Muhammad Khalid, PhD, P.Eng.

Contact Information

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Career Highlights

- Professional engineer, researcher, and teacher with extensive experience and advanced training in mechanical engineering
- Recipient of NSERC Discovery grant and other funding grants of worth $\sim$ $\$287,000$ for research and industrial projects
- Developed and taught fundamental and advanced courses in mechanical and aerospace engineering and supervised more than 70 undergraduate and graduate engineering students in different universities of the world
- Led and participated in many collaborative projects in knowledge-based work environments, resulting in 28 technical journal articles and 21 papers & presentations in internationally reputed conferences, including ASME, AIAA, IEEE, and CSME
- Excellent leadership, project management, organizational, interpersonal, analytical, communication, presentation, and problem-solving skills

Areas of Interest

Renewable Energy, Thermo-Fluids, Wind & Hydrokinetic Energy, Multi-Physics Simulations, Marine Propulsion, Bio-Inspired Designs, Computational Techniques, and Nonlinear Dynamics

Current Academic Appointments

Lakehead University, Canada
Assistant Professor (Tenure-Track) 01/2023 – Present

- Affiliation:
  - ◇ Department of Mechanical Engineering
  - ◇ Founding Director of Nature-Inspired Engineering Research Lab (NIERL)
  - ◇ Conducting research in bio-inspired future energy harvesting, propulsive, and heat transfer systems based on fundamental and applied research in fluid-structure-acoustic-thermal interactions
  - ◇ Recipient of NSERC Discovery Grant (2022 - 2027) to develop novel computational tools for high-fidelity simulations of fluid-structure-acoustic interactions based systems
  - ◇ Teaching two courses (EMEC 3454 - Applied Heat Transfer and EMEC 3559 - Computational Methods and Modeling for Mechanical Engineering) in Winter 2023
  - ◇ Mentoring and co-supervising PhD and MSc students in their graduate research

University of Alberta, Canada
Adjunct Professor 07/2021 – Present

- Affiliation:
  - ◇ Department of Mechanical Engineering
  - ◇ Conducting fundamental and applied research in computational fluid-structure interactions
  - ◇ Actively collaborating with Professor Arman Hemmati (University of Alberta) to design nature-inspired efficient energy harvesting and propulsive systems
  - ◇ Mentoring and co-supervising PhD and MSc students in their graduate research

Current Industrial Appointment

AeroEnergy Consulting, Canada 01/2021 – Present
Simulation Specialist Consultant

- Project: Performance Enhancement of a Cooling System in a Power Plant
- Key Outcomes:

- ◇ Generating high-quality mesh around piping structures and building walls for simulations based on conjugate heat transfer
- ◇ Performing three-dimensional fluid-structure-thermal interactions based simulations to evaluate the performance of cooling mechanisms in the power plant
- ◇ Designing passive control mechanisms to avoid recirculation of heated air in the building

- Project: Feasibility study of a novel solar energy harvesting technology
- Key Outcomes:
  - ◇ Generated multiple CAD models of the heating system using SolidWorks for a parametric study
  - ◇ Generated high-quality mesh on and inside pipes with internal mountings using ANSYS Fluent Mosaic Meshing
  - ◇ Performed three-dimensional multiphysics-based simulations for conjugate heat transfer between heated pipes and high-pressure air flows in ANSYS Fluent
  - ◇ Provided expert advice on design modifications to improvise the design process
- Project: Cost minimization for a geothermal power plant in Alberta
- Key Outcomes:
  - ◇ Developed mathematical models for cost and power production as functions of various governing thermodynamic design parameters in geothermal plants
  - ◇ Performed multi-objective optimization studies to minimize cost and maximize power production using nonlinear techniques

EDUCATION

National University of Sciences & Technology, Pakistan

Ph.D., Mechanical Engineering, 05/2016

- Dissertation: *Numerical Simulations, Nonlinear Analysis, and Control of Bio-inspired Flows: A Step towards Autonomous Vehicles*
- Advisor: Professor Imran Akhtar

University of Virginia, USA

Visiting Doctoral Student, Mechanical and Aerospace Engineering, 10/2014 – 03/2015

- Adviser: Professor Haibo Dong
- Area of Study: Nonlinear Mechanics of Bio-inspired Swimming and Flight

National University of Sciences & Technology, Pakistan

M.Sc, Mechanical Engineering, 08/2009

- Thesis: *CFD Based Analysis of Supersonic Flows*
- Adviser: Professor Muhammad Afzaal Malik
- Area of Research: Computational Fluid Dynamics and Compressible Flows

B.E., Mechanical Engineering, 05/2007

- Senior Design Project: *Modeling and Simulation of a MEMS Gyroscope*

PREVIOUS ACADEMIC & RESEARCH APPOINTMENTS

University of Alberta, Canada

Associate Teaching Professor 09/2022 – 12/2022

Research Associate 04/2021 – 08/2022

Visiting Postdoctoral Research Fellow 09/2020 – 03/2021

- Affiliation:
  - ◇ Department of Mechanical Engineering

- Key Outcomes:
  - ◇ Conducted fundamental and applied research in computational fluid-structure-acoustic interactions
  - ◇ Taught courses (MEC E 563 - Finite Element Method for Mechanical Engineers, MEC E 430 - Fluid Mechanics II, MEC E 230 - Introduction to Thermal-Fluid Science and MEC E 362 - Mechanics of Machines) to undergraduate and graduate students in mechanical engineering
  - ◇ Actively collaborated with Professor David Wood (University of Calgary), Professor Haibo Dong (University of Virginia), and Professor Arman Hemmati (University of Alberta) to design nature-inspired efficient energy harvesting and propulsive systems
  - ◇ Lead Volunteers Coordinator and member of the Program Development Committee to organize Canadian Society of Mechanical Engineers (CSME) Congress, 2022
  - ◇ Mentored PhD and MSc students in their thesis research

Peking University, China 03/2019 – 02/2021

International Exchange Postdoctoral Research Fellow

- Affiliations:
  - ◇ Key State Laboratory of Turbulence and Complex Flows
  - ◇ Institute of Ocean Research
  - ◇ Department of Mechanics and Engineering Science
- Advisor: Professor Moubin Liu
- Research Project: Hydrodynamics and hydro-acoustics of fish swimming
- Key Outcomes:
  - ◇ Recipient of a highly competitive International Exchange Research Fellowship jointly funded by China National Postdoc Foundation and Peking University, China (Funding Amount $\sim$ \$1,16,000)
  - ◇ Developed advanced computational tools for integrated experimental-numerical investigations of engineering systems involving complex fluid-structure interaction using sharp interface immersed-boundary method and finite-element methods
  - ◇ Developed and employed numerical simulations tools to investigate hydrodynamics and hydro-acoustics of bio-inspired swimming
  - ◇ Examined the connectivity between the physiology and kinematics of fish locomotion
  - ◇ Developed advanced modal decomposition techniques to understand the functionality of natural physical systems involving multi sub-domains to enable machine learning control algorithms
  - ◇ Investigated open-channel intense wave-structure coupling by our in-house advanced solver based on smoothed-particle hydrodynamics technique coupled with nonlinear finite element methods
  - ◇ Mentored PhD and MSc students in their thesis research
  - ◇ Seven journal publications in *Physics of Fluids* (featured as the Editor's Pick), *Physical Review Fluids* (featured as the Editor's Suggestion), *Bioinspiraion & Biomimetics*, *Journal of Fluids and Structures*, and *Applied Ocean Research*

National University of Sciences & Technology, Pakistan

- **Assistant Professor (Tenure Track)** 10/2016 – 03/2019
  (On leave from 09/2017 – 12/2018)
- **Assistant Professor** 04/2012 – 10/2016
  (On leave from 10/2014 – 03/2015)
- **Lecturer** 09/2009 – 04/2012
- **Lab Engineer** 05/2007 – 09/2008
- Affiliations:

  - ◇ Department of Mechanical Engineering
    NUST College of Electrical & Mechanical Engineering
- Key Outcomes:
  - ◇ Headed postgraduate program in mechanical engineering and designed a system to automate the monitoring process for academic and research progress of 350 MSc and PhD students
  - ◇ Recipient of funding grants worth $\sim$ $25,000 from different industrial organizations to design and develop unmanned aerial and underwater vehicles
  - ◇ Published three journal articles in *Journal of Computational and Nonlinear Dynamics* and *Journal of Aerospace Engineering* as the first author and 13 papers in international conferences organized by AIAA, ASME, and IEEE
  - ◇ Managed funds of $200k to purchase scientific equipment for teaching and research labs

Computational Science Research Center & **Peking University**, Beijing, China
Joint Visiting Research Fellow 10/2018 – 12/2018

- Affiliations:
  - ◇ Division of Mechanics, CSRC
  - ◇ Department of Mechanics and Engineering Science, PKU
- Key Outcomes:
  - ◇ Constructed computational tools in Fortran to prescribe kinematics for complex three-dimensional bodies discretized by finite elements and its further utilization in different CFD solvers

Jiangsu University, China 10/2017 – 10/2018
Postdoctoral Research Fellow

- Affiliation:
  - ◇ Research Center for Fluid Machinery Engineering
- Research Areas: Nature-inspired fluid-structure interaction and wind turbine aerodynamics
- Key Outcomes:
  - ◇ Developed user-defined functions (UDFs) through the macros of ANSYS Fluent for flow-induced motion of multi-component systems
  - ◇ Developed mathematical models to optimize energy harvesting from bio-inspired oscillating structures
  - ◇ Conducted high-fidelity numerical simulations in ANSYS for flow and structural dynamics of vertical-axis wind turbines
  - ◇ Investigated acoustic propagation associated with vibrating and rotary systems using high-end simulations in ANSYS Fluent
  - ◇ Published three journal articles in *Ocean Engineering*, *Journal of Fluids and Structures*, and *Smart Materials and Structures* with two as the first author

University of Virginia, USA 10/2014 – 03/2015
Visiting Research Scholar

- Affiliation:
  - ◇ Flow Simulations Research Group, Department of Mechanical and Aerospace Engineering
- Advisor: Professor Haibo Dong
- Research Areas: Nonlinear Mechanics of Coordinated Flight and Swimming
- Key Outcomes:
  - ◇ Recipient of International Research Support Initiative Program (IRSIP) funded by the Higher Education Commission (HEC) of Pakistan to carry out doctoral research (Funding Amount $\sim$ $16,500)
  - ◇ Performed high-end simulations using in-house solver based on finite element methods

and sharp-interface immersed-boundary method to analyze nonlinear flows and structural characteristics associated with bio-inspired flight and swimming
- ◇ Investigated the governing nonlinear hydrodynamic mechanisms in fish schooling and energetic benefits associated with this natural phenomenon
- ◇ Published one journal article in *Journal of Fluids and Structures* and one AIAA conference paper

HITEC University, Pakistan
Department of Mechanical Engineering
Lecturer 10/2008 – 08/2009

- ◇ Taught courses for computer-aided engineering to undergraduate students in mechanical and electrical engineering

TEACHING EXPERIENCE

Lakehead University, Canada
Department of Mechanical Engineering

- ◇ **Assistant Professor** 01/2023 – Present
  - ○ EMEC 3454 - Applied Heat Transfer Winter, 2023
    (61 Students)
  - ○ EMEC 3559 - Computational Methods and Modeling for Mechanical Engineering
    Winter, 2023
    (66 Students)

University of Alberta, Canada
Department of Mechanical Engineering

- ◇ **Associate Teaching Professor** 09/2022 – 12/2022
  - ○ MEC E 563 - Finite Element Method for Mechanical Engineers Fall, 2022
    (51 Students)
  - ○ MEC E 430 - Fluid Mechanics II Fall, 2022
    (91 Students)
- ◇ **Adjunct Professor** 01/2022 – 08/2022
  - ○ MEC E 362 - Mechanics of Machines Spring/Summer, 2022
    (54 Students)
  - ○ MEC E 230 - Introduction to Thermal-Fluid Science Winter, 2022
    (105 Students)

National University of Sciences & Technology, Pakistan
Department of Mechanical Engineering
NUST College of Electrical & Mechanical Engineering

- Developed and taught courses of statics, dynamics, thermodynamics, heat transfer, fluid mechanics, solid mechanics, mechanical vibrations, computational fluid dynamics, and finite-element methods to undergraduate and graduate students in mechanical engineering
- Mentored and supervised more than 60 undergraduate and graduate students
- Managed and conducted labs related to thermo-fluids, refrigeration, and structural mechanics
- Took initiative to record and upload my course lectures delivered to undergraduate engineering students on Youtube
- Conducted 4 voluntary workshops as a volunteer to teach MATLAB, ANSYS, and AutoCAD to engineering students in collaboration with SAE and ASME students' chapters
- Courses Taught during Faculty Appointments:
  - ◇ **Assistant Professor (Tenure Track)** 10/2016 – 03/2019

- ME-130: Thermodynamic I — Spring, 2017
  (51 Students, 1 Syndicate)
- ME-330: Heat & Mass Transfer — Fall, 2016
  (48 Students, 1 Syndicate)

◇ **Assistant Professor** — 04/2012 – 10/2016

- ME-233: Fluid Mechanics II — Spring, 2016
  (48 Students, 1 Syndicate)
- ME-234: Fluid Mechanics Lab — Spring, 2016
  (47 Students, 1 Syndicate)
- ME-330: Heat and Mass Transfer — Fall, 2015
  (87 Students, 2 Syndicates)
- ME-323: Mechanics & Measurement Lab — Fall, 2015
  (48 Students, 1 Syndicates)
- ME-445: Computational Fluid Dynamics — Spring, 2015
  (78 Students, 2 Syndicates)
- ME-112: Engineering Statics — Spring, 2014
  (95 Students, 2 Syndicates)
- ME-419: Thermo-fluids Lab III — Spring, 2014
  (47 Students, 1 Syndicate)

◇ **Lecturer** — 09/2009 – 04/2012

- ME-261: Control Systems — Fall, 2013
  (80 Students, 2 Syndicates)
- ME-419: Thermo-fluids Lab III — Fall, 2013
  (81 Students, 2 Syndicate)
- ME-112: Engineering Statics — Spring, 2013
  (89 Students, 2 Syndicates)
- ME-437: Mechanical Vibrations — Fall, 2012
  (86 Students, 2 Syndicates)
- ME-419: Thermo-fluids Lab III — Fall, 2012
  (87 Students, 2 Syndicate)
- ME-112: Engineering Statics — Spring, 2012
  (95 Students, 2 Syndicates)
- ME-322: Heat and Mass Transfer — Fall, 2011
  (88 Students, 2 Syndicates)
- ME-192: Engineering Mechanics — Spring, 2011
  (125 Students, 3 Syndicates)
  Co-taught with Professor Akhtar Nawaz Malik
- ME-322: Heat and Mass Transfer — Fall, 2010
  (89 Students, 2 Syndicates)
- ME-191 Computer Aided Drawing — Fall, 2010
  (125 Students, 3 Syndicates)
  Co-taught with Professor Rehan Ahmed Khan
- ME-112: Engineering Mechanics — Spring, 2010
  (89 Students, 2 Syndicates)
- ME-191 Computer Aided Drawing — Spring, 2010
  (90 Students, 2 Syndicates)
  Co-taught with Professor Rehan Ahmed Khan
- EM-223 Mechanics of Materials — Fall, 2009
  (96 Students, 2 Syndicates)
- ME-191 Computer Aided Drawing — Fall, 2009

(89 Students, 2 Syndicates)
Co-taught with Professor Rehan Ahmed Khan

◇ **Lab Engineer** 05/2007 – 09/2008

○ Assisted the departmental faculty to conduct labs and examinations of Computer-Aided Engineering and Instrumentation & Control

HITEC University, Pakistan
Department of Mechanical Engineering
Lecturer 10/2008 – 08/2009

◇ Computer Aided Drawing Spring, 2009
(120 Students, 3 Syndicate)
◇ Computer Aided Drawing Fall, 2008
(150 Students, 3 Syndicate)

Industrial & Research Grants

[1] Principal Investigator, "Flow Physics and Vortex-Induced Acoustics in Bio-Inspired Collective Locomotion"
- Discovery Grant from Natural Sciences and Engineering Research Council (NSERC) 04/2022– 03/2027
- Funding Amount $\sim \$137,500$

[2] Principal Investigator, "CFD Based Design of an Underwater Vehicle"
- General Public Organization, Pakistan 09/2016– 07/2017
- Funding Amount $\sim \$1400$

[3] "University Conference Travel Grant",
- National University of Sciences & Technology, Pakistan 11/2016
- Funding Amount $\sim \$4000$

[4] "University Conference Travel Grant",
- National University of Sciences & Technology, Pakistan 06/2015
- Funding Amount $\sim \$4000$

[5] Principal Investigator, "CFD Based Design Development of Solar Powered Unmanned Aerial Vehicle",
- General Public Organization, Pakistan 05/2013 – 03/2014
- Funding Amount $\sim \$7500$

[6] Principal Investigator, "Development of a Remote-Controlled Unmanned Aerial Vehicle for 2013 International Competition on Future Flight Design, Istanbul, Turkey",
- National University of Sciences & Technology, Pakistan 01/2013 – 05/2013
- Funding Amount $\sim \$8000$

[7] "University Conference Travel Grant"
- National University of Sciences & Technology, Pakistan 11/2012
- Funding Amount $\sim \$4000$

[8] Principal Investigator, "Design and Development of a Remote-Controlled Unmanned Aerial Vehicle for Design, Build & Fly Contest at Ghulam Ishaq Khan Institute of Technology, Pakistan"
- National University of Sciences & Technology, Pakistan 08/2010 – 04/2011
- Funding Amount $\sim \$1300$

AWARDS

National Natural Science Foundation, China

- **International Exchange Research Fellowship** 12/2018
  - ◇ Project: Hydrodynamics and hydro-acoustics of fish swimming
  - ◇ Funding Amount $\sim \$1,16,000$

Higher Education Commission, Pakistan

- **HEC Approved PhD Supervisor** 04/2017
- **Visiting Doctoral Research Fellowship** 09/2014
  - ◇ International Research Support Initiative Program
  - ◇ Funding Amount $\sim \$16,500$
  - ◇ To conduct partial doctoral research at University of Virginia, USA

Ghulam Ishaq Khan Institute of Technology, Pakistan

- **Supervisor for the Runner-up Team** 04/2017
  - ◇ Design, Build & Fly Contest by AIAA Chapter
- **Runner-up Prize** 04/2007
  - ◇ Pro-Engineer Design Exhibition, 1st All Pakistan Mechanical Engineering Competition

National University of Sciences & Technology, Pakistan

- **Mega S&T Graduate Scholarship** 09/2007
  - ◇ (Funding Amount $\sim \$12,000$)
- **Academic Merit Scholarship** 07/2005
- **Academic Merit Scholarship** 02/2005

REFEREED JOURNAL PUBLICATIONS

The symbol ($\star$) represents HQPs for whom I served as the direct supervisor/research advisor or co-supervisor.

Under Review/Submitted

(J28) Z. Zhang, C. Shu, Y. Liu, W. Liu, and M.S.U. Khalid, " An improved M-SPEM for modeling complex hydroelastic fluid-structure interaction problems", *Journal of Computational Physics*.

Published/In Press

(J27) J.M. Kelley*, M.S.U. Khalid, Y. Pan, and H. Dong, "Geometric characteristics of flapping foils for enhanced propulsive efficiency", *Journal of Fluids Engineering*, In Press, 2023.

(J26) M.S.U. Khalid, D. Wood, and A. Hemmati, "Self-starting characteristics and flow-induced rotation of multi-stage co-axial vertical-axis wind turbines", *Energies*, 15(24): 9365, 2022.

(J25) Z. Zhang, C. Shu, M.S.U. Khalid, Y. Liu, Z. Yuan, Q. Jiang, and W. Liu, "Particle-based modeling and investigation of cold spray additive manufacturing with multi-layer multi-track powders", *Journal of Manufacturing Processes*, 84: 565–586, 2022.

(J24) A. Gungor*, M.S.U. Khalid, and A. Hemmati, "Classifications of vortex patterns of oscillating foils in side-by-side configurations", *Journal of Fluid Mechanics*, 951: A37, 2022.

(J23) G. Zhu, Y. Zhao, Z. Wang, M.S.U. Khalid, and M.B. Liu, "Semi-resolved CFD-DEM simulation of fine particle migration with heat transfer in heterogeneous porous media", *International Journal of Heat and Mass Transfer*, 197: 123349, 2022.

(J22) Z.L. Zhang, C. Shu, M.S.U. Khalid, Z. Chen, and W. Liu, "Investigations on the hydroelastic slamming of deformable wedges by using the smoothed particle element method", *Journal of Fluids and Structures*, 114: 103732, 2022.

(J21) H. Farooq*, M.S.U. Khalid, I. Akhtar, and A. Hemmati, "Nonlinear response of passively flapping airfoils", *Ocean Engineering*, 261: 112071, 2022.

(J20) H. Farooq*, M. Ghommem, M.S.U. Khalid, I. Akhtar, "Numerical investigation of hydrodynamic performance of flapping foils for energy harvesting". *Ocean Engineering*, 260: 112005, 2022.

(J19) M. Temesgen*, M.S.U. Khalid, D. Wood, and B.T. Admasu, "Some effects of turbine inertia on the starting performance of vertical-axis hydrokinetic turbine", *Ocean Engineering*, 252: 111143, 2022.

(J18) T. Asim, I. Sheikh, A. Hemmati, and M.S.U. Khalid, "A review of recent advancements in offshore wind turbines technology", *Energies*, 15(2): 579, 2022.

(J17) S. Verma, M.S.U. Khalid, and A. Hemmati, "On association of lift generation, wake topology and kinematics of oscillating foils", In Press, *International Journal of Micro Air Vehicles*.

(J16) A. Gungor*, M.S.U. Khalid, and A. Hemmati, "How does switching synchronization of pitching parallel foils from out-of-phase to in-phase change their wake dynamics?", *Physics of Fluids*, 33: 081901, 2021.

(J15) M.S.U. Khalid, J. Wang, I. Akhtar, A. Hemmati, H. Dong, and M.B. Liu, "Larger wavelengths suit the hydrodynamics of carangiform swimmers", *Physical Review Fluids*, 6: 073101, 2021 (**featured as an Editors' Suggestion**).

(J14) Z.L. Zhang*, M.S.U. Khalid, T. Long, M.B. Liu, and C. Shu, "Improved element-particle coupling strategy with δ-SPH and particle shifting for modeling sloshing with rigid or deformable structures", *Applied Ocean Research*, 114: 102774, 2021.

(J13) M.S.U. Khalid, J. Wang, I. Akhtar, A. Hemmati, H. Dong, and M.B. Liu, "Why do anguilliform swimmers undulate their bodies with wavelengths shorter than their bodylengths?", *Physics of Fluids*, 33(3): 031911, 2021 (**featured as the Editor's Pick**).

(J12) M.S.U. Khalid, J. Wang, I. Akhtar, H. Dong, and M.B. Liu, "Modal Decompositions of the Kinematics of Crevalle Jack and the Fluid-Caudal Fin Interaction", *Bioinspiration & Biomimetics*, 16: 016018, 2020.

(J11) M.S.U. Khalid, J. Wang, H. Dong, and M.B. Liu, "Flow transitions and mappings for undulatory swimmers", *Physical Review Fluids*, 5(6): 063104, 2020.

(J10) M. Usman, M. Hamid, M.S.U. Khalid, R.U. Haq, and M.B. Liu, "A robust scheme based on novel-operational matrices for some classes of time-fractional nonlinear problems arising in mechanics and mathematical physics", *Numerical Methods for Partial Differential Equations*, 36(6): 1566–1600, 2020.

(J9) Z.L Zhang*, M.S.U. Khalid, T. Long, J.Z. Chang, and M.B. Liu, "Investigations on sloshing mitigation using elastic baffles by coupling smoothed finite element method and decoupled finite particle method", *Journal of Fluid and Structures*, 94: 102942, 2020.

(J8) M.S.U. Khalid, I. Akhtar, and B.W. Wu, "Quantification of flow noise produced by an oscillating hydrofoil", *Ocean Engineering*, 171: 377–390, 2019.

(J7) R. Salzar, G. Taylor, M.S.U. Khalid, and A. Abdelkefi, "Optimal design and energy harvesting performance of carangiform fish-like robotic system", *Smart Material and Structures*, 27: 075045, 2018.

(J6) M.S.U. Khalid, I. Akhtar, H. Dong, N. Ahsan, X. Jiang, and B. Wu, "Bifurcations and route to chaos for flow over an oscillating airfoil", *Journal of Fluids and Structures*, 80: 262–274, 2018.

(J5) M.S.U. Khalid, I. Akhtar, H. Imtiaz, H. Dong, and B. Wu, "On the hydrodynamics and nonlinear interaction between fish in tandem", *Ocean Engineering*, 157(C): 108–120, 2018.

(J4) M.S.U. Khalid and I. Akhtar, "Nonlinear reduced-order models for aerodynamic lift produced by oscillating airfoils", *Journal of Computational and Nonlinear Dynamics*, 12(5): 051019, 2017.

(J3) M.S.U. Khalid, I. Akhtar, and H. Dong, "Hydrodynamics of a tandem fish school with asynchronous undulation of individuals", *Journal of Fluids and Structures*, 66: 19–35, 2016.

(J2) M.S.U. Khalid, T. Rabbani*, I. Akhtar, N. Durrani, and M.S. Siddiqui, "Reduced-order modeling of torque on a vertical-axis wind turbine at varying tip-speed ratios", *Journal of Computation and Nonlinear Dynamics*, 10(4): 041012, 2015.

(J1) M.S.U. Khalid, I. Akhtar, and N. Durrani, "Analysis of Strouhal number based equivalence of pitching and plunging airfoils and wake deflection", *Proceedings of the Institution of Mechanical Engineers, Part G: Journal of Aerospace Engineering*, 229(8): 1423–1434, 2015.

Conference Proceedings & Presentations

(C21) A. Gungor, M.S.U. Khalid, and A. Hemmati, "Effect of pitching phase difference on three-dimensional wake features behind parallel foils", *75th Annual Meeting of the Division of Fluid Dynamics*, Indianapolis, Indiana, USA, 2022.

(C20) S. Verma, M.S.U. Khalid, and A. Hemmati, "On association of wake topology and lift generation of oscillating foil in coupled motion", *Canadian Society of Mechanical Engineers (CSME) Congress*, Edmonton, Canada, 2022.

(C19) H. Farooq, M.S.U. Khalid, I. Akhtar, and A. Hemmati, "Micro power generators based on semi-passive oscillations of airfoils", *Canadian Society of Mechanical Engineers (CSME) Congress*, Edmonton, Canada, 2022.

(C18) A.U.M. Hashmi, F. Butt, I. Akhtar, and M.S.U. Khalid, "On the effect of control temperature location on datacenter power consumption using numerical analysis", *ASME Fluids Engineering Division Summer Meeting (FEDSM)*, Toronto, Canada, 2022.

(C17) W. Siddiqui, Z. Abbas, I. Akhtar, and M.S.U. Khalid, "Nusselt number dependence on aspect ratio and Rayleigh Number: A numerical study of Rayleigh-Benard instability", *ASME Fluids Engineering Division Summer Meeting (FEDSM)*, Toronto, Canada, 2022.

(C16) A. Gungor, M.S.U. Khalid, and A. Hemmati, "Effect of phase difference on wake and propulsive performance characteristics of pitching foils in side-by-side sonfiguration", *ASME Fluids Engineering Division Summer Meeting (FEDSM)*, Toronto, Canada, 2022.

(C15) A. Gungor*, M.S.U. Khalid, and A. Hemmati, "The physical mechanism behind the wake merging phenomena of pitching foils in side-by-side arrangement", *74th Annual Meeting of the American Physical Society (APS) Division of Fluid Dynamics*, Phoenix, Arizona, USA, 2021.

(C14) R. Salzar, G. Taylor, M.S.U.Khalid, and A. Abdelkefi, "Insights on the piezoelectric energy harvesting performance of carangiform fish-like robotic systems", *ASME Conference on Smart Materials, Adaptive Structures and Intelligent Systems*, San Antonio, TX, USA, 2018.

(C13) R. Shahab*, A.A. Aamir*, M.S.U. Khalid, and A.U. Haq, "Three-dimensional computational fluid dynamics based design of an underwater vehicle", *15th International Bhurbhan Conference on Applied Sciences and Technology*, Islamabad, Pakistan, 2018.

(C12) M.A. Naseem*, E. Uddin, M.S.U. Khalid, A. Mubashar, and S.R. Shah, "Investigation of the flow around uncambered airfoils at 1000 Reynolds number using computational fluid dynamics for micro air vehicles", *World Engineering Congress on Advances in Structural Engineering and Mechanics*, Seoul, South Korea, 2017.

(C11) S.M. Abdullah*, A. Abdullah*, A. Shahzad*, and M.S.U. Khalid, "Aerodynamics of a flying wing UAV with backward facing stepped wing profile", *14th International Bhurbhan Conference on Applied Sciences and Technology*, Islamabad, Pakistan, 2017.

(C10) M.S.U. Khalid and I. Akhtar, "Nonlinear reduced-order models for lift of oscillating airfoils", *ASME International Mechanical Engineering Congress & Exposition*, Phoenix, AZ, USA, 2016.

(C9) H. Zaidi, I. Akhtar, S.I. Majeed, T. Zaidi, and M.S.U. Khalid, "Nonlinear Characterization of Heart Rate Variability in Normal Sinus Rhythm, Atrial Fibrillation and Congestive Heart Failure", *ASME International Mechanical Engineering Congress & Exposition*, Phoenix, AZ, USA, 2016.

(C8) M.S.U. Khalid, I. Akhtar, H. Dong, and N. Ahsan, "Nonlinear characterization of flow over oscillating elliptic airfoils", *45th Fluid Dynamics Conference, AIAA Aviation Forum*, Dallas, TX, USA, 2015.

(C7) H. Imtiaz, I. Akhtar, and M.S.U. Khalid, "Proper orthogonal decomposition closure models for Burgers and Navier-Stokes equations", *22nd Computational Fluid Dynamics Conference, AIAA Aviation Forum*, Dallas, TX, USA, 2015.

(C6) T. Rabbani*, M.S.U. Khalid, I.Akhtar, and M.S. Siddiqui, "Reduced order modeling of loads on a vertical-axis wind turbine", *11th IEEE International Bhurban Conference on Applied Sciences & Technology*, Islamabad, Pakistan, 2014.

(C5) K. Nazir*, I. Akhtar, N. Durrani and M.S.U. Khalid, "Numerical study to analyze the effects of hot/cold aisle configurations on heat transfer phenomenon in a data center", *ASME International Mechanical Engineering Congress & Exposition*, San Diego, CA, USA, 2013.

(C4) M.S.U. Khalid and I. Akhtar, "Characteristics of flow past a symmetric airfoil at low Reynolds number, A nonlinear perspective", *ASME International Mechanical Engineering Congress & Exposition*, Houston, TX, USA, 2012.

(C3) N. Qazi, M.S.U. Khalid, and I. Akhtar, "GPU-based simulations to analyze the effect of heat source in mixed convection", *ASME International Mechanical Engineering Congress & Exposition*, Houston, TX, USA, 2012.

(C2) M.A. Malik, M.S.U. Khalid, and F. Barlas, "Modeling & simulation of kinematics for an active flapping and pitching mechanism", *World Congress on Engineering*, London, UK, 2010.

(C1) M.S.U. Khalid and M.A. Malik, "Modeling & simulation of supersonic flow using McCormack's technique", *World Congress on Engineering*, London, UK, 2009.

Invited Talks, Seminar & Workshops

[1] *Interactions of Fluid Flows with Structures and Heat: Multiphysics Modeling for Interdisciplinary Applications*, Department of Mechanical Engineering, Lakehead University, Canada (Nov 9, 2022)
Host: Professor Ali Tarokh

[2] *Connecting Physiology and Kinematics of Natural Swimmers*, Intelligent and Bio-inspired Mechanics (IBiM) Seminar Series, Queen's University, Canada (June 2, 2021)
Host: Professor Dixia Fan
(Recording available at https://youtu.be/VlIcfLPV0Z8)

[3] *Undulating swimmers: A comparative perspective*, Center for System and Control, Key State Laboratory of Turbulence and Complex Flows, Institute of Ocean Research, Peking University, Beijing, China (Dec 27, 2019)
Host: Professor Guangming Xie

[4] *Fluid-structure interaction for bio-inspired propulsion and reduced-order modeling*, Department of Mechanics and Engineering Science, Peking University, Beijing, China (May 29 , 2019)
Host: Professor Moubin Liu

[5] *Bio-inspired flight and swimming: A nonlinear perspective*, Computational Science Research Center, Beijing, China (June 14, 2018)
Host: Professor Yang Ding

[6] *MATLAB for numerical methods*, Department of Mechanical Engineering, College of Electrical & Mechanical Engineering, National University of Sciences & Technology, Rawalpindi, Pakistan (Jan 18–21, 2017)
Host: NUST EME Student Section for American Society of Mechanical Engineers

[7] *Fish schooling with asynchronous undulation*, 14th International Bhurbhan Conference on Applied Sciences & Technology, Islamabad, Pakistan (Jan 12, 2017) **Session Keynote Talk**

[8] *Extracting nonlinear dynamical features of flow fields around oscillating wings & fins*, Nonlinear Dynamics & Energy Harvesting Lab, Department of Mechanical & Aerospace Engineering, New Mexico State University, Las Cruces, NM, USA (Nov 13, 2016)
Host: Professor Abdessettar Abdelkefi

[9] *MATLAB for Engineering Systems Design*, National University of Sciences & Technology, Islamabad, Pakistan (May, 2014)
Host: NUST Student Chapter for Society of Automotive Engineers

[10] *MATLAB & SIMULINK for Engineers*, International Conference on Modeling & Simulation, College of Electrical & Mechanical Engineering, National University of Sciences & Technology, Islamabad, Pakistan (Oct, 2011)
Conference Workshop

[11] *Design Issues in Unmanned Aerial Vehicles*, Air University, Islamabad, Pakistan (Dec, 2011)
Host: Professor Ejaz Yaqoob and Mr. Ahad Nazir

LIST OF HQPS

University of Alberta, Canada

- **Shakthi Velan Subramonian** (MSc Co-Supervisor) (from 09/2022 onwards)
  - ◇ Energy Harvesting through Flow-Induced Oscillations of Foils in Tandem
- **Uday Tamalla** (MSc Co-Supervisor) (from 06/2022 onwards)
  - ◇ Computational Modeling of Flow-Induced Vibrations in Oil & Gas Pipelines
- **Abdur Rehman** (M.Eng Capstone Supervisor) (from 01/2022 – 06/2022)
  - ◇ Computational Modeling of Flow-Induced Vibrations in Pipelines
- **Ahmet Gungor** (PhD Research Advisor) (09/2020 – Present)
  - ◇ Bio-Inspired Propulsion and Fish Schooling
  - ◇ One article published in *Physics of Fluids*, one article under review in *Journal of Fluid Mechanics*, and one article under preparation for *Journal of Royal Society Interface*
- **Priscila Scarlet Portocarrero Mendoza** (Research Advisor) (from 04/2022 – 12/2022)
  - ◇ Computational Simulations for Flow-Induced Rotations of Vertical-Axis Wind Turbines

University of Virginia, USA

- **John Kelly** (Research Advisor) (08/2021 – Present)
  - ◇ Advanced Computational Techniques for Shape-Changing Bio-Inspired Propulsors
  - ◇ One articles under preparation for *Journal of Fluids Engineering*

Bahir Dar University, Ethiopia

- **Muluken Temesgen Tigabu** (Research Advisor) (03/2021 – Present)
  - ◇ Designs of efficient and low-cost vertical-axis hydrokinetic turbines
  - ◇ Collaborating with Professor David Wood (University of Calgary) to co-supervise Muluken for developing computational models for hydrokinetic energy harvesting systems
  - ◇ One article under review in *Ocean Engineering*

Bahauddin Zakariya University, Pakistan

- **Hamayun Farooq** (Research Advisor) (01/2019 – Present)
  - ◇ Advanced computational techniques for multiphysics interactive energy harvesting systems
  - ◇ Two articles under under review in *Ocean Engineering*, one article under review in *Applied Energy*, and one article under preparation for *Renewable Energy*

Peking University, China

- **Zhilang Zhang** (Research Advisor) (05/2019 – 01/2021)
  - ◇ Fluid-Structure Interactions through Coupling of Smoothed-Particle Hydrodynamics and Nonlinear Finite Element Methods
  - ◇ Two articles published in *Journal of Fluids and Structures* and *Applied Ocean Research*
  - ◇ Mentored him to secure a research-based position in the National University of Singapore (NUS)

National University of Sciences & Technology, Pakistan

- **International Students' Competition**

- ◇ Muhammad Ahmad Tauqeer, Haseeb Chaudhry, Nouman Ali, Nouman Khalid, Kashif Ali, and Muzammal Khalil (Supervisor) (09/2012 – 05/2013)
  - Future Flight Design Competition, conducted by Turkish Air Force Academy, Istanbul, Turkey
  - Our technical report was awarded the highest score

- **National Students' Competitions**
  - ◇ Haseeb Javed, Syed Saadat Shakeel, Muhammad Sarmad, and Aqib Javed (Supervisor) (08/2016 – 04/2017)
    - EME Fliers, Design, Build, & Fly Contest, conducted by AIAA Student Chapter, Ghulam Ishaq Khan Institute of Technology, Pakistan
    - Won the runner-up prize
  - ◇ Muhammad Qasim Khan, Khadija Tahir, Khurram Abbas, Taimoor Ali, and Arfeen Ahmed Ali (Supervisor) (08/2016 – 04/2017)
    - Team Airborne, Design, Build, & Fly Contest, conducted by AIAA Student Chapter, Ghulam Ishaq Khan Institute of Technology, Pakistan
  - ◇ Mohammad Omer Siddiqui, Ayesha Shafi, Mohsin Ali Chaudhry, Ammad Riaz, and Sharjeel Asad (Supervisor) (05/2010 – 04/2011)
    - Silbers: Design, Build, & Fly Contest, conducted by AIAA Student Chapter, Ghulam Ishaq Khan Institute of Technology, Pakistan
    - Won consolation prize

- **Undergraduate Senior Design Projects**
  - ◇ Rameez Shahab and Ahmed Asees Aamir (Supervisor) (09/2016 – 05/2017)
    - Project Title: 3D CFD Based Design of an Underwater Vehicle
  - ◇ Aakash Gul and Muhammad Maaz Abbasi (Supervisor) (09/2016 – 05/2017)
    - Project Title: CFD Analysis of a Tri-rotor UAV
  - ◇ Waqas Ahmed Bin Najeeb, Abdul Mannan Khalil, and Hammadullah Kitchlew (Supervisor) (09/2015 – 05/2016)
    - Project Title: Design & fabrication of forward sweep UAV
  - ◇ Syed Muhammad Abdullah, Ali Abdullah, and Muhammad Asim Shahzad (Supervisor) (09/2015 – 05/2016)
    - Project Title: Design of a flying wing UAV using backward facing step based wing profile
  - ◇ Zaryab Haider and Muhammad Mohsin Khan Niazi (Co-Supervisor) (09/2015 – 05/2016)
    - Project Title: Energy harvesting through flapping wings
  - ◇ Affan Ali Syed, Nayab Shiraz, and Ovais Ahmed Bin Najeeb (Supervisor) (09/2013 – 05/2014)
    - Project Title: Analysis of vertical take-off and landing of UAV
  - ◇ Hamza Ahmed, Muhammad Taha Safdar, and Warda Naeem (Co-Supervisor) (09/2013 – 05/2014)
    - Project Title: Design, analysis and fabrication of RC Submarine
  - ◇ Zain Hassan, Zoya Farooq, and Saiqa Ijaz (Co-Supervisor) (09/2013 – 05/2014)
    - Project Title: Design and fabrication of 5-DOF Serial Manipulator

- ◇ Muhammad Waqas us Din Arif, Saadat Azim, Anas Elahi Khan, and Obaid Khalid Khan (Supervisor) (09/2011 – 05/2012)
  - Project Title: Design & Fabrication of Solar Powered Unmanned Aerial Vehicle
- ◇ Muhammad Yawar, Muhammad Muneeb, and Usman ul Haq (Supervisor) (09/2011 – 05/2012)
  - Project Title: Design & Fabrication of Hybrid Micro Air Vehicle
- ◇ Sohail Tanveer, Mohib Khan, and Raza Malik (Supervisor) (09/2011 – 05/2012)
  - Project Title: Aerodynamic Drag Reduction of Hino KL-340 Truck with Wind Tunnel Testing of Scaled Down Model
- ◇ Abdul Saim, Muhammad Tayyab Saeed, Nabeel Hussain Shah, and Usman Hafeez (Co-Supervisor) (09/2011 – 05/2012)
  - Project Title: Design a Heat Exchanger for Computing Clusters
- ◇ Ahsan Ali Hani Bajwa, Hassan Khalid, Syed Najam Haider, and Hussain Ali Shah (Co-Supervisor) (09/2011 – 05/2012)
  - Project Title: Design, Analysis and Fabrication of Cooling Tower according to specifications of Dynamometer of Engine Testing Lab
- ◇ Faisal Mushtaq, Muhammad Nauman Zafar, and Ahmed Rashid (Supervisor) (09/2010 – 05/2011)
  - Project Title: Design of test bench for aerodynamic characteristics of small aerial vehicles
- ◇ Ikram ul Haq, Muhammad Mujtaba Hanif, and Muhammad Behroz Javed (Supervisor) (09/2010 – 05/2011)
  - Project Title: Design of a flapping wing micro air vehicle
- ◇ Zafar Iqbal, Zubair Ahmed, and Talha Khalid (Supervisor) (09/2010 – 05/2011)
  - Project Title: Design & fabrication of a subsonic wind tunnel
- ◇ Asim Razzaq, Khobeb Muslim, and Hamid Minhas (Supervisor) (09/2009 – 05/2010)
  - Project Title: Aerodynamic design study of ground vehicles

- **Undergraduate Summer Internships**
  - ◇ Qasim Nazir (Supervisor) (06/2013 – 08/2013)
  - ◇ Muhammad Maaz Abbasi (Supervisor) (06/2013 – 08/2013)

Professional Service

Institutional Service

National University of Sciences & Technology, Pakistan

- Head, Postgraduate Program (07/2016 – 08/2017)
  Department of Mechanical Engineering
  College of Electrical & Mechanical Engineering
- Member, Disciplinary Committee (01/2017 – 03/2017)
  College of Electrical & Mechanical Engineering
- Undergraduate Degree Coordinator (04/2015 – 04/2016)
  Department of Mechanical Engineering
  College of Electrical & Mechanical Engineering
- Officer-in-Charge, Fluid Mechanics Laboratory (04/2015 – 07/2016)
  Department of Mechanical Engineering
  College of Electrical & Mechanical Engineering
- Officer-in-Charge, Heat Transfer & Refrigeration Laboratory (06/2012 – 09/2014)
  Department of Mechanical Engineering
  College of Electrical & Mechanical Engineering

- Undergraduate Degree Coordinator (03/2012 – 08/2014)
  Department of Mechanical Engineering
  College of Electrical & Mechanical Engineering
- Technical Member, Local Purchase Committee (07/2014 – 09/2014)
  College of Electrical & Mechanical Engineering

Referee Service

- Mentor, Publons Review Academy
- Estonian Research Council (Grant Reviewer)
- Physics of Fluids (AIP)
- Bioinspiration & Biomimetics (IOP Science)
- Journal of Vibrations and Acoustics (ASME)
- Ocean Engineering (Elsevier)
- International Journal for Heat and Mass Transfer (Elsevier)
- Journal of Petroleum Science and Engineering (Elsevier)
- International Journal of Micro Air Vehicles (Sage)
- Proceedings of the Institute of Mechanical Engineers, Part C: Journal of Mechanical Engineering Science (Sage)
- Proceedings of the Institute of Mechanical Engineers, Part G: Journal of Aerospace Engineering (Sage)
- Journal of Aerospace Engineering (ASCE)
- International Journal of Environmental Science and Technology (Springer)
- Fluid Dynamics Research (IOPScience)
- Mechanics and Industry (EDP Sciences)
- Machine Learning: Science and Technology (IOP Science)

Member, Guidance and Evaluation Committee (MSc Research)
National University of Sciences & Technology, Pakistan

- Adil Naseem (2016 – 2017)
- Nabeel ur Rehman (2013 – 2014)
- Kamran Nazir (2012 – 2013)
- Imran Aziz (2012 – 2013)
- Sadia Riaz (2010 – 2011)
- Munzur Shaheer (2010 – 2011)
- Fahim Barlas (2010 – 2011)

External Thesis Evaluations (MSc Research)
Ghulam Ishaq Khan Institute of Technology, Pakistan

- Nayab (01/2017)

University of Huddersfield, UK

- Martin Zahariev (12/2016)

Conference Service

- Lead Volunteers Coordinator and member of the Program Development Committee, Canadian Society of Mechanical Engineers (CSME) Congress, Edmonton, Canada, June, 2022.
- Session Co-Organizer: Special Session on Computational Modeling in Swimming and Flying, ASME Fluids Engineering Division Summer Meeting (FEDSM), Toronto, Canada, Aug, 2022.
- Program Committee: International Conference on Modeling and Simulation, Islamabad, Pakistan, 2011.

- Program Committee: International Conference on Energy Systems Engineering, Islamabad, Pakistan, 2010

Judge for Students' Competitions
National University of Sciences & Technology, Pakistan

- Bridge Building Design Competition (02/2013)
  - ◇ Organized by NUST EME Student Chapter, American Society of Mechanical Engineers, Department of Mechanical Engineering, College of Electrical & Mechanical Engineering
- Egg Drop Competition (10/2012)
  - ◇ Organized by NUST EME Student Chapter, American Society of Mechanical Engineers, Department of Mechanical Engineering, College of Electrical & Mechanical Engineering

PROFESSIONAL MEMBERSHIPS

- Professional Engineer (PEng), The Association of Professional Engineers and Geoscientists of Alberta (APEGA) (Member ID: 278536) (01/2022 – Present)
- Registered Engineer, Pakistan Engineering Council (10/2007 – Present)
- Member, International Association of Engineers (06/2009 – Present)