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EDUCATIONAL HISTORY

Doktor-Ingenieur (Dr.-Ing.) (Doctor Engineer) Institute of Thermodynamics, University of Bundeswehr, Munich, Germany	2017
M.Engg in Mechanical Engineering (Energy Systems) (2nd Position, 3.7 CGPA) NED University of Engineering & Technology, Karachi	2011
B.E in Mechanical Engineering (7th Position, 81.5%) NED University of Engineering & Technology, Karachi	2009

Brief Professional/ Career Profile:

I did B.E and M.E in Mechanical Engineering with distinction from NED University of Engineering & Technology. I did PhD from University of Bundeswehr, Munich Germany in 2017. I joined NED University as Lecturer in 2009. Currently, I am serving the Mechanical Engineering department of the same University as an Assistant Professor. I have taught courses of Thermodynamics, Internal Combustion Engines, Introduction to Computational Fluid Dynamics, Advanced Heat Transfer, Advanced Fluid Mechanics, Computational Fluid Dynamics and Applied Combustion Engineering during my teaching career at NED University. My research expertise is Thermofluid systems' studies, numerical modelling, heat transfer enhancement studies, renewable energy, etc. I have been an active researcher since 2012 and since then I have published 15 research articles in renowned journals and 5 research articles in International/national conferences.

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

Technical Training Courses attended:

- ANSYS software certification (30 hrs course).
- Computational Thermo-Fluid Mechanics (30 hrs course).
- Hands-on training of Computational Fluid Dynamics (30 hrs course).
- Higher Education Teaching Certificate Course by Harvard University.

Courses conducted at NED Academy:

Conducted three times a professional course titled "Hands-on Training of Computational Fluid Dynamics" through NED Academy at Mechanical Engineering Department. About 150 students participated in these sessions.

PHD THESIS

Title: “Modeling of Turbulent Premixed Combustion using LES and RANS Methods”

Supervisor: Prof. Dr. rer. nat. Michael Pfitzner

University: University of Bundeswehr, Munich, Germany

Abstract:

- Modelling and simulation of complex processes of turbulent premixed combustion for varied pressures, inlet conditions of flow and turbulent length scales.
- A novel LES sub-grid Flame Surface density model is used to investigate various features of significant importance e.g. counter-gradient sub-grid scalar flux, pressure and Lewis number effects.
- The performance of the simplified version of the model is investigated.
- RANS version of the model is developed and investigated its performance in comparison to the original model and well documented experimental data.

Number of publications: Four journal and four conference (international) publications.

Journal Publications:

1. U. Allauddin, S.R.R. Lomada M. Pfitzner, “Investigation of pressure and the Lewis number effects in the context of flame surface density closure for LES of premixed turbulent combustion”, *Theoretical and Computational Fluid Dynamics*, 35(1), pp. 17-37, 2021.
2. U. Allauddin, M. Pfitzner, “Development of a RANS premixed turbulent combustion model based on the algebraic flame surface density concept” *Journal of Engineering for Gas Turbines and Power*, vol. 141(2), 2018.
3. U. Allauddin, M. Klein, M. Pfitzner, N. Chakraborty, “A-priori and a-posteriori analysis of algebraic flame surface density modelling in the context of large eddy simulation of turbulent premixed combustion”, *Numerical Heat Transfer, part A*, vol. 71(2), pp. 153-171, 2017.
4. R. Keppeler, E. Tangermann, U. Allauddin, M. Pfitzner, “LES of low to high turbulence combustion in an elevated pressure environment”, *Flow Turbulence Combustion*, vol. 92, pp. 767-802, 2014.

Conference Publications:

1. U. Allauddin, R. Keppeler, M. Pfitzner, “Turbulent premixed LES combustion models based on fractal flame surface density concept”, ASME paper GT2014-25919, Proc. ASME Turbo Expo, Düsseldorf, Germany, June 2014.
2. M. Klein, U. Allauddin, R. Keppeler, M. Pfitzner, “Towards uncertainty quantification and quality assessment for large eddy simulation of turbulent premixed combustion”, In *Uncertainty Quantification in Computational Fluid Dynamics*, Paris, France, May 2015.
3. P. Janas, U. Allauddin, M. Pfitzner, B. Boehm, A. Kempf, “Numerical investigation of the influence of different valve seat geometries on the in-cylinder flow and combustion in spark ignition engines”, abstract accepted for LES4ICE, Rueil-Malmaison, France, November 2016.
4. U. Allauddin, M. Klein, M. Pfitzner, N. Chakraborty, “A-priori and a-posteriori analysis of algebraic flame surface density modelling in the context of large eddy simulation of turbulent premixed combustion”, Proc. SPEIC 14 – Towards sustainable combustion, Lisboa, Portugal, November, 2014.

INDEPENDENT STUDY PROJECT

Title: “The Simulation of Turbulent Axisymmetric Impinging Jets using RANS Methods”

Supervisor: Prof. Dr. Naseem Uddin

University: NED University of Engineering & Technology, Karachi

Abstract:

- Numerically investigated the flow field and heat transfer augmentation via axisymmetric detached rib-roughners in single and multiple jets impingement with and without cross-flow interactions
- Examined the influence of jet Reynolds number, jet-outlet-to-target wall distance, blowing ratio, rib clearance ratio, rib width and rib height
- Did the validation of numerical predictions with the relevant experimental data and performed Grid Sensitivity analysis through GCI method to reduce the discretization errors
- The presence of detached ribs showed a significant augmentation in heat transfer in single jet impingement without cross-flow and enhanced peak Nusselt number in single and multiple jets impingement with detached ribs and cross-flow at moderate cross-flow velocities.

Number of publications: Two journal publications.

1. U. Allauddin, N. Uddin, S. O. Neumann, “Heat transfer enhancement by detached-ribs on a flat surface subjected to jet impingement”, Numerical Heat Transfer ,part A, vol. 63, pp. 921-940, 2013.
2. U. Allauddin, N. Uddin, “Heat transfer enhancement by detached-ribs on a surface subjected to jet impingement”, J. Thermophysics Heat Transfer, vol. 27, pp. 355-359, 2013.

FINAL YEAR PROJECT

Title: “Design and Feasibility of an Alternate Air Conditioning System at HUB Power Plant”

Supervisor: Prof. Dr. Anjum Khalid

University: NED University of Engineering & Technology, Karachi

Key Highlights:

- Prepared a detailed Feasibility Report for replacing existing Vapor Compression Chiller with more economical chiller i.e. Vapor Absorption/Centrifugal Chiller and explored a potential annual saving of Rs. 5 Million
- Did designing of major components and prepared a lay out of the piping system of the new system.

EMPLOYMENT HISTORY

NED University of Engineering & Technology, Karachi

Feb.09 ~ Present

The details of different positions held are:

Department organization	Name of post	Grade	Date From	Date To	Total period	Brief description of Job
MECHANICAL/NED UNIVERSITY OF ENGINEERING AND TECHNOLOGY, KARACHI	LECTURER (CONTRACT)	BPS-18	24-Jan-2009	07-Feb-2010	1 years 14 days	Teaching, R&D, Supervision Of Undergraduate, Postgraduate, Industrial And Research Projects, Administrative Work, Etc.
MECHANICAL/NED UNIVERSITY OF ENGINEERING AND TECHNOLOGY, KARACHI	LECTURER (ADHOC)	BPS-18	08-Feb-2010	23-Jun-2010	4 months 15 days	Teaching, R&D, Supervision Of Undergraduate, Postgraduate, Industrial And Research Projects, Administrative Work, Etc.
MECHANICAL/NED UNIVERSITY OF ENGINEERING AND TECHNOLOGY, KARACHI	LECTURER (PERMANENT)	BPS-18	24-Jun-2010	14-Mar-2018	7 years 8 months 18 days	Teaching, R&D, Supervision Of Undergraduate, Postgraduate, Industrial And Research Projects, Administrative Work, Etc.
MECHANICAL/NED UNIVERSITY OF ENGINEERING AND TECHNOLOGY, KARACHI	ASSISTANT PROFESSOR (PERMANENT)	BPS-19	15-Mar-2018	17-May-2021	3 years 2 months 2 days	Currently Working As An Assistant Professor In Mechanical Department At Nedu. The Job Responsibilities Includes: 1. Conducting Theory And Practical Classes Of Different Subjects Related To Mechanical Engineering. 2. Supervising Different Undergraduate, Postgraduate, Industrial And Research Projects. 3. Research And Development. 4. Administrative Work. 5. Also Serving As Director Ned Dice Energy Innovation Center.

RESEARCH GRANTS

- Recipient of HEC Start Up Research Grant of Rs. 487,800/- (SRGP-2067, 2018, Status: completed).
- Recipient of PKR 1 million research funding for the Independent Research Project titled “Performance Enhancement of an Impinging Jet System Using a Variety of Techniques”. (Status: In progress).
- Recipient of NGIRI-IGNITE 2020 research funding on two R&D projects titled "Numerical Study to Investigate Heat and Fluid Flow Characteristics of a Roughened Solar Air Heater" and "Part Detailing of EV Three Wheeler on Solid Modelling along with FES". (Status: completed).
- Recipient of PKR 0.8 million funding from Thal Engineering Pvt. Ltd. and Gresham’s Eastern Pvt. Ltd. for four different applied projects entitled “Energy storage system of Electric vehicles”, “Parametric Study of a Newly Designed Industrial Boiler using CFD”, “Study of Swirl Effects on Combustion in an Industrial Natural Gas Combustor using CFD”, “Energy conservation at Thal Engineering” and “Part Detailing of Electric Three Wheeler on Solid Modelling along with FES” (Status: completed).
- Recipient of PKR 0.4 million funding from Thal Engineering Pvt. Ltd. for two different projects related to indigenous development of Electric Car (Status: In progress).
- With a mission to win major research funding from HEC/External source, I applied for all the HEC Research grants. The proposal for the ICRG Research grant went to the second round where only 50 projects were shortlisted from all over Pakistan.

DEVELOPMENT OF AN ADVANCED HPC FACILITY

Developed an advanced High Performance Computational (HPC) facility in the Mechanical department from the funding received from HEC. Using this facility, I published following research papers in high-quality JCR journals:

1. U. Allauddin, H.M.U. Khan, R. Mohiuddin, N. Uddin, W.A. Khan, “Nanoscale heat transfer investigation of an array of jets impingement with different working fluids under crossflow with and without pin-fins”, *Journal of Heat Transfer*, vol. 50(1), 81-104, 2020.
2. U. Allauddin, T. Jamil, M. Shakaib, H.M.U. Khan, R. Mohiuddin, M.S. Saeed, H. Ahsan, N. Uddin., Heat transfer enhancement caused by impinging jets of Al₂O₃-water nanofluid on a micro-pin fin roughened surface under crossflow conditions–A numerical study, *J. Enhanced Heat Transfer*, vol. 27(4), pp. 367-387, 2020.
3. U. Allauddin et al., Parametric Study of Swirl Effects on Combustion in an Industrial Natural Gas Combustor using CFD, *Journal of Engineering Thermophysics*, 30(1), 2020.

DESIGN AND FABRICATED PROJECTS

- Design and Fabrication of Solar Water Geyser at Staff Washrooms of Mechanical Engineering Department
- An Alternate /Supporting Heating and Cooking System for Staff Canteen using Renewable Energy

MASTER THESIS SUPERVISED

Supervised Master Thesis ME:5002 entitled:

1. "Performance enhancement of an impinging jet system using a variety of techniques"
2. "Theoretical and experimental design of reversible axial exhaust fan"
3. "Heat transfer and fluid flow characteristics investigation using detached ribs in a wall jet flow"
4. "A numerical study for the thermal performance enhancement of heat exchangers"
5. "Simulation of Ranque-Hilsch vortex tube using RANS methods"
6. "Investigation of fluid & heat transfer over a dimpled plate jet impingement system"
7. "Numerical investigations of flow and heat transfer characteristics in impinging jet system using nanofluids"

PH.D. THESIS SUPERVISED

Supervising a Ph.D. student along with Dr. Muhammad Shakaib, Assistant Professor in Mechanical Engineering Department of NED University. The thesis title is "Flow Patterns and Heat Transfer in Circulating Fluidized Beds: Numerical Modeling and Experimental Validation".

PROFESSIONAL/SCIENTIFIC MEETINGS ATTENDED

- Participated as a distinguished speaker in National Conference on Computational Mechanics NCCM 02-03 April 2019 held at Pakistan Institute of Engineering & Applied Sciences (PIEAS), Islamabad.
- Participated as a Session Chair in National Conference on Computational Mechanics (NCCM 02-03 April 2019)
- Participated in an international "Training of Trainers" workshop on "Energy Solutions by Dalberg", a US based global group, envisioned to build a more inclusive and sustainable world. The 3-day workshop held on 29-31 January 2019 and consists of 6 modules, designed to support the capacity building and scaling of renewable energy start-ups in Pakistan.

RESEARCH PUBLICATIONS

Year 2021

- U. Allauddin, S. Salahuddin, M. Uzair, Performance enhancement of an impinging jet system using different working fluids-A numerical study, Heat Transfer Research, 52(1), pp. 17-30, 2021.
- U. Allauddin, H.R. Ansari, S.S. Ahmed, A. Anjum, H.A. Siddique, M.Y. Ahmed, A.A. Khan¹, S.S. Khan, M. Salman, N. Uddin, Parametric Study of Swirl Effects on Combustion in an Industrial Natural Gas Combustor using CFD, Journal of Engineering Thermophysics, 30(1), 2021.
- M. Mahrukh, U. Allauddin, M. E. Haque, N. Uddin, A numerical investigation of flow over single and three tandem square cylinders at Reynolds number of 22000, accepted for publication in Mehran University Research Journal of Engineering and Technology, 2021.

Year 2020

- U. Allauddin, S.R.R. Lomada M. Pfitzner, "Investigation of pressure and the Lewis number effects in the context of flame surface density closure for LES of premixed turbulent combustion", Theoretical and Computational Fluid Dynamics, 35(1), pp. 17-37, 2021.
- U. Allauddin, T. Jamil, M. Shakaib, H.M.U. Khan, R. Mohiuddin, M.S. Saeed, H. Ahsan, N. Uddin., Heat transfer enhancement caused by impinging jets of Al₂O₃-water nanofluid on a micro-pin fin roughened surface under crossflow conditions-A numerical study, J. Enhanced Heat Transfer, vol. 27(4), pp. 367-387, 2020.
- U. Allauddin, H.M.U. Khan, R. Mohiuddin, N. Uddin, W.A. Khan, "Nanoscale heat transfer investigation of an array of jets impingement with different working fluids under crossflow with and without pin-fins", Journal of Heat Transfer, vol. 50(1), 81-104, 2020.
- U. Allauddin et al., An optical-energy model for optimizing the geometrical layout of solar photovoltaic arrays in a constrained field, Renewable Energy, vol. 149, pp. 55-65, 2020.
- U. Allauddin et al., Influence of Transpiration on Heat Transfer and Entropy Generation in a Dissipative Nanofluid Flow with Magnetic Dissipation: An Exact Approach, accepted for publication in Journal of Energies, vol. 13(20), pp. 5506, 2020.

Year 2019

- U. Allauddin, M. Pfitzner, "Development of a RANS premixed turbulent combustion model based on the algebraic flame surface density concept" Journal of Engineering for Gas Turbines and Power, vol. 141(2), 2018.

Year 2018

- U. Allauddin, M. Mahrukh, N. U. Rehman, M. E. Haque, N. Uddin, "Numerical Investigation of Heat Transfer by an Impinging Jet using Alumina-water Nanofluid", Numerical Heat Transfer, part A, vol. 74(8), pp. 1486-1502, 2018.

Year 2017

- U. Allauddin, M. Klein, M. Pfitzner, N. Chakraborty, "A-priori and a-posteriori analysis of algebraic flame surface density modelling in the context of large eddy simulation of turbulent premixed combustion", Numerical Heat Transfer, part A, vol. 71(2), pp. 153-171, 2017.

Year 2016

- P. Janas, U. Allauddin, M. Pfitzner, B. Boehm, A. Kempf, "Numerical investigation of the influence of different valve seat geometries on the in-cylinder flow and combustion in spark ignition engines", abstract accepted for LES4ICE, Rueil-Malmaison, France, November 2016.

Year 2015

- M. Klein, U. Allauddin, R. Keppeler, M. Pfitzner, “Towards uncertainty quantification and quality assessment for large eddy simulation of turbulent premixed combustion”, In Uncertainty Quantification in Computational Fluid Dynamics, Paris, France, May 2015.

Year 2014

- R. Keppeler, E. Tangermann, U. Allauddin, M. Pfitzner, “LES of low to high turbulence combustion in an elevated pressure environment”, Flow Turbulence Combustion, vol. 92, pp. 767-802, 2014.
- U. Allauddin, R. Keppeler, M. Pfitzner, “Turbulent premixed LES combustion models based on fractal flame surface density concept”, ASME paper GT2014-25919, Proc. ASME Turbo Expo, Düsseldorf, Germany, June 2014.
- U. Allauddin, M. Klein, M. Pfitzner, N. Chakraborty, “A-priori and a-posteriori analysis of algebraic flame surface density modelling in the context of large eddy simulation of turbulent premixed combustion”, Proc. SPEIC 14 – Towards sustainable combustion, Lisboa, Portugal, November, 2014.

Year 2013

- U. Allauddin, N. Uddin, S. O. Neumann, “Heat transfer enhancement by detached-ribs on a flat surface subjected to jet impingement”, Numerical Heat Transfer ,part A, vol. 63, pp. 921-940, 2013.
- U. Allauddin, N. Uddin, “Heat transfer enhancement by detached-ribs on a surface subjected to jet impingement”, J. Thermophysics Heat Transfer, vol. 27, pp. 355-359, 2013.
- U. Allauddin, M.A. Siddiqui, S.A. Raza, H.B. Kakar, “Assessment of coal gasification technologies potential for Sindh coal reservoirs”, Proc. Int. Conference on Energy and Sustainability, Karachi, Pakistan , January 2013.

Year 2012

- N. U. Shaikh, M.A. Siddiqui, U. Allauddin, “Integrated solar water-heater and solar water cooler performance during winter time”, NED University J. Research, pp. 61-72, 2012.

ADMINISTRATIVE RESPONSIBILITIES

Currently also working as a Director of NED DICE Energy Innovation Centre with a mission:

- To encourage and promote Energy related innovations throughout the country and transform them into commercial products and services and to serve as R&D wing for industry to help solve their energy related problems
- To empower our nation to address its Energy/Water problems through innovative solutions.

Following major activities were performed under the role of Director of NED DICE Energy Innovation Centre:

1. Currently, working on design and development of Pakistan first ever indigenous electric car. The concept model of the car is ready for production in collaboration with TEVTA Pakistan. The design and development of power train system, battery packs with battery, thermal and vibration management systems and other major systems of the car are in progress. It is planned to launch the engineering prototype model at the end of 2021.
2. Generated PKR 1.2 million funding to complete industrial projects entitled “Energy storage system of Electric vehicles”, “Parametric Study of a Newly Designed Industrial Boiler using CFD”, “Study of Swirl Effects on Combustion in an Industrial Natural Gas Combustor using CFD”, “Energy conservation at Thal Engineering”, “Part Detailing of Electric Three Wheeler on Solid Modelling along with FES”, “Design and Fabrication of Battery Packs along with Battery Management System and Thermal Management System for an Electric car” and “Design Simulation and Implementation of Thermal, Vibration and Battery Management System for an Electric Car”.
3. Design and developed a new professional website of the Center
4. Started Research Assistantship Program in which the Chartered members of the Centre can offer one project of their industry and one project of National interest and a team of four students will dedicatedly work on the project. Each team will get a stipend of Rs. 10,000/- per month for ten months. The applied projects from industry will be offered, students will get an exposure of industry, one of the supervisors will be from industry so students will learn the practices of industry and at the end students will be paid for completing the project.
5. The Centre purchased Solar Panels Testing equipment by the funding received from USA organization to make Centre self-financed by offering different services and generate revenue out of it. PKR 125,000/- was generated in the first assignment.
6. DICE Energy & Water was arranged at NED University on 10-11 October 2018. The event included four different event categories. It provided an opportunity to the academia and the industry to share innovative ideas and solutions to address the current energy/water scenario. More than 120 innovative project ideas were received from 28 different Universities of Pakistan.
7. In collaboration with Shell Tameer organized two different sessions for the commercialization of projects registered in DICE Energy & Water 2018 event.
8. Organized a technical session entitled “A Talk on Global Energy Economics” on 10th January 2019. Mr. Muqtadar Quraishi from Cornell University, Ithaca, New York State, USA delivered a condensed yet clear view of the World Energy scene both at a macro and micro level.
9. Organized three meeting of the Industrial board of the Centre on: 9th, March 2018, 15th, March 2019 and 17th October, 2019 with the key agenda of “Development of the DICE Energy & Water Innovation Center to effectively support industry in their Energy and Water related problems”.

Worked as an ASME Faculty Coordinator of ASME NEDUET Section which had responsibilities of:

- Organized a variety of activities of technical content and professional and personal values
- Prepared students to participate in International, National and Local activities arranged by ASME
- Created a professional and practical approach in the young engineers by engaging them in different activities of ASME

OTHER ADMINISTRATIVE WORK

- Member BOS of Mechanical Engineering Department of NED University of Engineering & Technology.
- Member BOS of Mechanical Engineering Department of Government Technical College Karachi
- Member BOS of Mechanical Engineering Department of Nazeer Hussain University.
- Course coordinator of ME:215 Internal Combustion Engines and ME:112 Thermodynamics.
- Member of scheme of studies revision committee.
- Member of standards revision committee at PSQCA.
- Prepare a proposal of EV Testing & Research Center at NED UET.
- Prepared a practical workbook for the course of Heat & Mass Transfer.
- Upgraded the Heat Transfer lab of Mechanical Engineering Department.
- Part of collaboration with AUTOCOM Pvt. Ltd. The team is working on indigenous development of an Electric Luggage vehicle.
- Career and student wellness counselor.
- Facilitated the tours of different national and internal delegates.

TECHNICAL SKILLS

- Proficiency in ICEMCFD, CFX, Fluent, OpenFOAM, Tecplot and Paraview.

SUBJECTS OF INTEREST

- Computational Fluid Dynamics
- Heat Transfer
- Fluid Mechanics
- Renewable Energy
- Thermodynamics
- Combustion

REFERENCES

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