of wake interactions with a turbine blade", Sponsored by **EPRSRC** and **Rolls Royce, UK**, **2001-2003**,(CoPI-Prof. P.R.Voke, UniS, UK).
10. "A Three-Dimensional Navier-Stokes Analysis for a Film Cooled Rotating Blade", Sponsored by **AR&DB**, Government of India, **1999-2002**, (PI).
11. "Development of a Navier-Stokes solver for turbomachinery applications", Sponsored by **AICTE**, Government of India, **1998-2000**, (PI).

### **Consultancy**

#### **Consultancy Projects:**

1. "Technology Development and Aerodynamic Analysis of Foil Air Thrust Bearing for High Speed Air Cycle Machine", Sponsored by **HAL**, India, **2014-2015**, (PI).
2. "CFD evaluation of aerodynamics and internal cooling performance of a gas turbine blade", Sponsored by **NTPC**, **2009-2012**, (PI).
3. "Aerodynamic Analysis of Foil Air Bearing", Sponsored by **HAL**, India, **2006-2007**, (PI).
4. "Project on LCA: Three-dimensional flow analysis and design optimization of the Kaveri Engine Exhaust Duct including struts and after burner", **GTRE**, Bangalore, India. **2000-2001**, (PI).
5. "Project on LCA: Prediction of flow and heat transfer distributions over turbine blades with and without film cooling", **GTRE**, Bangalore, India, **2000-2001**, (PI).
6. "Project on LCA: Determination of optimized location of trailing edge ejection holes on turbine blades", **GTRE**, Bangalore, India, **2000-2001**, (PI).
7. "Development of analytical models for calculating flow and heat transfer parameters to design a hot air oven", **Lohia Packaging**, Kanpur, **1998- 1999**, (PI).
8. "Design of cyclone separator as antipollution device, SPM monitoring instrument and heat exchanger as air pre-heater", **Re-rolling Mills and Galvanizing Plants**, Howrah District, **1995-1997** (PI/B.E.College).

### **Peer Recognition**

1. HAL Chair, 2017-20.
2. Awarded Visiting Fellowship for two years, 2001-2003, University of Surrey, UK.
3. Member of the Propulsion Panel, AR&DB, Govt. of India, 2010-12.

4. Review Chair, ASME Gas Turbine India Conference, 2014.
5. Member of ASME since 2005.
6. Awarded the Best Paper for "Self-sustained oscillation for a three dimensional transonic cavity using LES", 5th International and 41st National Conference on Fluid Mechanics and Fluid Power 2014.
7. Awarded the Best Paper for "Aero-thermal analysis of a compressor blade at low Reynolds number through LES", International Conference on Computational Methods for Thermal Problems, THERMACOMP, 2018.
8. Ronald W. Lewis Award for the paper "Film cooling enhancement by introduction of mist on a flat plate", International Conference on Computational Methods for Thermal Problems, THERMACOMP, 2018.
9. Received Directors commendation for teaching Viscous Flow Theory, Advanced Theory of Turbomachinery and Fluid Mechanics and Rate Processing at IIT Kanpur.
10. Obtained Merit Scholarship for four years while pursuing Bachelor Degree at Bengal Engineering College, Calcutta University. ORS award from British Government and Studentship from Kings College, Cambridge for Ph.D was offered.
11. Reviewer for Journal of Fluid Mechanics; ASME Journal of Fluids Engineering; ASME Journal of Turbomachinery; ASME Journal of Heat Transfer; J. AIAA; Journal of Mechanical Engineering Science, IMechE, Part C; Journal of Power and Energy, IMechE, Part A; Journal of Aerospace Engineering, IMechE, Part G and J. of Engineering Mathematics, physics of fluids, .

#### **Invited Seminar/Lecture**

1. "LES of Unsteady Flows: Challenges and Success" invited talk, University of Florida, Gainesville, 13th May, 2015.
2. S. Sarkar, 2014, "Unsteady Flows in Turbomachinery: Challenges and Success", Symposium on Turbomachines, 5-6th April, 2014 MNNIT Allahabad, India (Keynote Speaker).
3. "Large-Eddy Simulation: A Preview", Workshop on LES, Otto von Guericke University of Magdeburg Germany, 12-13th July 2012.
4. "Large-Eddy Simulation for Flows of Engineering Interest", invited talk, Otto von Guericke University of Magdeburg, Germany, 12th July 2012.
5. "Large-Eddy Simulation of Wake-Induced Transition over a Highly-Loaded LPT Blade", invited talk, Technical University of Dresden, Germany, 10th July 2012.
6. "Large Eddy Simulation of Wake-Induced Transition over a Highly-Loaded LPT Blade, International conference on application of fluid Engineering", keynote speaker, Delhi, India, 2012.
7. "Large-Eddy Simulation: A Preview, Workshop on Computational Fluid Dynamics, Centre for Modeling, Simulation and Design", invited paper, University of Hyderabad, 2010.
8. "Turbulent Flows of Engineering Interest, International Conference on Turbulence", invited paper, IIT Kanpur, 2009.
9. "Large-Eddy Simulation for Some Flows of Engineering Interest, 11th Annual CFD Symposium", Invited paper by Aeronautical Society of India, Bangalore, 2009.

10. "Large-eddy simulation of flow structure and transition over a LP turbine blade interacted by passing wakes", Invited Speaker, Annual CFD Symposium, Aeronautical Society of India, Bangalore, 2005.
11. "Large-eddy Simulations of blade wake interactions of LP turbines" invited by NAL, Bangalore, July, 2004.
12. "Wake-induced transition of a highly loaded LP turbine blade through large-eddy simulation" presented at CDF Lab. and Whittle Lab., University of Cambridge, 2003.
13. "Unsteady surface pressure over a LP turbine blade due to passing wakes", presented at Rolls-Royce, UK, 2002.
14. "CFD and Aero-engines", Invited Speaker, Aeronautical Society of India, 17.06.2000.
15. "Jet-Crossflow Interactions and Turbulence Modelling and "Numerical Simulation of Film Cooling over Turbine Blades", National Aerospace Laboratory, Bangalore, India, 1996.
16. "CFD Applied to Turbomachinery", invited by Gas Turbine Research Establishment, Bangalore, India, 1995

### ***Contributions to the institute***

#### **Institute Level Administrative Assignments:**

1. Chairman, House Allotment Committee-II (Type II/I/IA & IB houses) from November 1, 2016 to October 31, 2019.
2. Coordinator from IIT Kanpur for Multicentric Gas Turbine Technology (GATET) Initiative in India 2007-2013.
3. Coordinator from IIT Kanpur for Unman Air Vehicle (UAV) Initiative in India, ADA, 2009-2012.

#### **Department Level Administrative Assignments:**

1. Member, Departmental Faculty Affairs Committee (DFAC), 2016-2019.
2. Member, Departmental Faculty Affairs Committee (DFAC), 2010-2012.
3. Convener of Energy Conversion Lab, IIT Kanpur, Oct 2004 - Till date.
4. Convener of DPGC, Member of DUGC/DPGC (several times).
5. Convener of FTS Group, FTS group activities, IIT Kanpur, 2003-2005.
6. Convener, Stock Verification, ME, 2003-2005.
7. Convener of the committee, condemnation of old/non-functioning instruments, 2004-2005.
8. Faculty Counsellor of the Department, 2000-2001.
9. Faculty Adviser, IIT Kanpur, 1999 - 2001.

#### **Development of Research Facilities:**



1. Experimental facilities are being developed to keep up the pace with the recent technological advancement in the field of Turbomachinery and thus to enhance the research activities so as to improve the understanding of unsteady flow phenomena.
2. A cascade tunnel with a sweeping row of wake-generating bar upstream of cascade (to mimic rotor-stator interactions) has been designed and fabricated.
3. A general purpose wind tunnel with a transparent test section has also been fabricated.
4. Facilities have been developed to resolve the flow field and turbulence through optical measurement techniques, such as PIV and LDA.
5. Instruments such as Electronically Scanned Pressure (ESP), digital micro-manometers, temperature recorder have been purchased during the financial year.
6. An LES Compressible Flow Solver has been developed and parallelized using MPI.
7. An existing incompressible LES solver in coordinate independent or covariant form has been parallelized using MPI.
8. Three High Performance Clusters have been purchased for unsteady turbulent flow research. All in-house developed flow solvers are successfully running with their parallel version.
9. Developed Computational Turbomachinery Lab for PG Research.

**Teaching Lab Modernization:** Energy conversion lab (ME401A) has been thoroughly modernized with addition of following test setups:

1. Series and Parallel pump
2. Pelton and Francis Turbine
3. Multi stage centrifugal compressor
4. Rankine cyler (A mini power plant)
5. I. C. Engine (Variable compression ratio)
6. Refrigeration Unit

### ***Contributions outside the institute***

1. Review Chair, ASME Gas Turbine India Conference, 2014.
2. Member of the Propulsion Panel, AR&DB, Govt. of India, 2010-12.
3. Track Chair, Heat Transfer, ASME Gas Turbine India Conference, 2015.
4. Members of faculty selection committee, IIT Kharagpur, 2014, NIT Kurukshetra, 2013.
5. Members of Academic Review Committee, NIT Allahabad, 2014 & External Member of Academic Senate for three years, 2015-17, NIT Kurukshetra.
6. Session Chair to review and assess all papers under the session Film Cooling, ASME Gas Turbine India Conference 2013.
7. Session chair to review and assess all papers under the session Film Cooling, ASME Gas Turbine India Conference 2012.

8. Session chair, Conjugate Heat Transfer, ASME Turbo Expo 2012, Copenhagen, Denmark.
9. In-charge of Computer Laboratory, Department of Mechanical Engineering, B. E. College, Calcutta University. 1996 - Nov. 1997.

**Continuing Education Workshops Organized:**

1. "Large-Eddy Simulation: A Preview", Workshop on LES, Otto von Guericke University of Magdeburg Germany, 12-13th July 2012.
2. "Large-Eddy Simulation: A Preview, Workshop on Computational Fluid Dynamics, Centre for Modeling, Simulation and Design", invited speaker, University of Hyderabad, 2010.
3. "Large-Eddy Simulation for Some Flows of Engineering Interest, 11th Annual CFD Symposium", Invited paper by Aeronautical Society of India, Bangalore, 2009.
4. Delivered a series of lectures on "Turbulence modeling and their applications" Teaching Workshop, Organised by GE, India, Bangalore, 2005.
5. Presented a series of lectures on "CFD and Aero-thermal Analysis of Turbomachinery" to senior officers of Hindustan Aeronautics Limited, Koraput, India, 10.06.2000 to 19.06.2000.
6. Delivered lectures on "Experimental Methods in Turbomachinery" for the Summer Course on Experimental Methods in Thermal Science, sponsored by the Quality Improvement Program of the Ministry of Human Resource Development, Government of India and organized by IIT Kanpur, 2-7 August 99
7. Delivered lectures on "Compressible Flows", "CFD for Compressible Flow", and "CFD & Turbomachinery" for the Summer Course on Special Topics in Fluid Mechanics, sponsored by the Quality Improvement Program of the Ministry of Human Resource Development, Government of India and organised by IIT Kanpur, 20-25 July 98.

***Others***

I like painting and photography.