Curriculum Vitae – Chang Kwon Kang

Education

- PhD, 2011, Department of Aerospace Engineering, University of Michigan, Ann Arbor
    - Dissertation: Aerodynamics, Scaling, and Performance of a Flexible Flapping Wing
    - Advisors: Dr. Wei Shyy and Dr. Carlos Cesnik
- MSc, 2005, Department of Aerospace Engineering, Delft University of Technology, The Netherlands
    - Thesis: Topological Analysis of Fourth Order Juncture Flow
    - Advisor: Dr. Peter Bakker
- BSc, 2002, Department of Aerospace Engineering, Delft University of Technology, The Netherlands, Cum Laude

Professional Experience

- 2019 – present, Associate Professor, Department of Mechanical and Aerospace Engineering, University of Alabama in Huntsville, USA
- 2013 – 2019, Assistant Professor, Department of Mechanical and Aerospace Engineering, University of Alabama in Huntsville, USA
- 2011 – 2013, Postdoctoral Research Fellow, Department of Aerospace Engineering, University of Michigan, Ann Arbor, USA; Advisor: Dr. Wei Shyy
- 2007 – 2011, Graduate Student Research Assistant, Department of Aerospace Engineering, University of Michigan, Ann Arbor, USA; Advisor: Dr. Wei Shyy, Dr. Carlos Cesnik
- 2001 (Jun) – 2001 (Nov), Visiting Scholar, Arizona State University, Tempe, USA; Advisor: Dr. William Saric

Research Interests

- Bioinspired flapping wing robots for terrestrial and Martian atmospheres
- Complex dynamical systems involving fluid-structure and fluid-structure-dynamic interaction

Funding Support (External)

- PI, “Alabama Space Grant Consortium Fellowship: Bioinspired Flight Vehicle with Flexible Wings for Aerial Exploration on Mars”; NASA National Space Grant College and Fellowship, 8/1/2019 – 7/31/2020, $37,000 (Student fellow: Jeremy Pohly)
- PI, “Collaborative Research: Dynamics and Control of Long Range Micro Air Vehicles Inspired by Monarch Butterflies”, NSF CMMI-1761618, 6/1/2018 – 5/31/2021, $276,876, CO-PI: Dr. Taeyoung Lee (George Washington University)
- PI, “Marsbee - Swarm of Flapping Wing Flyers for Enhanced Mars Exploration”; NASA Institute of Advanced Concepts Phase I, 80NSSC18K0870, 5/15/2018 – 2/14/2019, $125,000, CO-PIs: Dr. Farbod Fahimi, Dr. Guangsheng Zhang, Dr. Brian Landrum, Dr. Robert Griffen (University of Alabama in Huntsville); Dr. Taeyoung Lee (George Washington University); Dr. Hikaru Aono (Tokyo University of Science)
- PI, “Alabama Space Grant Consortium Fellowship: Bioinspired Flight Vehicle with Flexible Wings for Aerial Exploration on Mars”; NASA National Space Grant College and Fellowship, 8/1/2018 – 7/31/2019, $37,000 (Student fellow: Jeremy Pohly)
- PI, “Alabama Space Grant Consortium Fellowship: MarsBees – Can bees Fly on Mars?”; NASA National Space Grant College and Fellowship, 8/1/2017 – 7/31/2018, $37,000 (Student fellow: Jeremy Pohly)

- CO-I, “REU Site: Fundamental Research Topics Related to Unmanned Systems,” NSF EEC-1359311, 3/15/2014 – 3/14/2017, $297,792, PI: Dr. Farbod Fahimi; CO-PI: Dr. Ramazan Aygun
- CO-I, “The Beneficial Effects of Butterfly Scales,” NSF CBET-1335572, 9/1/2013 – 8/31/2016, $118,254, PI: Dr. Brian Landrum; CO-PI: Dr. Nathan Slegers

Funding Support (Internal)

- PI, UAH Research Infrastructure Fund Award, 2018, 1 year, $15,575CO-PI,
- UAH Individual Investigator Distinguished Research Award, 2018, 1 year, $44,000, PI: Dr. Shannon Mathis (Kinesiology)
- CO-PI, UAH Cross-College Faculty Research, 2016, 1 year, $5,000, PI: Dr. Shannon Mathis (Kinesiology); CO-PIs: Dr. Brian Landrum; Dr. Ryan Conners (Kinesiology)
- PI, UAH Research Infrastructure Fund Award, 2015, 1 year, $11,727.48
- PI, UAH Individual Investigator Distinguished Research Award, 2014, 1 year, $39,940
- PI, UAH New Faculty Research Program Award, 2013, 1 year, $4,555

Honors and Awards

- Book about my research: “Mars-Exploring Flying Swarms with NASA inventor Chang Kwon Kang”, in Out of This World 2 series, World Book, Inc. 2022
- University of Alabama in Huntsville, Outstanding Junior Faculty of the College of Engineering, 2019
- NASA Innovative Advanced Concepts Fellow, 2018
- NATO RTO Scientific Achievement Award (AVT-149, Chair: Dr. Michael Ol), 2011

Student Honors and Awards

- Thomas Clark, 2022 AIAA Region II Student Competition, 2nd place in the undergraduate category
- Thomas Clark, 2022 Research Horizons Day: First place; College of Engineering; Undergraduate
- Frederick Schulze, 2021 AIAA Region II Student Competition, 3rd place in the undergraduate category
- Madhu Sridhar, 2019 AIAA 2019-0566, 2019 AIAA Atmospheric Flight Mechanics Best Student Paper
- Jeremy Pohly, 2019, Outstanding graduate student of the Mechanical and Aerospace Engineering at the University of Alabama in Huntsville
- Darnisha Crane, 2018 Research Horizons Day: First place; College of Engineering; Undergraduate
- Madhu Sridhar, 2018, Outstanding graduate student of the Mechanical and Aerospace Engineering at the University of Alabama in Huntsville
- James Bluman, 2017, Outstanding graduate student of the Mechanical and Aerospace Engineering at the University of Alabama in Huntsville
- Deepa Kodali, 2016 Zonta International Amelia Earhart Fellowship

Publications (supervised students are underlined, *: undergraduate students)

Book

B1 Shyy, W., Aono, H., **Kang, C.** and Liu, H. *An Introduction to Flapping Wing Aerodynamics*, Cambridge University Press, 2013

Book Chapter

BC1 Tran, T. X., **Kang, C.** and Mathis, S. L. "Lower-Gait Tracking Application Using Smartphones and Tablets in *Integrating Artificial Intelligence and IoT for Advanced Health Informatics: AI in the Healthcare Sector (Internet of Things)*, edited by Comito, C., Forestiero, A., Zumpano, E., Springer, 2022, pp. 1-8

Journal Publications

J37 Vechalapu, T. R., **Kang, C.**, and Kanistras, K. "Experimental Investigation of Effects of Spanwise Segmented Blowing on a Circulation Control Wing with a Dual-Radius Flap," *Experiments in Fluids*, Accepted for publication, 2025

J36 Hill, J., Fahimi, F., **Kang, C.**, and Aono, H. "Adaptive Discrete Time Sliding Mode Pitch Controller for a Flapping Wing Micro Air Vehicle," *Journal of Bionic Engineering*, Vol. 22, 2025, pp. 585–595

J35 Pohly, J., **Kang, C.**, and Aono, H. "Deciphering the Flapping Frequency Allometry: Unveiling the Role of Sustained Body Attitude in the Aerodynamic Scaling of Normal Hovering Animals," *Biology Open*, Vol. 14, Issue 3, 2025

J34 **Kang, C.**, Twigg, R., Aono, H., Lee, T., Sridhar, M.K. "Power Benefits of High-Altitude Flapping Wing Flight at Monarch Butterfly Scale," *Biomimetics* (2023 impact factor: 3.4), Vol. 8, Nr. 4, 2023, pp. 352

J33 Shimura, K., Aono, H., **Kang, C.** "An Experimental Study on Response and Control of a Flapping-wing Aerial Robot under Wind Gusts," *Journal of Bionic Engineering* (2023 impact factor: 4.9), Vol. 21, 2023, pp. 209–223

J32 Tsuchiya, S., Aono, H., Asai, K., Nonomura, T., Ozawa, Y., Anyoji, M., Ando, N., **Kang, C.**, and Pohly, J., "First lift-off and flight performance of a tailless flapping-wing aerial robot in high-altitude environments," *Scientific Reports*, Vol. 13, 2023, pp. 8995

J31 Miyasaka, S., Aono, H., **Kang, C.**, "Experimental Analyses of Aerodynamic Force Generation and Wing Motion Associated with a Single-motor-driven Butterfly-inspired Flapping-wing Robot," *Sensors and Materials*, Vol. 35, Nr. 9, 2023, pp. 3097-3108

J30 Raghu, S. L., **Kang, C.**, Landrum, D.B., Whitehead, P, and Conners, R. T., "Kinematic Analysis of Gait in an Underwater Treadmill using Land-Based Vicon T40s Motion Capture Cameras Arranged Externally," *Journal of Biomechanics*, Vol. 124, 2021, pp. 110553

J29 K. C., Tejaswi, **Kang, C.**, and Lee, T, "Dynamics and Control of a Flapping Wing UAV with Abdomen Undulation Inspired by Monarch Butterfly," *Proceedings of American Control Conference*, 2021

J28 Sridhar, M.K., **Kang, C.**, Landrum, D.B., Aono, H., Mathis, S.H., Lee, T., "Unconventionally high lift coefficients in Monarch butterflies at high-altitude conditions", *Bioinspiration & Biomimetics* (2019 impact factor: 3.062), Vol. 16, 2021, 034002

J27 K. C., Tejaswi, Sridhar, M.K., **Kang, C.**, and Lee, T, “Effects of Abdomen Undulation in Energy Consumption and Stability for the Flights of Monarch Butterfly,” *Bioinspiration & Biomimetics*, Vol. 16, 2021, 046003

J26 Hefner, C, **Kang, C.**, Qiu, H., and Shyy, W. "Distinct Aerodynamics of Insect Flight (*Elements in Aerospace Engineering*)”, Cambridge University Press, 2021

J25 Pohly, J., **Kang, C.,** Sridhar, M.K., Landrum, D.B., Bluman, J.E., Aono, H., “Scaling Bioinspired Mars Flight Vehicles for Hover," *Acta Astronautica* (2019 impact factor: 2.830), Vol. 180, 2021, pp. 545 - 559

J24 Nedunchezian, K., **Kang, C.**, and Aono, H. "A Numerical Analysis of the Effects of Wing Kinematics on Flapping Wing Aeroacoustics," *Journal of Sound and Vibration* (2018 impact factor: 3.123), Vol. 442, 2019, pp. 366 - 383

J23 Raghu, S. L., **Kang, C.**, Whitehead, P., Takeyama, A.*, and Conners, R., “Static accuracy analysis of Vicon T40s motion capture cameras arranged externally for motion capture in constrained aquatic environments," *Journal of Biomechanics* (2018 impact factor: 2.576), Vol. 89, 2019, pp. 139–142

J22 Medina, C. and **Kang, C.** "Analytical Solution to the Aeroelastic Response of a Two-dimensional Elastic Plate in Axial Potential Flow," *Journal of Fluid Mechanics* (2017 impact factor: 2.893), Vol. 845, R3, 2018

J21 Arora, N., **Kang, C.**, Shyy, W., and Gupta, A. "Analysis of Passive Flexion in Propelling a Plunging Membrane using a Torsional Spring Model," *Journal of Fluid Mechanics* (2017 impact factor: 2.893), Vol. 857, pp. 562 – 604, 2018

J20 Bluman, J. E., Sridhar, M., and **Kang, C.** "Passive Stabilization of Hovering Fruit Fly Models with Flexible Wings," *Journal of Royal Society Interface* (2017 impact factor: 3.355), Vol. 15, pp. 20180409, 2018

J19 Bluman, J. E., Pohly, J., Sridhar, M., **Kang, C.**, Landrum, D. B., and Fahimi, F. "Achieving Bioinspired Flapping Wing Hovering Flight Solutions on Mars via Wing Scaling," *Bioinspiration & Biomimetics* (2017 impact factor: 2.727), Vol. 13, pp. 046010, 2018

J18 **Kang, C.**, Cranford, J., Sridhar, M., Kodali, D., Landrum, D. B., and Slegers, N. "Experimental Characterization of a Butterfly in Climbing Flight," *AIAA Journal* (2017 impact factor: 1.556), Vol. 56, No. 1, 2018

J17 Bluman, J. E., **Kang, C.**, and Shtessel, Y. "Control of a Flapping Wing Micro Air Vehicle: a Sliding Mode Approach," *Journal of Guidance, Control, and Dynamics* (2017 impact factor: 2.024), Vol. 41, No. 5, 2018, pp. 1223-1226

J16 Pohly, J., Salmon, J. L., Bluman, J. E., Nedunchezian, K. and **Kang, C.**, "Quasi-steady versus Navier-Stokes Solutions of Flapping Wing Aerodynamics,” *Fluids*, Vol 3, Nr. 4, 2018 (invited paper in a special issue “Bio-inspired Fluids”; guest editor: Dr. Haibo Dong)

J15 Kodali, D., Medina, C., **Kang, C.** and Aono, H. "Effects of Spanwise Flexibility on Performance of the Flapping Flyers in Forward Flight," *Journal of Royal Society Interface*, Vol. 14, pp. 20170725, 2017

J14 Bluman, J. E. and **Kang, C.** "Achieving hover equilibrium in free flight with a flexible flapping wing," *Journal of Fluids and Structures* (2017 impact factor: 2.434) Vol. 75, pp. 117-139, 2017

J13 Bluman, J. E. and **Kang, C.**, "Wing-wake interaction destabilizes hover equilibrium of a flapping insect-scale wing," *Bioinspiration & Biomimetics*, Vol 12, 2017, pp. 046004

J12 Kodali, D., and **Kang, C.**, "An Analytical Model and Scaling of Chordwise Flexible Flapping Wings in Forward Flight," *Bioinspiration & Biomimetics*, Vol 12, 2016, pp. 016006

J11 Shyy, W., **Kang, C.**, Chirarattananon, P, Ravi, S., Liu, H. "Aerodynamics, Sensing, and Control of Insect-scale Flapping-Wing Flight," *Proceedings of Royal Society A* (2017 impact factor: 2.410), Vol. 472, 2016, pp. 20150712 (invited review paper)

J10 Sridhar, M. K. and **Kang, C.**, "Aerodynamic Performance of Flexible Flapping Wings at Fruit Fly Scale in Hover Flight," *Bioinspiration & Biomimetics*, Vol 10, 2015, pp. 036007

J9 **Kang, C.**, and Shyy, W., "Analytical model for instantaneous lift and shape deformation of an insect-scale flapping wing in hover," *Journal of Royal Society Interface*, Vol 11, 2014, pp. 20140933

J8 Vandenheede, R., Bernal, L. P. B., Morrison, C., Gogulapati, A., Friedmann, P. P., **Kang, C.**, and Shyy, W., "Experimental and Computational Study on Flapping Wings with Bio-Inspired Hover Kinematics," *AIAA Journal*, Vol. 52, Nr. 5, pp. 1047 - 1058, 2014

J7 **Kang, C.** and Shyy, W., "Scaling and Lift Generation of Hovering Flexible Wing of Insect Size," *Journal of Royal Society Interface*, Vol. 10, Nr. 85, 2013

J6 **Kang, C.**, Aono, H., Baik, Y.S., Bernal, L.P., and Shyy, W., "Fluid Dynamics of Pitching and Plunging Flat Plate at Reynolds Number of $O(10^4)$," *AIAA Journal*, Vol. 51, No. 2, pp. 315-329, 2013

J5 **Kang, C.**, Aono, H., Cesnik, C.E.S., and Shyy, W., "Effects of Flexibility on the Aerodynamic Performance of Flapping Wings," *Journal of Fluid Mechanics*, Vol. 689, pp. 32 - 74, 2011; also AIAA-2011-3121

J4 Trizila, P., **Kang, C.**, Aono, H., Visbal, M., and Shyy, W., "Low-Reynolds-Number Aerodynamics of a Flapping Rigid Flat Plate," *AIAA Journal*, Vol. 49, No. 4, pp. 806 - 823, 2011

J3 Shyy, W., Aono, H., Chimakurthi, S, Trizila, P., **Kang, C.**, Cesnik, C., and Liu, H., "Recent Progress in Flapping Wing Aerodynamics and Aeroelasticity," *Progress in Aerospace Sciences* (2017 impact factor: 4.729), Vol. 48, Nr. 7, pp. 284-327, 2010

J2 Ol, M., Bernal, L., **Kang, C.**, and Shyy, W., "Shallow and Deep Dynamic Stall for Flapping Low Reynolds Number Airfoils," *Experiments in Fluids* (2017 impact factor: 2.195), Vol. 46, Nr. 5, pp. 883-901, 2009

J1 Shyy, W., Trizila, P., **Kang, C.**, Aono, H., "Can Tip Vortices Enhance Lift of a Flapping Wing?," *AIAA Journal*, Vol. 47, pp. 289-293, 2009

Conference Papers and Presentations

C52 Tejaswi K. C., Lee, T. and **Kang, C.** "Deep Neural Pose Estimation for a Flapping Wing Unmanned Aerial Vehicle with Visual-Inertial Sensor Fusion," 2024 AIAA Scitech, AIAA-2024-0948

C51 Tarpley, M.*, Pohly, J., **Kang, C.**, Aono, H., and Lee, T., "Numerical Analysis of Flight Performance of Bioinspired Mars Flight Vehicles," 2023 AIAA Scitech, AIAA-2023-1219

C50 O'Donoghue, D.*, **Kang, C.**, Tran, T., "Recognition and Classification of Vortical Flows using Artificial Neural Networks and Graftieaux's Identification Criteria," 2023 AIAA Scitech, AIAA-2023-2633

C49 Pohly, J., and **Kang, C.** "Unsteady Lift and Circulation for Impulsively Started Flat Plates at Low Reynolds Numbers," 2023 AIAA Scitech, AIAA-2023-1788

C48 Pohly, J., **Kang, C.**, Aono, H., and Lee, T., "Climbing Flight of Monarch Butterflies with Flexible Wings via Half-Cycle Flapping and Abdomen Modulation," 2023 AIAA Scitech, AIAA-2023-1789

C47 Chatterjee, A., Vechalapu, T. R., **Kang, C.**, Kanistras, K., "Experimental Investigation of Swept Bio-Inspired Wing Planforms," 2023 AIAA Scitech, AIAA-2023-2461

C46 Miyasaka, S., Aono, H., and **Kang, C.**, "Analysis and measurement of aerodynamic force and wing motion of a butterfly-inspired flapping wing robot based on elastic band and single motor," the 40th annual conference of the Robotics Society of Japan, Tokyo Japan, Sep 5-9 2022, RSJ2022AC2G2-01

C45 Shimura, K., Aono, H., and **Kang, C.**, "Roll attitude control of a single motor driven small flapping-wing aerial robot", the 40th annual conference of the Robotics Society of Japan, Tokyo Japan, Sep 5-9 2022, RSJ2022AC2G2-02

C44 Tsuchiya, S., Aono, H., Asai, K., Nonomura, T., Ozawa, Y., Anyoji, Y. and **Kang, C.**, "Analysis and measurement of aerodynamic force and wing motion of a dual motor driven flapping-wing aerial robots under low-pressure conditions," the 40th annual conference of the Robotics Society of Japan, Tokyo Japan, Sep 5-9 2022, RSJ2022AC2G2-03

C43 Pohly, J., **Kang, C.**, Aono, H., Lee, T, "Modeling Freely Flying Monarch Butterflies Using a Strongly Coupled High Fidelity Numerical Framework," 15th World Congress on Computational Mechanics, Yokohama, Japan, July 7 - August 5, 2022, Virtual

C42 Morris, T., Schulze, F.*, Sridhar, M., Clark, T.*, **Kang, C.**, Roh, K., Aono, H., "Experimental Investigation of the Effects of Vein Structures on the Force Production of Monarch Butterfly Wings," AIAA 2022-0308, 2022 AIAA Scitech, January 3-7, 2022, San Diego, CA & Virtual

C41 Sridhar, M.K., Pohly, J., **Kang, C.**, Landrum, D.B., Lee, T., Aono, H., "Effects of Vein Structures on Fluid-structure Interaction of Flexible Flapping Wings at High Altitudes," AIAA-2021-0963, AIAA Scitech Forum, 11-15 & 19-21 January 2021, Virtual Event, 2021.

C40 Tran, T., **Kang, C.**, Mathis, S., "Lower-Gait Tracking Mobile Application: A Case Study of Lower body Motion Capture Comparison Between Vicon T40 System and Apple Augmented Reality", IEEE International Conference on Bioinformatics & Biomedicine, 2020.

C39 McCain, J., Pohly, J., Sridhar, M.K., **Kang, C.,** Landrum, D.B., Aono, H., "Experimental Force and Deformation Measurements of Bioinspired Flapping Wings in Ultra-Low Martian Density Environment", AIAA 2020-2003, AIAA Scitech, Orlando, FL, 6-10 January 2020

C38 Dunne, S., Palma, G., Pohly, J., Mesmer, B., Landrum, D.B, **Kang, C.** "System Analyzer for a Bioinspired Mars Flight Vehicle System for Varying Mission Contexts," AIAA 2020-0665, AIAA Scitech, Orlando, FL, 6-10 January 2020

C37 Twigg, R., Sridhar, M., Pohly, J., Hildebrandt, N.*, **Kang, C.**, Landrum, D.B., Roh, K., Salzwedel, S.*, "Aeroelastic Characterization of Real and Artificial Monarch Butterfly Wings," AIAA 2020-2002, AIAA Scitech, Orlando, FL, 6-10 January 2020

C36 Sridhar, M.K., **Kang, C.**, and Lee, T, "Geometric Formulation for the Dynamics of Monarch Butterfly with the Effects of Abdomen Undulation," AIAA 2020-1962, AIAA Scitech, Orlando, FL, 6-10 January 2020

C35 Sridhar, M.K., **Kang, C.,** Landrum, D.B., Aono, H., "Fluid-structure Interaction of Flexible Flapping Wings at High Altitude Conditions", AIAA 2020-1781, AIAA Scitech, Orlando, FL, 6-10 January 2020

C34 Aono, H., Kikkawa, K., Ishikawa, H., and **Kang, C.,** "A Numerical Study of Sound Generation on Pitch and Plunge Wing at Low Reynolds Numbers", AIAA 2020-1495, AIAA Scitech, Orlando, FL, 6-10 January 2020

C33 Sridhar, M.K., **Kang, C.**, and Landrum, D.B., "Beneficial Effect of the Coupled Wing-Body Dynamics on Power Consumption in Butterflies," AIAA 2019-0566, AIAA 2019 Scitech Forum, San Diego, California, January 7 - 11, 2019 (AIAA Atmospheric Flight Mechanics Best Student Paper)

C32 Nedunchezian, K., **Kang, C.**, and Aono, H., "Sound Generation of Flexible Plunging Wings in Hover at Low Reynolds Numbers," AIAA 2019-1072, AIAA 2019 Scitech Forum, San Diego, California, January 7 - 11, 2019

C31 Pohly, J., **Kang, C.,** Sridhar, M.K., Landrum, D.B., Fahimi, F., Mesmer, B., Bluman, J.E., Aono, H., Lee, T. "Scaling Bioinspired Mars Flight Vehicles for Hover," AIAA 2019-0567, AIAA 2019 Scitech Forum, San Diego, California, January 7 - 11, 2019

C30 Sridhar, M.K., **Kang, C.**, Landrum, D.B., Wahidi, R., Lang, A. and Wilroy, J. " Numerical Investigation of Effects of Experimental Environment on Vortex Formation in Low Reynolds Number Flows," AIAA 2018-1080, 2018 AIAA Aerospace Sciences Meeting, Kissimmee, Florida, January 8 - 12, 2018

C29 Nedunchezian, K., **Kang, C.**, and Aono, H. "A Numerical Analysis of the Effects of Wing Kinematics on Flapping Wing Aeroacoustics," AIAA 2018-0269, 2018 AIAA Aerospace Sciences Meeting, Kissimmee, Florida, January 8 - 12, 2018

C28 **Kang, C.**, Sridhar, M.K., and Landrum, D.B. "Dynamic Relationship Between Flapping Wing and Body Undulation of Monarch Butterflies in Free Flight," AIAA 2018-0041, 2018 AIAA Aerospace Sciences Meeting, Kissimmee, Florida, January 8 - 12, 2018

C27 Pohly, J., Sridhar, M.K., Bluman, J. E., **Kang, C.**, Landrum, D.B., Fahimi, F., Aono, H. and Liu, H., "Payload and Power for Dynamically Similar Flapping Wing Hovering Flight on Mars," AIAA 2018-0020, 2018 AIAA Atmospheric Flight Mechanics Conference, Kissimmee, Florida, January 8 - 12, 2018

C26 Bluman, J. E., Shtessel, Y., and **Kang, C.**, "Sliding Mode Control of a Biomimetic Flapping Wing Micro Air Vehicle in Hover," AIAA 2017-1633, AIAA Atmospheric Flight Mechanics Conference, Grapevine, Texas, January 9 - 13, 2017

C25 Salmon, J. L., Bluman, J. E., and **Kang, C.**, "Quasi-steady versus Navier-Stokes Solutions of Flapping Wing Aerodynamics," AIAA 2017-0329, 55th AIAA Aerospace Sciences Meeting, Grapevine, Texas, January 9 - 13, 2017

C24 Kodali, D., **Kang, C.**, and Aono, H. " An Analytical Aeroelastic Model of Spanwise Flexible Flapping Wings in Forward Flight," AIAA 2017-0331, 55th AIAA Aerospace Sciences Meeting, Grapevine, Texas, January 9 - 13, 2017

C23 Bluman, J. E., **Kang, C.**, Landrum, D.B., Fahimi, F., and Mesmer, B. "Marsbee-Can a Bee Fly on Mars?," AIAA 2017-0328, 55th AIAA Aerospace Sciences Meeting, Grapevine, Texas, January 9 - 13, 2017

C22 **Kang, C.**, Sridhar, M.K., Landrum, D.B., Nakamura, Y., and Aono, H., "Effects of Altitude on the Flight Performance of Monarch Butterflies," AIAA 2017-0093, 55th AIAA Aerospace Sciences Meeting, Grapevine, Texas, January 9 - 13, 2017

C21 Benson, K.L., Landrum, D.B., and **Kang, C.**, "Monarch Madness: A Cross-curricular Approach to Elementary STEM Education," AIAA 2017-0515, 55th AIAA Aerospace Sciences Meeting, Grapevine, Texas, January 9 - 13, 2017

C20 Bluman, J. E. and **Kang, C.**, "Balancing the Efficiency and Stability of the Coupled Dynamics and Aerodynamics of a Flapping Flyer," AIAA 2016-4009, AIAA AVIATION, Washington, D.C., 13-17 June 2016

C19 Sridhar, M.K., **Kang, C.**, and Landrum, D.B., " Instantaneous Lift and Motion Characteristics of Butterflies in Free Flight," AIAA 2016-3252, AIAA AVIATION, Washington, D.C., 13-17 June 2016

C18 Bluman, J. E., Sridhar, M. K., and **Kang, C.**, " The Influence of Wing Flexibility on the Longitudinal Dynamics of a Flapping Wing Micro Air Vehicle in Hover," AIAA 2016-0470, 57th AIAA/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, San Diego, California, January 4-8, 2016

C17 Deepa, K. and **Kang, C.**, " Analytical Aerodynamic Model of Chordwise Flexible Flapping Wings in Forward Flight," AIAA 2016-1064, 54th AIAA Aerospace Sciences Meeting, San Diego, California, January 4-8, 2016

C16 Cranford, J., **Kang, C.**, Landrum, D.B., and Slegers, N. "Experimental Characterization of Butterfly in Climbing Flight," AIAA 2015-2328, AIAA AVIATION, Dallas, Texas, June 22-26, 2015

C15 Sridhar, M. K. and **Kang, C.**, "Aerodynamic Performance of Flexible Flapping Wings at Bumblebee Scale in Hover Flight," AIAA 2015-0254, 53th AIAA Aerospace Sciences Meeting, Kissimmee, Florida, January 5-9, 2015

C14 Sridhar, M. K. and **Kang, C.**, "Effects of Flexible Wings in Hover Flight at Fruit Fly Scale," AIAA 2014-2311, 44th AIAA Fluid Dynamics Conference, Atlanta, Georgia, June 16 - 20, 2014

C13 **Kang, C.**, and Shyy, W., "A Quasi-Steady Model for the Lift on a Hovering Flexible Wing," AIAA 2014-1114, 52nd Aerospace Science Meeting, National Harbor, Maryland, January 13 – 17, 2014

C12 **Kang, C.**, and Shyy, W., "Modeling of Instantaneous Passive Pitch of Flexible Flapping Wings," AIAA 2013-2469, 43rd AIAA Fluid Dynamics Conference, San Diego, California, June 24 – 27, 2013

C11 Vandenheede, R.B.R, Bernal, L.P., Morrison, C., Gogulapati, A., Friedmann, P.P., **Kang, C.**, and Shyy, W., "Comparison of Experiments on Bio-Inspired Hover Kinematics with The Unsteady Vortex Model and CFD, " AIAA 2013-0066, 51th AIAA Aerospace Science Meeting Including the New Horizons Forum and Aerospace Exposition, Grapevine, Texas, January 7 – 10, 2013

C10 **Kang, C.**, and Shyy, W., "Passive Wing Rotation in Flexible Flapping Wing Aerodynamics," AIAA-2012-2763, 30th AIAA Applied Aerodynamics Conference, New Orleans, Louisiana, June 25 - 28, 2012

C9 **Kang, C.**, and Shyy, W., "Effects of Flexibility on the Aerodynamics of a Hovering Flexible Airfoil at Reynolds Number of 100 to 1000," AIAA-2012-1206, 50th AIAA Aerospace Science Meeting, Nashville, Tennessee, January 9 - 12, 2012

C8 **Kang, C.**, Aono, H., Cesnik, C.E.S., and Shyy, W., "Effects of Flexibility on the Aerodynamic Performance of Flapping Wings," AIAA-2011-3121, 6th AIAA Theoretical Fluid Mechanics Conference, Honolulu, Hawaii, June 27-30, 2011

C7 **Kang, C.**, Aono, H., Cesnik, C.E.S., and Shyy, W., "A Scaling Parameter for Thrust Generation of Flapping Flexible Wings," AIAA-2011-1313, 49th AIAA Aerospace Sciences Meeting, Orlando, Florida, 4 - 7 January 2011

C6 Aono, H., **Kang, C.**, Cesnik, C.E.S., and Shyy, W., "A Numerical Framework for Isotropic and Anisotropic Flexible Flapping Wing Aerodynamics and Aeroelasticity," AIAA-2010-5082, 28th AIAA Applied Aerodynamics Conference, Chicago, Illinois, June 28-1, 2010

C5 Trizila, P., **Kang, C.**, Aono, H., Visbal, M., and Shyy, W., "Fluid Physics and Surrogate Modeling of a Low Reynolds Number Flapping Rigid Flat Plate," AIAA 2010-5081, 28th AIAA Applied Aerodynamics Conference, 28 June - 1 July 2010, Chicago, Illinois

C4 **Kang, C.**, Aono, H., Trizila, P., Baik, Y., Rausch, J.M., Bernal, L., Ol, M.V., and Shyy, W., "Modeling of Pitching and Plunging Airfoils of Reynolds Number between $1x10^4$ and $6x10^4$", AIAA-2009-4100, 27th AIAA Applied Aerodynamics Conference, San Antonio, Texas, June 22-25, 2009

C3 **Kang, C.**, Baik, Y., Bernal, L., Ol, M.V., and Shyy, W., "Fluid Dynamics of Pitching and Plunging Airfoils of Reynolds Number between $1x10^4$ and $6x10^4$", AIAA-2009-536, 47th AIAA Aerospace Sciences Meeting including the New Horizons Forum and Aerospace Exposition, Orlando, Florida, Jan. 5-8, 2009

C2 Trizila, P., **Kang, C.**, Visbal, M., and Shyy, W., "A Surrogate Model Approach in 2-D Versus 3-D Flapping Wing Aerodynamic Analysis", AIAA-2008-5914, 12th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Victoria, British Columbia, September, 2008

C1 Trizila, P., **Kang, C.**, Visbal, M., and Shyy, W., "Unsteady Fluid Physics and Surrogate Modeling of Low Reynolds Number, Flapping Airfoils", AIAA-2008-3821, 38th Fluid Dynamics Conference and Exhibit, Seattle, Washington, June 2008

Conference Presentations

15 **Kang, C.** and Aono, H. “Scaling of flexible flapping wings under varying atmospheric density conditions”, AIAA Scitech (invited presentation), Orlando, FL, January 6-11, 2025

14 Aono, H. and **Kang, C.** “Experimental and computational analysis of robotic flapping wings in low atmospheric density conditions”, AIAA Scitech (invited presentation), Orlando, FL, January 6-11, 2025

13 Aono, H., Shimzu, K., Tsuchiya, S., Nonomura, T., Ozawa, Y., **Kang, C.**, and Pohly, J. “Vortex Dynamics of Two-dimensional Robotic Flapping Wing Motion under High-altitude Condition”, ASME-JSME-KSME Joint Fluids Engineering Conference 2023, AJK FED2023, July 9-13, Osaka, JAPAN.

12 Pohly, J., **Kang, C.**, Landrum, D.B., Bluman, J., Aono, H., “ CFD-informed Scaling of Bioinspired Mars Flight Vehicles for Hover”, Oral Presentation, AIAA Scitech Forum, 11-15 & 19-21 January 2021, Virtual Event, 2021.

11 Pohly, J., McCain, J., Sridhar, M.K., **Kang, C.**, Landrum, D.B., Mesmer, B.L., Bluman, J., Lee, T., Aono, H., “Marsbees: Bio-inspired Flapping Wing Flight Vehicles for Mars Exploration”, AIAA 2020-2003, AIAA Scitech, Orlando, FL, 6-10 January 2020, Invited oral presentation

10 Sridhar, M.K., **Kang, C.**, Landrum, D. B., and Mathis, S. "The Role of Coupled Wing-Body Dynamics on Power Consumption in Butterflies," 2018 71th APS Division of Fluid Dynamics, Atlanta GA, November 18 – 20, 2018

9 Pohly, J., Bluman, J., **Kang, C.**, Landrum, D. B., Aono, H., and Liu, H. "Lift and Power Required for Flapping Wing Hovering Flight on Mars," 2017 70th APS Division of Fluid Dynamics, Denver CO, November 19 – 21, 2017

8 Medina, C. and **Kang, C.** " Analytical Solution for the Aeroelastic Response of a Two-Dimensional Elastic Plate in Axial Flow," 2017 70th APS Division of Fluid Dynamics, Denver CO, November 19 – 21, 2017

7 **Kang, C.**, Sridhar, M. K., Landrum, D. B., and Aono, H. "Effects of altitude on the climbing performance of Monarch butterflies," 2016 69th APS Division of Fluid Dynamics, Portland OR, November 20 – 22, 2016

6 Aono, H., Ozawa, Y., Yamamoto, M., Ishikawa, H., **Kang, C.**, and Liu, H. "Effects of wing flexibility on sound characteristics of a four-wing flapping wing micro air vehicle," 5th Joint

meeting, Acoustical Society of America and Acoustical Society of Japan, Honolulu Hawaii USA, 28 November – 2 December 2016

5 Shyy, W. and **Kang, C.**, "Time-Accurate Estimate of Flexible Flapping Wing Aerodynamics," Invited Presentation, 7th World Congress of Biomechanics, Boston, Massachusetts, July 6 - 11, 2014

4 Shyy, W., **Kang, C.**, and Cho, Y., "Adaptive and Passive Flow Control via Actuation and Flexible Structures at Low Reynolds Number," 5th International Symposium on Fluid Machinery and Fluids Engineering, Jeju, Korea, October 24 – 27, 2012

3 Su, W., **Kang, C.**, and Cesnik, C.E.S., "Nonlinear Aeroelastic Analysis of Flapping Wing Micro Air Vehicles with a Surrogate Aerodynamic Model," International Forum on Aeroelasticity and Structural Dynamics 2011, Paris, France, June 26–30, 2011

2 **Kang, C.**, Aono, H., and Shyy, W., "Scaling in Flexible Flapping Wings," American Physical Society, 64th Annual Meeting of the Division of Fluid Dynamics, Baltimore, Maryland, November 19 - 22, 2011

1 Saric, W., Reed, H., **Kang, C.**, Gladden, R., Gabet, P., and Clevenger, D., "Supersonic Laminar Flow Control on Swept Wings Using Distributed Roughness Experiments," American Physical Society, 54th Annual Meeting of the Division of Fluid Dynamics, San Diego, California, November 18 - 20, 2001

<u>Undergraduate Student Papers</u>

4 Clark, T. and **Kang, C.** "Development of a Bio-Inspired Artificial Butterfly Vehicle," 2022 AIAA Region II Student Conference, Atlanta, GA, 2nd prize

3 O'Donoghue, D. and **Kang, C.** "Machine Learning Based Topology Classification of Vortical Flows," 2022 AIAA Region II Student Conference, Atlanta, GA

2 Schulze, F. and **Kang, C.**, "Developing a Flapping Gear System for Butterfly-Inspired Motion," 2021 AIAA Region II Student Conference, 3rd prize

1 Williams, J., Phillips, H., and **Kang, C.**, "Towards a Stable flight of an Artificial Mechanical Butterfly," 2016 AIAA Region II Student Conference

Professional Presentations and Workshops

- Hong Kong University of Science and Technology, Hong Kong, "Marsbee – Swarm of Flapping Wing Flyers for Enhanced Mars Exploration" July 5, 2019
- Chiba University, Japan, "Marsbee – Swarm of Flapping Wing Flyers for Enhanced Mars Exploration" June 26, 2019
- NIAC Inventive Genius Lecture: From Science Fiction to Science Fact, Chicago Museum of Science & Industry, "Marsbee – Swarm of Flapping Wing Flyers for Enhanced Mars Exploration" April 13, 2019
- NASA Innovative Advanced Concepts Symposium, Boston, MA, "Marsbee – Swarm of Flapping Wing Flyers for Enhanced Mars Exploration" September 25-27, 2018
- NASA HQ, Washington DC, "Marsbee – Swarm of Flapping Wing Flyers for Enhanced Mars Exploration" June 5-6, 2018
- Fluid-structure interaction workshop at the University of New South Wales in Canberra, Australia, "Analytical Solution for the Aeroelastic Response of a Two-Dimensional Elastic Plate

in Axial Potential Flow", May 7-9, 2018
- George Washington University, Washington DC, "High-altitude Effects on Butterfly Flight", June 14, 2016
- University of Alabama, Tuscaloosa, AL, "Flapping Wing Aerodynamics of Monarch Butterflies", Feb. 25, 2016
- UAH AIAA Student Chapter, Huntsville, AL, "Flapping Wing Aerodynamics of Monarch Butterflies", Feb 2, 2016
- University of Maryland, MD, "Aerodynamics of Insect Flight", July 10, 2015
- CFDRC, Huntsville, AL, "Scaling and Lift Generation of Flexible Flapping Wings", Aug 30, 2013
- University of Alabama in Huntsville, Huntsville, AL, "Scaling and Lift Generation of Flexible Flapping Wings", Apr 1, 2013
- Siemens Corporate Research, Princeton, NJ, "Multi-Physics from Flapping Wings Systems to Cardiac Mechanics", Feb 21, 2013
- Korea Advanced Institute of Science and Technology, Daejeon, Korea, "Aerodynamics, Scaling, and Performance of a Flexible Flapping Wings", Dec 22, 2011

Graduate Student Mentoring

PhD

- James E. Bluman. 2017
  - Dissertation title: "The effects of wing flexibility on the flight performance and stability of flapping wing micro air vehicles"
  - Currently an Associate Professor at West Point
- Deepa Kodali. 2019
  - Dissertation title: "Analytical models of chordwise and spanwise flexible flapping wings in forward flight"
  - Currently an Assistant Professor at the Christian University
- Madhu Sridhar. 2021
  - Dissertation title: "The Effects of Altitude on the Aerodynamic Performance of Monarch Butterflies"
  - Currently a Research Scientist at the University of Alabama in Huntsville
- Jeremy Pohly. 2023
  - Dissertation title: "Modeling Freely Flying Insects Using a Strongly Coupled High Fidelity Numerical Framework"
  - Currently an Aerospace Engineer at Gray Analytics
- Tulasi Ram Vechalapu. 2024 (co-advised with Dr. Konstatinos Kanistras)
  - Dissertation title: "Experimental Investigation of Steady and Unsteady Effects of a Circulation Control Wing with Spanwise Segmented Blowing"
  - Currently a Postdoc at Mississippi State University

MSc

- Madhu Sridhar. 2015
  - Thesis title: "Aerodynamic performance of flexible flapping wings at fruit fly and bumblebee scales in hover flight"
  - Currently a Research Scientist at the University of Alabama in Huntsville
- Jacob Cranford. 2015 (co-advised with Dr. Nathan Slegers).
  - Thesis title: "A novel experimental method for studying trajectories and wing kinematics of freely flying butterflies"
  - Currently an Aerospace Engineer at Monte Sano Research Corporation.

- James L. Salmon. 2016
    - Thesis title: “A comparison of the quasi-steady to the Navier-Stokes equation solutions of flapping wing aerodynamics”
    - Currently a Software Engineer at Makai Ocean Engineering.
- Cory Medina, 2017
    - Thesis title: “A closed-form solution to the aeroelastic response of an elastic plate in axial flow”
    - Currently a Research Engineer at Los Alamos National Lab
- Kabilan Nedunchezian. 2018
    - Thesis title: “A Numerical Analysis of the Effects of Flapping Wing Kinematics on Aeroacoustics in Hovering Flight”
    - Currently at Robotics Deployment Manager at Berkshire Grey
- Shreyas Lakshmipuram Raghu. 2019
    - Thesis title: Kinematic Analysis of Gait in An Aquatic Treadmill using Land - Based Motion Capture Cameras”
    - Currently a PhD student at the University of Alabama in Huntsville
- Jesse McCain. 2019
    - Thesis title: “Experimental Force and Wing Motion Measurements of A Bioinspired Flapping Wing in A Martian Density Condition”
    - Currently an Aerospace Research Engineer at Dynetics
- Rachel Twigg. 2020
    - Thesis title: “Aeroelastic Characterization of Real and Bioinspired Artificial Butterfly Wings”
    - Currently a Research Engineer at Dynamic Concepts
- Timothy Morris. 2021
    - Thesis title: “Experimental Measurements of the Wing Deformation and Force Production of Real Monarch Butterfly Wings”
- Arnab Chatterjee. 2022
    - Thesis title: “Experimental Investigation of Swept Bio-Inspired Wing Planforms”
    - Currently a Flight Test Engineer at Piper Aircraft
- Thomas Clark. 2023
    - Thesis title: “Design and Kinematic Testing of a Resin Artificial Monarch Butterfly Wing”
    - Currently at Defense Intelligence Agency
- Darnisha Crane. 2024
    - Thesis title: “A Novel Method for Time-Based Synchronization of Acquired Force and Motion Data”
    - Currently a Radar Systems Engineer at Raytheon

<u>Undergraduate Research Students:</u>

- NSF REU: Raisa Chowdhury (Carnegie Mellon, 2015), M’hamed Ben Moussa (UAH, 2016), Munsa Manandhar (Emory University)
- UAH Research or Creative Experience for Undergraduates: Brittany Greene (Biology, 2016) Darnisha Crane (MAE, 2017)
- Lab Assistants: Yusuke Nakamura (MAE), Alex Christley (MAE), Pratik Bhardwaj (MAE), Nathanial Long (MAE), Janelle Williams (ISEEM), Jeffrey Boudreau (MAE), Hunter Philips (MAE), Brittany Greene (Biology), Daniel Aiken (MAE), Ryota Nakano (MAE), Akifumi Takeyama (MAE), Ryo Suzuki (MAE), Nicholas Hildebrandt (MAE), Frederick Schulze (MAE), Madison Smith (MAE), Charity Wangari (MAE), Thomas Clark (MAE), Spencer Rubottom

(MAE), Michael Wahl (MAE), Travis Craig (MAE), Michaela Tarpley (MAE), Aidan Faino (MAE), Dylan O'Donoghu (MAE), Tyler Ardry (MAE), Caroline Waugh (MAE), Jorge Mares Zamora (MAE)

Teaching History

University of Alabama in Huntsville

- 2013 Fall
  - MAE430/530, Fundamentals of Aerodynamics, Undergrad; Grad, 48 students, student instructor evaluation (SIE): undergrad: 90.45/100; grad: 98.52/100
- 2014 Spring
  - MAE693, Graduate Engineering Analysis II, Grad, 25 students, SIE: 87.04/100
  - MAE755, Advanced Aerodynamics, Grad, 2014S, 6 students, SIE: 91.11/100
- 2014 Fall
  - MAE430/530, Fundamentals of Aerodynamics, Undergrad; Grad, 43 students, SIE: Not administered by University
- 2015 Spring
  - MAE693/EE630, Graduate Engineering Analysis II, Grad, 25 students, SIE: MAE693: 3.47/4; EE630: 3.47/4; EE630 Online: 3.67/4
  - MAE695/610, Aerodynamics, Grad, 10 students, SIE: On-Campus 3.75/4; Online 3.5/4
- 2015 Fall
  - MAE430, Fundamentals of Aerodynamics, Undergrad, 27 students, SIE: 3.48/4
  - MAE695/610, Aerodynamics, Grad, 7 students, SIE: 4/4
- 2016 Spring
  - MAE695/620, Compressible Aerodynamics, Grad, 21 students SIE: On-Campus 4/4; Online 3.67/4
- 2016 Fall
  - MAE330, Fundamentals of Aerodynamics, Undergrad, 57 students, SIE: 4.49/5
  - MAE695/610, Aerodynamics, Grad, 7 students, SIE: 5/5
- 2017 Spring
  - MAE330, Fundamentals of Aerodynamics, Undergrad, 34 students, SIE: 4.47/5
  - MAE695/620, Compressible Aerodynamics, Grad, 11 students, SIE: 5/5
- 2017 Fall
  - MAE330, Fundamentals of Aerodynamics, Undergrad, 52 students, SIE: 4/5
- 2018 Spring
  - MAE330, Fundamentals of Aerodynamics, Undergrad, 37 students, SIE: 4.8/5
- 2018 Fall
  - MAE330, Fundamentals of Aerodynamics, Undergrad, 37 students, SIE: 4.19/5
  - MAE610, Aerodynamics, Grad, 19 students, On-Campus: not enough input; Online: SIE: 4.64/5
- 2019 Spring
  - MAE330, Fundamentals of Aerodynamics, Undergrad, 58 students, SIE: 3.16/5
  - MAE620, Compressible Flows, Grad, On-Campus: 12 students, SIE: 4.44/5; Online: 11 students, SIE: 4.25/5
- 2019 Fall
  - MAE330, Fundamentals of Aerodynamics, Undergrad, 88 students, SIE: 3.94/5
  - MAE610, Aerodynamics, Grad, On-Campus: 6 students, SIE: 4.62/5; Online: 9 students, SIE: 3.31/5
- 2020 Spring
  - MAE330, Fundamentals of Aerodynamics, Undergrad, 56 students, SIE: 4.22/5
- 2020 Fall

    - MAE330, Fundamentals of Aerodynamics (fully online), Undergrad, 95 students, SIE: 4.27/5
    - MAE610, Aerodynamics (fully online), Grad: 14 students, SIE: 4.43/5
- 2021 Spring
    - MAE330, Fundamentals of Aerodynamics (fully online), Undergrad, 58 students, SIE: 4.56/5
    - MAE620, Compressible Flow (fully online), Grad: 20 students, SIE: 4.50/5
- 2021 Fall
    - MAE330, Fundamentals of Aerodynamics, Undergrad, 111 students, SIE: 4.59/5
    - MAE610, Aerodynamics (fully online), Grad: 21 students, SIE: 4.15
- 2022 Spring
    - MAE330, Fundamentals of Aerodynamics, Undergrad, 44 students, SIE: 4.49/5
    - MAE693/EE630, Graduate Engineering Analysis II, Grad: 40 students, SIE: 4.62/5
- 2022 Fall
    - MAE200, Principles of Aeronautics and Astronautics, Undergrad, 63 students, SIE: 4.95/5
    - MAE330, Fundamentals of Aerodynamics, Undergrad, 86 students, SIE: 4.49/5
- 2023 Spring
    - MAE330, Fundamentals of Aerodynamics, Undergrad, 38 students, SIE: 5/5
    - MAE693/EE630, Graduate Engineering Analysis II, Grad: 31 students, SIE: 4.55/5
- 2023 Fall / 2024 Spring: Sabbatical Leave
- 2024 Fall
    - MAE480/580, Aircraft Stability and Control, Undergrad/Grad: 76 students, SIE: 4.56/5
    - MAE610, Aerodynamics, Grad: 22 students, SIE: 4.0/5
- 2025 Spring
    - MAE330, Fundamentals of Aerodynamics, Undergrad, 47 students, SIE: 4.69/5
    - MAE480/580, Aircraft Stability and Control, Undergrad/Grad: 61 students, SIE: 4.8/5

<u>New curriculum development</u>

- MAE610, Aerodynamics, Grad: Fundamental concepts in aerodynamics at a graduate level including conservation laws, complex potential theory, thin airfoil theories, finite-wing lifting-line theory, boundary layers and von Karman momentum integral equations.
- MAE620, Compressible Flow, Grad: Compressible, supersonic and transonic flow, as described by the Euler equations, at the graduate level. Linear and nonlinear theories of shock waves, expansion waves, and their interactions are studied.

Professional Service and Membership

- Associate Fellow – AIAA
- AIAA Fluid Dynamics Technical Committee member, 2018 – 2021
- Member – APS, The Royal Institution of Engineers in the Netherlands
- Reviewer: Journal of Fluid Mechanics, Journal of the Royal Society Interface, Journal of the Royal Society Interface Focus, Proceedings of the Royal Society A, Science Advances, AIAA Journal, Journal of Theoretical Biology, Bioinspiration & Biomimetics, Journal of Fluids and Structures, Journal of Aerospace Engineering, Aerospace Science and Technology, Aeronautical Journal, AIAA Conferences, International Federation of Automatic Control, American Helicopter Society Journal

University Service

- MAE Aerospace Graduate Coordinator, 2024 - present
- MAE Graduate Curriculum Committee member, 2023 – present
- UAH Faculty Senate member, 2021 – 2023
- Faculty Search Committee member (MAE), 2022 – 2023
- Faculty Senate Undergraduate Curriculum Committee member, 2021 – 2023
- First Year Reappointment Committee member (MAE), 2020 - present
- University Faculty Appeals Committee Alternate member, 2019 - 2020
- Reappointment and Tenure Promotion Committee member (MAE), 2020 – present
- MAE High-school Promotion and Tour, 2019 – 2023
- Sigma Gamma Tau faculty advisor – University of Alabama in Huntsville, 2017 – present
- MAE Undergraduate Curriculum Committee member, 2013 – 2022
- COE Strategic Planning - Leadership in Research Committee member, 2020 – 2021
- Reappointment and Tenure Promotion Committee member (Civil), 2019
- Faculty Search Committee member (MAE), 2014 – 2017
- Faculty Search Committee member (Kinesiology), 2016 – 2017