

Dr. SANDIP DUTTA

Work:

Lecturer, Mechanical Engineering Dept.

222 Fluor Daniel Bldg.

Clemson university

Clemson, SC 29634

sdudda@clemson.edu, alternate email: samdata40@gmail.com

Mobile: (678) 643-3546

1. SUMMARY

Computational Sciences, Data Analytics, and Thermal Sciences expert with significant academic, software, and industrial experience. I had been fortunate to have an exciting career that spanned from academia to commercial software and business development. My latest engagement prior to Clemson University was on Thermal and Mechanical Engineering design and involved advanced knowledge of thermal sciences. Prior to that I oversaw software development and quality assurance at Cognex (leader in machine vision) and interacted with customers and developers as a product manager. I was responsible for stable good quality software and hardware releases- and also prioritized features for major and minor releases to satisfy market lead and customer needs. I have enterprise software development skills and developed transaction-based fault tolerant computing architecture. I am a successful researcher and educator. My undergraduate and graduate students did well in their careers and I have more than fifty scholarly publications as listed later in this resume. I also co-authored a graduate level textbook, "Gas Turbine Heat Transfer and Cooling Technology", currently available in 2nd edition; 3rd edition is in preparation. My understanding of thermal engineering was enhanced from these hands on industrial experiences; and I look forward to transfer that acquired knowledge to my students and create innovative research projects.

My job responsibilities included- Turbine Hot-Gas-path Component design and production (US Export Controlled work), Head of software quality department, Factory automation and PLCs, Mechatronics, Faculty of Mechanical Engineering, Co-Author of graduate level textbook, Head of a research laboratory, Architect of complex enterprise software, Consultant and lead investigator to both Government and industrial projects. I also handled legal and financial aspects of a family business. There are 33 patents based on my work at GE.

2. EXPERTISE AND RESEARCH ACTIVITIES

- **Computational Sciences:** Continuing on Data Analytics with R and Python. Georgia Tech Micro-Masters on Data Analytics. MS in Computational Data Analytics from Georgia Tech- expected graduation Dec. 2019. Expertise in Ansys (Finite Element Analysis), Software Quality and Development Life Cycle. Marketing and training for smart image processing products. Manager of software repository hub.
- **Thermal sciences and Fluid Mechanics:** Designs related to turbine blades. Heat and water management in PEM fuel cells. Numerical model development and analysis of complex flows and turbulence in turbine blades. Design of experiments, predictions for the next generation of gas-turbines.
- **Automation Technology:** Mechatronics, PLC, Factory Automation, Statistical analyses, Finite Element analyses, Control Volume simulations. Instrumentation and non-destructive measurements, field trial validation, Component life assessment, statistical forecasting.
- **Software and Hardware Release Management:** Bug triage for service releases and new feature evaluations/feasibility studies for new products. Create installation packages and automate builds. Convert UI for multiple languages and regions. Oversee documentation and online help.
- **Machine Vision:** Quality and maintenance of complex machine vision and robotics software. Build a link among customers, marketing, training personnel, sales and application engineers, and developers for a smooth and systematic product development. Hire qualified personnel suitable for the team. Was involved in a business transition from start-up to take-over.

- **Project Management:** Managed full life cycle of software and needed resources. Negotiated manpower and machine availability from a limited resource pool. Prioritized and synchronized several different software development stages. UML and Rational Unified Process (RUP).
- **Small Business:** Financials of a family owned small business with \$600K per year gross revenue and \$3.8M in assets. Small but with all the same issues of a larger business. Handled taxes, finances, Legal and Licensing aspects. Will pursue computational finance research.
- **Research Proposals:** Extraction of real business requirements from users and development of white papers, case studies, technical papers, proposals in response to RFP.
- **Commercial Software:** Developed real world software for Insurance, manufacturing, Telecommunication industries and start-up companies. These had to be maintainable, readable, upgradable, and fault tolerant.
- **Scientific computing:** Complex, multivariable, statistical numerical analysis of thermal science and other engineering problems. Very complex turbulence and fluid dynamics computation using finite element and control volume approaches. Developed a new turbulence model for separated flows.

3. EDUCATION

M.S. (Expected graduation Dec, 2019, longer if part-time) in Computational Data Analytics. Big Data related to Finance. Georgia Tech University, Atlanta, GA.

Micro-Masters eDX (Expected graduation Dec, 2018) in Business Data Analytics. Big Data with R and Python. Georgia Tech University, Atlanta, GA.

Ph.D. (August, 1995) in Mechanical Engineering. Texas A&M University, College Station, Texas. Dissertation- "An Experimental and Numerical Study of Turbulent Heat Transfer in Orthogonally Rotating Two-Pass Ducts." Adviser: Prof. J.C. Han.

M.S. (August, 1992) in Mechanical Engineering. Louisiana State University, Baton Rouge, Louisiana. Thesis- "A Numerical Study of Turbulent Flow and Heat Transfer in A Ribbed Duct With Two Equation Turbulence Models." Adviser: Prof. S. Acharya.

B.Tech. (May, 1985) in Mechanical Engineering. Indian Institute of Technology, Kharagpur, India. Senior project work- "Combustion of Coal-Oil Slurry." Advisers: Profs. P.K. Nag and S.G. Mukherjee.

Completed Graduate Level Computational Sciences Courses (may be used for accreditation purposes)

- Advanced Engineering Computation: LSU ME-7533
- Random Processes – spectral analysis, numerical data analysis: LSU EE-4640
- Computational Boundary Layer Flow/Heat Transfer: LSU ME-7813
- Computational Fluid Flow/ Heat Transfer in HPC: LSU ME-7823
- Multivariate Data Analysis with SAS in HPC: LSU QBA-7022
- Intro to Finite Elements: TAMU MEMA-646
- Software Engineering: TAMU CPSC-606
- Computer Graphics: TAMU CPSC-441

4. CONTINUING EDUCATION

Continuing Education

- Microsoft Certified Professional (70-100: Architecture and Requirements), 2000.
- Object-Oriented Programming with VisualAge for Java: 2001.
- Network+ certification, 2001.
- ASP.net training with certification, 2003

- FileAid training with certification, 2003.
- Certified Software Quality Engineer by American Society for Quality (ASQ), 2004.
- .Lean Six Sigma Quality and Statistics, 2011

5. WORK EXPERIENCE

- 8/2018- Present: Lecturer, Mechanical Engineering, Clemson University, Clemson, SC.
- 3/2010-12/2017: Senior Design Engineer, GE Energy, Greenville, SC. Design of both rotating and stationary hot-gas-path components. IR camera data processing. Design of experiments for GE Research Center and GE Greenville. Transient and part load analyses. Adviser to GE sponsored research projects- Rose-Hulman Institute of Technology, Virginia Tech University. Programming for engineering applications. Instrumentation, large data processing and visualization, statistical analysis, component life prediction. Technical leadership to 35+ engineers.
- 2/2009-2/2010: Senior Design Engineer, PSM and Alstom, Jupiter, FL. Design of stationary and rotating components. Rotor analysis. Gas Turbine design for power generation.
- 8/2007-6/2013: Co-Owner of family business. Large scale child services, pre-school education and after school education. \$3.8M in net assets and \$600K+ cash flow per year with 20+ employees. Performed financials, legal, HR, and marketing tasks.
- 5/2005-1/2009: Release Manager, Cognex Corporation. Responsible for DVT product line's hardware and software. Resident manager in Duluth, GA responsible for DVT product line. Maintain DVT products, both software and hardware, in good health; interact with application engineers, sales, marketing, production, and R&D engineers to schedule releases and plan on new features. 5 direct reports and technical leadership to 20+ engineers.
- 6/2004-5/2005: DVT Corporation (a GA Tech spin off). Software Quality Manager. Created the software quality department in DVT, responsible for the high quality and stable software releases, planning for the next releases; and maintain interactions among customers, application engineers, R&D engineers, trainers, and marketing. Responsible for weekly updates to upper level management including CEO and CFO about the status of current products and future plans. Was a key player in implementing ISO 9001:2000 in the company.
- 10/2000-6/2004: AFLAC (a prominent insurance company), Software Research Center, Norcross, GA. Senior Software Architect. J2EE conversion of legacy assembly language batch processes. Major overhaul of insurance claim reprocessing system – made it user friendly, instantaneous, and redesigned the old mainframe display. J2EE implementation of insurance agent information access. Database design and optimization.
- 8/1995-10/2000: University of South Carolina, Asst. Professor of Mechanical Engineering. Taught Thermal sciences and did software consulting in Columbia, SC. Published in prestigious journals related to Gas-Turbine heat transfer. Helped establish a nationally recognized Fuel-Cell Research Center. Director of Applied Computational Fluid Research (ACFR) Laboratory at UofSC. Direct report - 9 PhD and Masters projects.

Prior to Ph.D.

9/92 - 8/95

Research Assistant to Prof. J.C. Han (experimental work) and Prof. M.J. Andrews (numerical work), Department of Mechanical Engineering, Texas A&M University, College Station, Texas. Experimental and numerical heat transfer in multi-pass rotating ducts in turbomachinery. Supported by GE, DOE, and Texas A&M Supercomputing Center.

1/95 - 5/95

Teaching Assistant for Fluid Mechanics Laboratory, Department of Mechanical Engineering, Texas A&M University, College Station, Texas. A class of 18 students. Experiments involved flow through orifice, calibration of flow meters, Bernoulli's theorem, impulse turbine performance evaluation, lift and drag measurement, etc.

6/93 - 8/93

Teaching Assistant for Heat Transfer Laboratory, Department of Mechanical Engineering, Texas A&M University, College Station, Texas. Student evaluation was 4.5 out of 5. A class of 20 students. Experiments involved conduction, convection, radiation, heat exchanger, etc.

1/90 - 8/92

Research Assistant to Prof. S. Acharya, Department of Mechanical Engineering, Louisiana State University, Louisiana. Numerical heat transfer and fluid flow studies with boundary layer separation. Research work was supported by NSF and Cornell Supercomputing Center.

8/90 - 5/92

Teaching Assistant for Fluid Mechanics Laboratory, Department of Mechanical Engineering, Louisiana State University, Baton Rouge, Louisiana. Received excellent evaluations from students (3.9/4). Awarded the **best TA in department**. Recognition letter received from the Head of the Department. A class of 12 students on average. Experiments involved lift and drag of airfoils, shock tube, supersonic flow and shock visualization, etc.

8/85 - 8/89

Design Engineer in MECON Ltd, Ranchi, India. Worked as project engineer and designer. Project engineering for steel rolling mills. Shop floor experience in large integrated steel plants of India - Bokaro, Bhilai, and Durgapur. Design of machine components and hydraulics for high-tech equipments, e.g.: high-speed flywheel for energy storage, automated guided vehicle, and launching pad. Worked with electro-mechanical, opto-mechanical, and hydraulic devices. Developed new layouts for steel rolling mills for better and efficient material movement, magnetic suspension bearings for high-speed flywheel, steering and regenerative braking of automated guided vehicle, etc.

6. AWARDS AND PATENTS

Technical student presentation, 2nd place, 1994, ASME Texas A&M University chapter.

Research and Productivity Scholarship, 1996, University of South Carolina

Provost's Teaching Development Award, 1998, University of South Carolina

Listed in Who's Who in the International Gas Turbine Institute (1996-2001)

Cognex President's award, 2005

Lean Six Sigma Green Belt, 2011

33 Patents on Thermal sciences, Additive Manufacturing, and Turbine systems. Patent details are restricted by GE as "need to know" basis. The list of patents is available on request.

Invention Disclosures at UofSC

¹**Dutta, S.** (1997), *Heat Transfer Enhancement with Inclined Perforated and Solid Baffles*.

²Giurgiutiu, V. and **Dutta, S.**, Rogers, C.A. (1997), *Compact High Frequency Solid State Modular Pump for Hydraulic Actuation*

³Brown, D. N. and **Dutta, S.** (1999), *Active Lift Enhanced Airfoil*

Patents

- ¹**Dutta, S.** and Smith, A.E. (2013), *Axially Cooled Airfoil*. Pub# 20130052035
- ²**Dutta, S.**, Itzel, G.M., and Lacy, B.P. (2014), *Film Hole Trench*. Patent# 8858175
- ³Maldonado, J. J. and **Dutta, S.** (2015), *System and Method for Operating a Gas Turbine Engine*. Patent# 9206744
- ⁴**Dutta, S.** and Maldonado, J. J. (2016), *System and Method for Reconditioning Turbine Engines in Power Generation Systems*. Patent# 9260968
- ⁵Lacy, B.P., Kottilingam, S.C., **Dutta, S.**, and Schick, D.E.. (2016), *Article and Method of Forming an Article*. Pub # 20160303656, 20160348536
- ⁶Zhang, X.J., **Dutta, S.**, and Itzel, G.M. (2016), *Turbine Airfoil*. Pub# 20160298545
- ⁷**Dutta, S.** (2017), *Systems and Methods for Increasing Heat Transfer Using at least One Baffle in an Impingement Chamber of a Nozzle in a Turbine*. Pub# 20170175577
- ⁸Cui, Y., Kottilingam, S.C., **Dutta, S.**, and Tollison, B.L. (2017), *Thermally Dissipative Article and Method of Forming a Thermally Dissipative Article*. Pub# 20170342540
- ⁹Lacy, B.P., Schick, D.E., and **Dutta, S.** (2017), *System and Method for Turbine Nozzle Cooling*. Patent# 9849510
- ¹⁰**Dutta, S.**, Lacy, B.P., Itzel, G. M., and Wassinger, S.P.(2017), *Turbine Nozzle with Cooling Channel Coolant Discharge Plenum*. Pub# 20170101891
- ¹¹Cui, Y., Kottilingam, S.C., **Dutta, S.**, and Tollison, B.L. (2017), *Thermally Dissipative Article and Method of Forming a Thermally Dissipative Article*. Pub# 20170342540
- ¹²Sezer, I., Itzel, G.M., Maldonado, J.J., and **Dutta, S.** (2017), *Article and Manifold for Thermal Adjustment of a Turbine Component*. Pub# 20170051612
- ¹³**Dutta, S.**, Zhang, J., Itzel, G.M., Delvaux, J.M., and Hafner, M.T. (2017), *Turbine Component and Methods of Making and Cooling a Turbine Component*. Pub# 20170350260, 20170350256, 20170350259
- ¹⁴**Dutta, S.** and Hart, K. M. (2017), *Impingement Insert for a Gas Turbine Engine*. Pub# 20170356299
- ¹⁵Lacy, B.P., Kottilingam, S.C., **Dutta, S.**, and Schick, D.E.. (2017), *Article and Method of Forming an Article*. Patent# 9849510
- ¹⁶**Dutta, S.**, Lacy, B.P., Itzel, G. M., and Wassinger, S.P. (2017), *Turbine Nozzle with Cooling Channel Coolant Discharge Plenum*. Pub# 20170101891
- ¹⁷**Dutta, S.**, Lacy, B. P., Itzel, G., and Vehr, J.W. (2017), *Turbine Nozzle with Cooling Channel Coolant Distribution Plenum*. Pub# 20170101892
- ¹⁸Hafner, M.T., Itzel, G.M., Delvaux, J.M., and **Dutta, S.** (2017), *Apparatus, Turbine Nozzle and Turbine Shroud*. Pub# 20170276021, 20170248029
- ¹⁹**Dutta, S.**, Lacy, B. P., Weber, J.A., and Stevens, P.G. (2017), *Turbine Nozzle with Inner Band and Outer Band Cooling*. Pub# 20170101890

²⁰**Dutta, S.**, Lacy, B. P., Weber, J.A., and Stevens, P.G. (2017), *Turbine Nozzle with Inner Band and Outer Band Cooling*. Pub# 20170101890

²¹Lacy, B.P., **Dutta, S.**, and Schick, D.E.(2017), *Article, Component, and method of Forming an Article*. Pub# 20170067699

²²**Dutta, S.**(2017), *Impingement Cooling System for a Gas Turbine Engine*. Pub# 20170356341

²³Weber, D. W. and **Dutta, S.**(2018), *Multi-Turn Cooling Circuits for Turbine Blades*. Pub# 20180112537

²⁴Weber, D. W., **Dutta, S.**, and Leary, B. J.(2018), *Varying Geometries for Cooling Circuits of Turbine Blades*. Pub# 20180112538

²⁵**Dutta, S.**, Lacy, B. P., Itzel, G. M., Weber, J. A., and Schick, D. E. (2018), *Turbine Components and Method for Forming Turbine Components*. Pub# 20180030837

7. INDUSTRIAL PUBLICATIONS

Internal Publications in GE

04/13/2010 Use of CTS crystals- lattice structure change by temperature exposure history
05/10/2010 7FA.05 S2B Transient Thermal Analysis
10/07/2010 7EA S1B Cooling Tip Flow
11/02/2010 7EA S1B Analysis
12/14/2010 9FA S2B analysis
02/03/2011 7EA AO S1B HT re-Baseline
08/22/2011 9FA S3B analysis
08/30/2011 9E AO S3B Bucket and Wheel transient thermal analysis
09/14/2011 7FA.05 S3B Transient Thermal Fast Ramp
01/03/2012 7FA.04 Fast Ramp Thermal S1B S2B
02/29/2012 7EA S1B Cooling flow optimization
04/27/2012 7FA.05 and 7FA.04 Fast Ramp Transient Thermal Analysis
05/31/2012 7FA.05 Hot Gas Path Thermal Instrumentation
11/05/2012 7EA S1B S2B Cold Flow
12/18/2012 9FA.03 S2B Scaled Thermal Analysis
05/02/2013 9EA S2N Pre-Test Predictions
07/23/2013 Film Coolant Temperature Rise in Film Hole
09/06/2013 7FA.05 and 7FA.04 S1B TE slot cooling
11/20/2013 9E S1B IR Data Processing
02/21/2014 7FA.04 S3B Thermal Analysis
02/21/2014 IR Camera Enclosure Thermal Analysis
07/28/2014 9FB S1N Film Curves
09/04/2014 IR Camera Reflection Model Development Procedure
03/10/2015 Platform surface cooling
04/17/2015 CMC (Si-C Ceramic Matrix Composite) Nozzle shell
04/29/2015 CMC Nozzle Bellows
07/03/2015 CMC Trailing edge cooling schemes
12/18/2015 CMC Thermal Analysis
02/02/2016 9FA.03 S1B S2B S3B Thermals
03/10/2016 DOE review CMC Nozzles
03/15/2016 Impingement Tests at VA Tech
07/20/2016 Impingement Heat Transfer Tests at AMW
09/16/2016 Increase cooling effectiveness in Last Stage Blade
01/13/2017 New Technology for S1N
02/01/2017 Cooling in curved holes

03/23/2017 Rotating flow CFD simulation
05/26/2017 White Paper- Effect of Rotational Buoyancy on Radially Outward Flow
06/06/2017 Map or Transfer Boundary Conditions with Matlab Script
07/31/2017 6F.01 Hot-gas-path analysis scope
09/07/2017 6F.01 All rotating airfoils next gen thermals
09/14/2017 6F.01 All nozzle vanes next gen Thermals
09/19/2017 6F.01 All shrouds next gen Thermals
11/29/2017 9E S2S Thermals

8. SCHOLARLY PUBLICATIONS

(The same publication is not repeated in different categories. Some papers were first presented in a conference and that later appeared in a Journal. One entry is made for such a publication in the journals section)

Peer Reviewed Journal Publications

¹**Dutta, S.** and Acharya, S. (1993), "Heat Transfer and Flow Past A Backstep With The Nonlinear k- ϵ Turbulence Model and The Modified k- ϵ Turbulence Model," *Numerical Heat Transfer*, Part A, Vol. 23, pp. 281-301. Also included in *Topics in Heat Transfer*, Vol. 1, HTD-Vol. 206-1, ASME, 1992.

²Acharya, S., **Dutta, S.**, Myrum, T.A., and Baker, R.S. (1993), "Periodically Developed Flow and Heat Transfer in A Ribbed Duct," *International Journal of Heat and Mass Transfer*, Vol. 36, No. 8, pp. 2069-2082.

³Acharya, S., **Dutta, S.**, Myrum, T.A., and Baker, S. (1994), "Turbulent Flow Past A Surface Mounted Two-Dimensional Rib," *ASME Journal of Fluids Engineering*, Vol. 116, No.2, pp. 238-246.

⁴**Dutta, S.**, Andrews, M.J., and Han, J.C. (1995), "Simulation of Turbulent Heat Transfer in A Rotating Duct," *AIAA Journal of Thermophysics and Heat Transfer*, Vol. 9, No. 2, April-June, pp. 381-382.

⁵**Dutta, S.**, Han, J.C., and Zhang, Y.M. (1995), "Influence of Rotation on Heat Transfer From A Two-Pass Channel With Periodically Placed Turbulence and Secondary Flow Promoters," *International Journal of Rotating Machinery*, Vol. 1, No. 2, pp. 129-144.

⁶**Dutta, S.**, Han, J.C., and Lee, C.P. (1995), "Experimental Heat Transfer in a Rotating Triangular Duct : Effect of Model Orientation," *ASME Journal of Heat Transfer*, Vol. 117, No. 4, November, pp. 1058-1061.

⁷**Dutta, S.**, Han, J.C., Zhang, Y.M., and Lee, C.P. (1996), "Local Heat Transfer in A Rotating Two-Pass Triangular Duct With Smooth Walls," *39th ASME International Gas Turbine & Aeroengine Congress and Exposition*, The Hague, June 13-16. ASME paper 94-GT-337. *ASME Journal of Turbomachinery*, Vol. 118, No. 3, July, pp. 435-443.

⁸**Dutta, S.**, Han, J.C., and Lee, C.P. (1996), "Local Heat Transfer in A Rotating Two-Pass Ribbed Triangular Duct With Two Model Orientations," *International Journal of Heat and Mass Transfer*, Vol. 39, No. 4, pp. 707-715.

⁹**Dutta, S.**, Andrews, M.J., and Han, J.C. (1996), "Prediction of Turbulent Heat Transfer in Rotating Smooth Square Ducts," *International Journal of Heat and Mass Transfer*, Vol. 39, No. 12, pp. 2505-2514.

¹⁰**Dutta, S.** and Han, J.C. (1996), "Local Heat Transfer in Rotating Smooth and Ribbed Two-Pass Square Channels with Three Model Orientations," *ASME Journal of Heat Transfer*, Vol. 118, No. 3, August, pp. 578-584.

¹¹**Dutta, S.**, Andrews, M.J., and Han, J.C. (1996), "On Flow Separation with Adverse Rotational Buoyancy," *ASME Journal of Heat Transfer*, Vol. 118, November, pp. 977-979.

¹²**Dutta, S.**, Morehouse, J.H., and Khan, J.A. (1997), "Numerical Analysis of Laminar Flow and Heat Transfer in a High Temperature Electrolyzer," *International Journal of Hydrogen Energy*, Vol. 22, No. 9, pp. 883-895. Also *1996 ASME 31st National Heat Transfer Conference*, Houston, Texas August 3-6, 1996.HTD Vol. 328, pp. 71-77

- ¹³**Dutta, S.**, Andrews, M.J., and Han, J.C. (1997), "Prediction of Turbulent Flow and Heat Transfer in Rotating Different Aspect Ratio Smooth Channels," *AIAA Journal of Thermophysics and Heat Transfer*, Volume 11, No. 2, April-June, pp. 318-319.
- ¹⁴Arefin Kabir, A.A.S., **Dutta, S.**, and Taher Ali, M.A. (1998), "Flow Characteristics of Splined Tipped Circular Jets," *ASME Journal of Fluids Engineering*, Vol. 120, June, pp. 398-400.
- ¹⁵Acharya, S., **Dutta, S.**, Myrum, T.A. (1998), "Heat Transfer in Turbulent Flow Past a Surface-Mounted Two-Dimensional Rib," *ASME Journal of Heat Transfer*, Vol. 120, August, pp. 724-734.
- ¹⁶Dutta, P. and **Dutta, S.** (1998), "Effect of Baffle Size, Perforation, and Orientation on Internal Heat Transfer Enhancement," *International Journal of Heat and Mass Transfer*, Vol. 41, No. 19, October, pp. 3005-3013.
- ¹⁷Zhang, X. and **Dutta, S.** (1998), "Heat Transfer Analysis of Buoyancy-Assisted Mixed Convection with Asymmetric Heating Conditions," *International Journal of Heat and Mass Transfer*, Vol. 41, No. 21, pp. 3255-3264.
- ¹⁸**Dutta, S.**, Dutta, P., Khan, J., and Jones, R. (1998), "Heat Transfer Coefficient Enhancement with Perforated Baffles," *ASME Journal of Heat Transfer*, Vol. 120, August, pp. 795-797.
- ¹⁹Fang, Z., Khan, J.A., and **Dutta, S.** (1998), "Computational Modeling of Aerosol Particle Transport and Deposition in an Abrupt Pipe Contraction," *Computer Modeling and Simulation Engineering*, Vol. 3, No. 4, November, pp. 228-234.
- ²⁰**Dutta, S.**, Zhang, X., Khan, J. A., and Bell, D. (1999), "Adverse and Favorable Mixed Convection Heat Transfer in a Two-Sided Heated Square Channel," *Experimental Thermal and Fluid Science*, Vol. 18, pp.314-322.
- ²¹**Dutta, S.** and Khan, J.A. (1999), "Numerical Prediction of Fully Developed Rotating Channel Flow with Modified Two-Equation Turbulence Models," accepted in the *Journal of Mechanical Engineering Research and Development*.
- ²²Arefin Kabir, A.A.S., **Dutta, S.**, and Taher Ali, M.A. (1999), "Passive Control of Circular Jet Spread-Rates with Axially Splined Nozzles," *International Journal of Fluid Mechanics Research*, Vol. 26, No. 1, pp. 36-48.
- ²³Saldarriaga, F.M. and **Dutta, S.** (1999), "Numerical Prediction of Stirred Laminar and Turbulent Air Flow in a Cylindrical Container," *Computer Modeling and Simulation Engineering*, Vol. 4, No. 2, May, pp. 287-293.
- ²⁴Noman, A., Saldarriaga, F., and **Dutta, S.** (1999), "Particle Laden Air Flow Visualization in a Multi-Rotor Configuration of a Lawn Mower Housing," *Journal of Flow Visualization and Image Processing*, Vol. 6(1), pp. 51-63.
- ²⁵**Dutta, S.**, Shimpalee, S., and Van Zee, J.W. (2000), "Three-Dimensional Numerical Simulation of Straight Channel PEM Fuel Cells," *Journal of Applied Electrochemistry*, Vol. 30, pp. 135-146.
- ²⁶**Dutta, S.**, Shimpalee, S., and Van Zee, J.W. (2001), "Numerical Prediction of Mass-Exchange Between Cathode and Anode Channels in a PEM Fuel Cell," *International Journal of Heat and Mass Transfer*, Vol. 44(11), pp. 2029-2042.
- ²⁷Shimpalee, S. and **Dutta, S.** (2000), "Numerical Prediction of Temperature Distribution in PEM Fuel Cells," *Numerical Heat Transfer, Part A*, Vol. 38, issue-2, pp. 111-128.

Review Articles and Book

- ¹Han, J.C. and **Dutta, S.** (1995), "Internal Convection Heat Transfer and Cooling - An Experimental Approach,"

Part I: Fundamental Heat Transfer in Stationary Ribbed Channels

Part II: Advanced Heat Transfer in Stationary Ribbed Channels

Part III: Fundamental Heat Transfer in Rotating Coolant Passages

Part IV: Advanced Heat Transfer in Rotating Coolant Passages

von Karman Institute for Fluid Dynamics, Lecture Series on Heat Transfer and Cooling in Gas Turbines, May 8-12, Belgium. *Heat Transfer and Cooling in Gas Turbines*, VKI Lecture Series 1995 - 05.

²Dutta, S. and Han, J.C. (1997), "Rotational Effects on the Turbine Blade Coolant Passage Heat Transfer," *Annual Review of Heat Transfer*, edited by Chancellor C.L. Tien, Volume IX, pp. 269-314.

³Han, J.C., Dutta, S., and Ekkad, S.V. (2012), *Gas Turbine Heat Transfer and Cooling Technology*, 2nd Edition, Taylor & Francis Inc., Philadelphia, PA.

Conference Publications and Presentations

¹Acharya, S., Dutta, S., Myrum, T.A., and Baker, R.S. (1993), "Turbulent Flow and Heat Transfer Past A Surface-Mounted Two-Dimensional Rib. Part I- Measurements," *29th National Heat Transfer Conference*, Atlanta, GA, August 8-11.

²Acharya, S., Dutta, S., Myrum, T.A., and Baker, R.S. (1993), "Turbulent Flow and Heat Transfer Past A Surface-Mounted Two-Dimensional Rib. Part II- Predictions With The Standard and Non-Linear k- ϵ Models," *29th National Heat Transfer Conference*, Atlanta, GA, August 8-11.

³Dutta, S., Andrews, M.J., and Han, J.C. (1994), "Numerical Prediction of Turbulent Heat Transfer in A Rotating Square Duct With Variable Rotational Buoyancy Effects," *6th AIAA/ASME Thermophysics and Heat Transfer Conference*, Colorado Springs, Colorado, June 20-23. *General Papers in Heat and Mass Transfer, Insulation, and Turbomachinery*, HTD Vol. 271, pp. 161-170.

⁴Dutta, S., Andrews, M.J., and Han, J.C. (1994), "Heat Transfer and Flow Predictions in A Rotating Square Duct With Coriolis-Modified Turbulence Models," *10th International Heat Transfer Conference*, Brighton, England, August 14-18. *Heat Transfer 1994*, Vol. 4, pp. 219-224.

⁵Dutta, S., Han, J.C., and Lee, C.P. (1994), "Effect of Model Orientation on Local Heat Transfer in A Rotating Two-Pass Smooth Triangular Duct," *ASME Winter Annual Meeting*, Chicago, Illinois, November 6-11. ASME HTD-Vol. 300, pp. 147-153.

⁶Dutta, S., Ekkad, S., Zhang, Y.M., and Han, J.C. (1995), "Rotation Effect on Internal Cooling and Spallation/Roughness Effect on External Heat Transfer," *DOE AGTSR Heat Transfer Workshop*, March 1-3, Clemson University, Clemson, South Carolina.

⁷Acharya, S., Dutta, S., and Myrum, T.A. (1995), "Heat Transfer in Turbulent Flow Past a Surface-Mounted Two-Dimensional Rib," *International Mechanical Engineering Congress and Exposition, the Winter Annual Meeting of ASME*, Nov. 12-17, San Francisco, California.

⁸Dutta, S., Andrews, M.J., and Han, J.C. (1996), "Prediction of Turbulent Flow and Heat Transfer in Rotating Square and Rectangular Smooth Channels," *41st ASME Gas Turbine and Aeroengine Congress, Exposition, and Users Symposium*, June 10-13, 1996, Birmingham, United Kingdom. ASME Paper # 96-GT-234.

⁹Tong, X., Khan, J.A., and Dutta, S. (1996), "Unidirectional Infiltration and Solidification / Remelting of a Binary Alloy in Porous Preform," *1996 ASME 31st National Heat Transfer Conference*, Houston, Texas, August 3-6, 1996. HTD Vol. 323, Vol. 1, p. 39-48.

¹⁰Dutta, S., Zhang, X., Khan, J., and Bell, D. (1997), "Heat Transfer Analysis in a Two-Side Heated Smooth Square Vertical Channel With Adverse and Favorable Mixed Convection," *1997 32nd National Heat Transfer Conference*, Baltimore, Maryland, August 10-12. HTD-Vol. 346, Volume 8, pp. 119-125.

¹¹**Dutta, S.**, Dutta, P., Khan, J., and Jones, R. (1997), "Experimental Study of Heat Transfer Coefficient Enhancement with Inclined Solid and Perforated Baffles," *1997 International Mechanical Engineering Conference and Exhibition*, Dallas, Texas, November 16-21, ASME Paper # 97-WA/HT-4.

¹²**Dutta, S.** (1997), "Turbulent Heat Transfer and Fluid Flow in Orthogonally Rotating Channels," *3rd ISHMT/ASME Heat and Mass Transfer Conference*, IIT, Kanpur, India, Dec. 29-31, 1997. *Heat and Mass Transfer 97*, ed. G. Biswas, S.S. Murthy, K. Muralidhar, and V.K. Dhir, pp. 427-432.

¹³Giurgiutiu, V., Lyons, J., Petrou, M., **Dutta, S.**, Rogers, C.A. (1998), "Strength, Durability and Health Monitoring of Composites Overlays on Civil Engineering Structures," *International Composites Expo ICE-98*, Nashville, TN, January 19-21, 1998.

¹⁴Dutta, P., **Dutta, S.**, Khan, J.A., (1998), "Internal Heat Transfer Enhancement by Two Perforated Baffles in a Rectangular Channel," *ASME TURBO EXPO '98*, Stockholm, Sweden, June 2-5, 1998.

¹⁵Giurgiutiu, V., **Dutta, S.**, and Rogers, C.A. (1998), "Compact High-Frequency Solid-State Modular Pump for Hydraulic Actuation," *9th International Conference on Adaptive Structures and Technologies - ICAST'98*, 14-16 October, Cambridge, MA.

¹⁶Lee, W.K., Van Zee, J.W., Shimpalee, S., and **Dutta, S.** (1999), "Effect of Humidity on PEM Fuel Cell Performance, Part I: Experiments," 1999 ASME IMECE, November 14-19, Nashville, TN. HTD 364-1, pp. 359-366.

¹⁷Shimpalee, S., **Dutta, S.**, Lee, W.K., and Van Zee, J.W. (1999), "Effect of Humidity on PEM Fuel Cell Performance, Part II- Numerical Simulation," 1999 ASME IMECE, November 14-19, Nashville, TN. AES 39, pp. 337-350.

¹⁸Nasari-Neshat, H., Lee, W.K., vanZee, J.W., Shimpalee, S., and **Dutta, S.** (1999), "Predicting the Effect of Gas-Flow Channel Spacing on Current Density in PEM Fuel-Cells," 1999 ASME IMECE, November 14-19, Nashville, TN.

¹⁹Giurgiutiu, V. and **Dutta, S.** (2000), "Health Monitoring and Quality Assurance for Rotary Micromachines and Active Sensors," *ISROMAC-8*, March 26-30, 2000, Honolulu, Hawaii, Proceedings Volume II, pp. 1141-1147.

²⁰Shimpalee, S., Dutta, S., and Van Zee, J.W. (2000), "Numerical Prediction of Local Temperature and Current Density in a PEM Fuel Cell," IMECE, Orlando, Florida. HTD 366-1, pp. 1-12.

Reports

¹**Dutta, S.** (1992), "A Numerical Study of Turbulent Flow and Heat Transfer in A Ribbed Duct With Two Equation Turbulence Models," MS Thesis, Louisiana State University, Baton Rouge, Louisiana.

²Han, J.C., Andrews, M.J., and **Dutta, S.** (1993), "Prediction of Heat Transfer and Turbulent Fluid Flow in One Pass Rotating Ducts," Proposal for Research Grant, Texas A&M Supercomputing Center, 1993-94, College Station, Texas.

³**Dutta, S.**, Zhang, Y.M., and Han, J.C. (1993), "Airfoil Internal Coolant Passage Heat Transfer," Report for General Electric Company - Aircraft Engines, TEES-4205, December.

⁴Advanced Turbine Cooling, Heat Transfer, and Aerodynamic Studies," *AGTSR Quarterly Reports*, Part I, 1993-1994.

⁵Advanced Turbine Cooling, Heat Transfer, and Aerodynamic Studies," annual presentation and report for *DOE Advanced Turbine Systems*, November 9-11, 1994, Washington, D.C.

⁶Zhang, Y.M., Parsons, J.A., and **Dutta, S.** (1994), "Compiled Data for Rotating Two-Pass Ribbed Ducts," December.

⁷**Dutta, S.** (1995), "An Experimental and Numerical Study of Turbulent Heat Transfer in Orthogonally Rotating Two-Pass Ducts," Ph.D. Dissertation, Texas A&M University, College Station, Texas.

⁸Zhang, Y.M., Huang, Y.Z., **Dutta, S.**, and Han, J.C. (1995), "A Heat Transfer Experiment of Impingement Cooling," Report for General Electric Company- Aircraft Engines, TEES-44950, March.

⁹"Advanced Turbine Cooling, Heat Transfer, and Aerodynamic Studies," *AGTSR Semi-Annual Report*, 1994-1995.

¹⁰Sirivatch, S. and Dutta, S. (1998), "Flow and Current Density Simulations in a PEM Fuel-Cell," DOE/EPSCoR.

¹¹Saldarriaga, F., Noman, A., Shimpalee, S., Terry, J., and Dutta, S. (1999), "Performance Modeling of Inlet Plenum for the Tritium Facility Exhaust Fans at SRS," Westinghouse Savannah River Company, Aiken, SC.

9. FUNDED PROJECTS

¹Han, J.C., **Dutta, S.**, and Andrews, M.J. (1993), "Prediction of Heat Transfer and Turbulent Flow in a Rotating Two-Pass Square Channel With Smooth Walls," Texas A&M Supercomputing Center, 100 Cray CPU Hours.

²Han, J.C. and **Dutta, S.** (1995), "Heat Transfer Measurements in Turbulated Coolant Passages," General Electric Company, \$70,000.

³Han, J.C., **Dutta, S.**, and Ekkad, S. (1995), "Advanced Cooling Technologies for Industrial Gas Turbine Applications," Advanced Technology Program, Texas, \$200,000.

⁴**Dutta, S.** (1996), "Simulation and Analysis of Adverse Buoyancy in Turbine Blade Internal Coolant Passage," Research and Productive Scholarship, University of South Carolina, \$9,191.

⁵**Dutta, S.** (1996), "Characterization of Feedline Bleed and Chillover of LOX system," South Carolina Space Grant Research Enhancement Program, \$5,055.

⁶**Dutta, S.**, McNeill, S. (1997), "Numerical Prediction of Rotating Fluid Flow and Large Suspended Particles in an Enclosure," American Yard Products, Inc., \$107,358 and additional financial support for a Phd. student (equivalent of \$70,000).

⁷**Dutta, S.** (1997), "Cooling of First Stage Rotor Blades at Elevated Temperatures and Pressures," Advanced Gas Turbine System Research, AGTSR/DOE, \$5,527.

⁸Zhang, X. and **Dutta, S.** (1998), "CFD/Experimental Heat Transfer Analysis of Multiple Injector in the Advanced Macrospray™ Systems," Advanced Gas Turbine System Research traineeship, AGTSR/DOE, \$6,400.

⁹**Dutta, S.** (1998), "Thermal Stress Studies in Complex Airfoils," South Carolina Space Grant Research Enhancement Program, \$8,000.

¹⁰**Dutta, S.** (co-PI, White, R.E. – PI) (1998-2001), "Simulation of Fuel Cells," DOE/EPSCoR, \$150,000 (Dutta's part).

¹¹**Dutta, S.** (1999), "Performance Modeling of Inlet Plenum for the Tritium Facility Exhaust Fan at SRS," SCUREF/WSRC/DOE, \$19,000.

¹²**Dutta, S.** and VanZee, J. (2000), "Fundamental Studies for Mapping the Current, Temperature, and Water

Distribution in an Electrochemical Membrane Reactor,” Honda Motor Co. Japan, \$128,388.

¹³Dutta, S. (2000), “Numerical Modeling of Flow in Zinc/Bromine Battery,” Powercell Corp., \$3,000.

10. STUDENTS SUPERVISED

Ph.D.

¹Francisco M. Saldarriaga, “Rotating flow with large suspended particles”, May 2000.

²Shimpalee Sirivatch, “Transport phenomena in electrochemical systems”, December 2000.

Masters

¹Prashanta Dutta, "Innovative Heat Transfer Enhancement with Inclined Solid and Perforated Baffles." December, 1997.

²Xiadong Zhang, "Mixed Convection with Asymmetric Heating." December, 1997.

³David Bell, "Heat Transfer Enhancement by Air-Water Bubbly Flow." Incomplete. Finished coursework and thesis.

⁴Abu M.R.M. Noman, "Flow Visualization in an Enclosed Chamber," December, 1999.

⁵Dahvid N. Brown, “High Lift Airfoils,” August 2000.

⁶Harold J. Hinton, “Heat Transfer Enhancement with Perforated Baffles and Ribs,” May 2000.

⁷Dominic Maccaluso, “Optimization of heat transfer for paper sheet drying,” May 2000.

Undergraduates in Research Projects

Ryan E. Jones, 1996

Erika Rhett, 1998

Chikynda Moore, 1998, 1999

Jason Terry, 1998, 1999

Demetrius Jones, 1999

Romelle Horton, 1999

11. SERVICES

Paper Review

- AIAA Journal of Thermophysics and Heat Transfer
- AIChE Journal
- ASME Journal of Heat Transfer
- ASME Journal of Turbomachinery
- ASME Journal of Energy Resources Technology
- ASME Journal of Solar Energy Engineering
- ASME Journal of Fluids Engineering
- ASME Journal of Energy Resources Technology
- Experimental Thermal and Fluid Science
- Experimental Mechanics
- Experimental Heat Transfer
- International Journal of Rotating Machinery
- International Journal of Heat and Mass Transfer
- International Journal of Hydrogen Energy
- Journal of Enhanced Heat Transfer
- Journal of Applied Electrochemistry
- Journal of Electrochemical Engineering
- Numerical Heat Transfer
- ASME/AIChE National Heat Transfer Conference, 1993, Atlanta

- ASME IMECE, November, 1995, San Francisco
- ASME Winter Annual Meeting, 1993
- ISTEP-6, 1993, May 9-13, Seoul, Korea
- National Heat Transfer Conference, 1995, Portland, Oregon
- 3rd World Conference on Experimental Heat Transfer, Fluid Mechanics and Thermodynamics, Oct. 31- Nov. 5, 1993, Honolulu, Hawaii
- 1996 IGTI ASME TURBO EXPO conference
- ASME International Solar Energy Conference
- 1997 IGTI ASME TURBO EXPO conference
- 1997 ASME National Heat Transfer Conference, Baltimore
- 1998 7th AIAA/ASME Joint Thermophysics and Heat Transfer Conference, Albuquerque, NM
- 1998 ASME TURBO EXPO, Stockholm, Sweden: 11/97, 11/97, 12/97, 11/97
- 1998 ASME IMECE, Anaheim, CA
- 1999 ASME/JSME Thermal Engineering Joint Conference
- 1999 ASME TURBO EXPO, Indianapolis, Indiana
- 1999 33rd AIAA Thermophysics Conference, Norfolk, VA
- 1999 ASME IMECE, Nashville, TN
- 2000 ISHMT, India
- 2000 ASME/AIChE/ANS
- 2000 ASME Turbo Expo
- 2000 ASME IMECE
- IGTI conference 2011, 2012, 2013, 2014, 2015
- Gas Turbine India, 2015
- Journal of Propulsion and Power
- Book review - "Essentials of Natural Gas Microturbines"

Session Organization

¹Session organizer in "Heat Transfer in Gas Turbine Systems," 31st National Heat Transfer Conference, August 3-6, 1996, Houston, TX. With Dr. P.K. Tekriwal, GE.

²Session organizer in "Film Cooling - 3," ASME TURBO EXPO'97 - Land, Sea, and Air, June 2-5, Orlando, Florida. With Prof. P.M. Ligrani, University of Utah.

³Session organizer in "Film Cooling," ASME TURBO EXPO'98, June 2-5, Stockholm, Sweden, with Prof. P.M. Ligrani, University of Utah.

⁴Session organizer in "Internal Cooling," ASME TURBO EXPO'99, June, Indianapolis, Indiana, with Prof. Tom I.P. Shih, Michigan State University.

⁵Session organizer in "Heat Transfer in Turbomachinery," 1999 ASME IMECE, November 14-19, Nashville, TN, with Prof. S. V. Ekkad, Louisiana State University, Baton Rouge, LA.

⁶Session organizer in "Health Monitoring of Rotating Machinery," 8th International Symposium on Transport Phenomena and Dynamics of Rotating Machinery (ISROMAC-8), Honolulu, Hawaii, March 26-30, 2000, with Prof. V. Giurgiutiu of UofSC.

Proposal Review

NSF FY99 Phase I SBIR panel review 9/14/98

12. COURSES TAUGHT

Undergraduate

Introduction to thermodynamics, fluid mechanics, heat transfer, intermediate fluid mechanics, and intermediate heat transfer. Fluid mechanics and heat transfer laboratory classes.

Graduate

Buoyant flow and heat transfer, numerical heat transfer and fluid flow analysis (new course developed), viscous fluid flow.

Industrial

“Intellect” image processing software usage, user training, and manuals, DVT, 2005-2009.

AFLAC commissioned agent editor, 2004

GE Course- Introduction to Heat Exchangers, 2012

GE Course- Instrumentation and Measurement Devices, Uncertainty Analysis, 2012

13. MISCELLANEOUS

Membership in Professional Societies Member of ASME K-14 (heat transfer in turbomachinery) committee.
Listed in the Who's Who of the International Gas Turbine Institute
(1996-2001). Was Senior member of AIAA.

Google Scholar: <https://scholar.google.com/citations?user=65wjRZ4AAAAJ&hl=en>

Graduate Textbook: https://www.amazon.com/Turbine-Transfer-Cooling-Technology-Second/dp/1439855684/ref=sr_1_1?s=books&ie=UTF8&qid=1516201816&sr=1-1&refinements=p_27%3ASandip+Dutta

LinkedIn: <https://www.linkedin.com/in/sandip-dutta-97b945b/>

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