

Kourosh Shoele

CONTACT INFORMATION

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APPOINTMENTS **Assistant Professor, Florida State University- Florida A&M University**, Tallahassee, Florida. Oct 2016 - now

Mechanical Engineering, Florida Center for Advanced Aero-Propulsion (FCAAP) & Center of Advanced Power Systems (CAPS)

- Primary research: *Fluid-structure interaction; coupled electromechanical modeling of flexible systems; multi-physics studies.*

Assistant Research Scientist, Johns Hopkins University, Baltimore, Maryland. July 2015 - Sep 2016

Mechanical Engineering & Institute of Computational Medicine (ICM)

- Primary research: *Fluid-structure interaction in engineering and biological systems; coupled aerodynamic-hydrodynamic modeling of offshore floating wind farms.*

Postdoctoral Associate, Johns Hopkins University, Baltimore, Maryland, Sep 2013 - July 2015

- Mentor: Rajat Mittal
- Primary research: *Computational modeling of flexible electromechanical structures; aeroelastic heat transfer enhancement; fluttering response of flexible membranes.*

Project Research Engineer, RE Vision Consulting, Sacramento, California, Oct 2011 - Sep 2013,

- Primary research: *Analysis and design of offshore structures; hydrokinetic energy conversion systems;*

Postdoctoral Associate, University of California, San Diego, La Jolla, California, Aug 2011 - Oct 2011

- Mentor: Qiang Zhu
- Primary research: *Fluid-structure interaction of offshore wind turbines; fluid dynamics of skeleton-reinforced flexible insect wings.*

EDUCATION

Ph.D., University of California, San Diego, La Jolla, California, 2011 (GPA: 4.0/4.0)

- Advisor: Qiang Zhu
- Thesis Title: *Flow interaction with highly flexible structures*

M.S., Sharif University of Technology, Tehran, Iran, 2005

- Thesis Title: *Online identification of nonlinear crack with the use of sequential nonlinear least square and adaptive tracking technique*

B.S., University of Shiraz, Shiraz, Iran, 2003

FIELDS OF INTEREST

Fluid-Structure Interaction, Computational Fluid Dynamic, Computational mechanics, Structural Dynamics, Biomechanics.

HONORS & AWARDS

- Best poster award, NASA International Workshop on Environment and Energy, San Diego, 2010.
- Inside JEB featured article: Journal of Experimental Biology, vol. 211 (2008).
- Ranked 1st in the nationwide M.S. entrance exam among 15000 participants in Iran in 2003.
- Ranked 1st among 15000 participants in the eighth Scientific Olympiad of Engineering in Iran in 2003.

RESEARCH EXPERIENCES

Assistant Professor, Mechanical Engineering, FAMU-FSU College of Engineering, 2016 - *now*

- Dynamics of immersed flexible deployable structures
- Hydrodynamic-aerodynamic modeling and control of offshore wind farms
- Interaction between compliant surface and flow
- Shock wave interaction with compliant surfaces

Assistant Research Scientist, Johns Hopkins University, 2015 - 2016

- Immersed boundary modeling of piezoelectric structures
- Stochastic hydrodynamic-aerodynamic modeling of offshore wind farms

Postdoctoral Associate, Johns Hopkins University, 2013 - 2015

- Developed coupled flow-structure-thermal interaction model for new applications in electronic cooling
- Developed high-order immersed boundary model of shell structures
- Studied piezoelectric flow energy harvesting systems

Collaborative Research Activities, 2011 - *now*

- Studied drafting mechanism in dolphins and hydrodynamics of fish schooling
- Explored a novel wave energy harvesting technique using a piezoelectric wave devouring sheet
- Studied ratcheting response of a small insect inside an oscillatory flow

Research Project Engineer, RE Vision Consulting, Sacramento, 2011 - 2013

- Developed a comprehensive wave-to-wire model for simulating wave extraction devices
- Developed new wave prediction method for control of wave energy converters
- Studied econometrics, dynamics and control of wave energy devices using analytical & numerical methods as well as experiments

Postdoctoral Associate, University of California San Diego, 2011

- Studied aerodynamics of flexible insect wings during hovering flight
- Studied dynamics of floating wind turbines with experimental and computational techniques

Research Assistant, University of California San Diego, 2006 - 2011

- Developed a parallel immersed boundary model that incorporates solvers based on domain decomposition, finite element model for solid, and spectral/multilevel solvers
- Studied fluid interaction with skeleton reinforced bio-membranes, focusing on anisotropic structural flexibility
- Studied fluid interaction with flexible bluff bodies

Research Assistant, Sharif University of Technology, Iran, 2003 - 2005

- Developed an algorithm for structural health monitoring of buildings considering their soil-structure interaction
- Studied dynamics of nonlinear breathing cracks in beams and frames and applied it for on-line detection of nonlinear damages in a structure

INDUSTRIAL EXPERIENCES

Project Engineer, RE Vision Consulting, Sacramento, 2011 - 2013

- Designed and built a small-scaled floating point absorber device for experiments
- Designed a small scaled power take-off hydraulic device for testing in a wave tank
- Developed a commercial wave-to-wire numerical toolbox for simulating linear/nonlinear dynamics of wave energy converters, mooring lines, electronics, etc.

Offshore Structural Designer, Namvaran Consulting Engineers, Iran. 2004 - 2006

- Participated in multi-years professional training courses about analysis and design of offshore structures
- Performed structural designs and deployment analyses of offshore platforms
- Analyzed and designed blast resistant buildings

PUBLICATIONS

Journal Publications(* are the current research group members.)

1. **K. Shoele**, P. Eastham. Effects of Nonuniform Viscosity on Ciliary Locomotion. *Physics Review Fluids* 3.4, : 043101, 2018.
2. **K. Shoele**. Wave energy harvesting by a wave devouring piezoelectric flexible plate. *Submitted*.
3. A. Rips, **K. Shoele**, R. Mittal. Flow induced flutter of inverted flag pairs. *Submitted*.
4. S. Orrego, **K. Shoele**, A. Ruas, K. Doran, B. Caggiano, R. Mittal, and SH Kang. Harvesting ambient wind energy with an inverted piezoelectric flag. *Applied Energy* 194: 212-222, 2017.
5. **K. Shoele**, R. Mittal. Energy harvesting by flow-induced flutter in a simple model of an inverted piezoelectric flag. *Journal of Fluid Mechanics*, 790, 582- 606, 2016.
6. **K. Shoele**, R. Mittal. Flutter instability of a thin flexible plate in a channel. *Journal of Fluid Mechanics*, 786, 29-46, 2016.
7. **K. Shoele**, Q. Zhu. Hydrodynamics of drafting mechanism in dolphin calves beneath free surface. *Journal of Theoretical Biology*, 382,363-377, 2015.
Featured as Highlighted Article on the webpage of Journal of Theoretical Biology.
8. **K. Shoele** and Q. Zhu. Performance of synchronized fins in biomimetic propulsion. *Bioinspiration & Biomimetics*, 10.2: 026008, 2015.
9. **K. Shoele**, R. Mittal. Computational study of flow-induced vibration of a reed in a channel and effect on convective heat transfer. *Physics of Fluids*, 26: 127103, 2014.
10. **K. Shoele** and Q. Zhu. Performance of a wing with nonuniform flexibility in hovering flight. *Physics of Fluids*, 25, 041901, 2013.
11. **K. Shoele** and Q. Zhu. Leading edge strengthening and the propulsion performance of flexible ray fins. *Journal of Fluid Mechanics*, 693: 402-432, 2012.
12. **K. Shoele** , I. Prowell, Q. Zhu and A. Elgamal. Dynamic and structural modeling of a floating wind turbine. *International Journal of Offshore and Polar Engineering*, 21(2), 155-160, 2011.

13. **K. Shoele** and Q. Zhu. Numerical simulation of Labriform swimming by a pectoral fin. *Journal of Experimental Biology*, 213: 2038-2047, 2010.
14. **K. Shoele** and Q. Zhu. Flow-induced vibrations of a deformable ring. *Journal of Fluid Mechanics*, 650: 343-362, 2010.
15. **K. Shoele** and Q. Zhu. Fluid-structure interactions of skeleton-reinforced fins: performance analysis of a paired fin in lift-based propulsion. *Journal of Experimental Biology*, 212(16): 2679-2690, 2009.
16. Q. Zhu and **K. Shoele**. Propulsion performance of a skeleton-strengthened fin. *Journal of Experimental Biology*, 211(13), 2087-2100, 2008. **Inside JEB featured article.**
17. **K. Shoele**, A.Vafai and A.Kaveh. Localized identification of shear building with embedded foundation in frequency domain. *The Structural Design of Tall and Special Buildings*, 17(2), 245-256, 2008.
18. **K. Shoele**, A. Vafai and A. Kaveh. Online detection of a breathing crack using an adaptive tracking technique. *Acta Mechanica*, 188(3), 19-154, 2007.

Book Chapters

19. Q. Zhu and **K. Shoele**. Numerical Modeling of the Performance of Ray Fins in Fish Locomotion. *Natural Locomotion in Fluids and on Surfaces, The IMA Volumes in Mathematics and its Applications*, 155(2), 151-157, 2012.

Submitted & Under Preparation Journal Papers (* are the current research members.)

20. **K. Shoele** C. Meneveau & R. Mittal. Spatial-temporal modeling of offshore floating wind farms. *In preparation*.
21. M. Vahab* & **K. Shoele**, Enhancement of nucleate boiling using Flow-induced vibration of a flexible plate . *In preparation*.
22. TK. Wang* & **K. Shoele**, Energy exchange mechanisms between turbulent boundary layer and flexible compliant coating. *In preparation*.

Selected Official Reports

23. M. Previsic, R. Jepsen, **K. Shoele** and et. al. Design, performance, and economic assessment for reference model 1-3. *Document prepared for DOE by RE-vision, LLC, Sandia National lab, NREL and AREL*, 2012.
24. **K. Shoele**, J. Epler and M. Previsic. Wave energy reference model; theoretical performance and validation, *Document prepared for DOE by RE-vision, LLC*, 2013.

Peer-Reviewed Conference Papers (* are the current research group members.)

25. T. Solano*, **K. Shoele** ,J, Ordenez, Thermal Analysis of Power Electronic Building Block-based Converter Array. 3rd Thermal and Fluids Engineering Conference (TFEC), Fort Lauderdale, FL, 2018.
26. K. Kopperstad*, **K. Shoele**, R. Kumar. A Combined Experimental and Numerical Study of the Floating Wind Turbines, AIAA Aviation, Atlanta, 2018.
27. M. Vahab*, **K. Shoele**. Flow-induced Vibration in the Presence of Multiphase Multimaterial System , AIAA Aviation, Atlanta, 2018.
28. A. Shahriar*, **K. Shoele**, R. Kumar. Aero-thermo-elastic Simulation of Shock-Boundary Layer Interaction over a Compliant Surface , AIAA Aviation, Atlanta, 2018.

29. TK. Wang*, **K. Shoele**. Aeroelastic Flutter in the Presence of an Active Flap, AIAA Aviation, Atlanta, 2018.
30. A. Rips, **K. Shoele**, A. Glezer, R. Mittal. Efficient electronic cooling via flow-induced vibrations, 33rd Thermal Measurement, Modeling & Management Symposium (SEMI-THERM), 2017.
31. **K. Shoele** ,Viscoelastic model for describing the response of transcatheter aortic valves. 5th International Conference on Computational and Mathematical Biomedical Engineering, Pittsburgh, PA, 2017.
32. H. Bakhshaei, G. Garreau, G. Tognetti, **K. Shoele**, R. Carrero, T. Kilmar, Z. Chi, WR. Thompson, JH. Seo, R. Mittal, AG. Andreou, Mechanical design, instrumentation and measurements from a hemoacoustic cardiac phantom. *Information Sciences and Systems (CISS), 2015 49th Annual Conference on* ,1,5, 2015.
33. **K. Shoele** , A. Glezer and R. Mittal. Enhancement of convective heat transfer in a micro-channel using flexible self-oscillating reeds. *17th USNCTAM*, Michigan, 2014.
34. JH. Seo, **K. Shoele** and R. Mittal. Computational modeling of the effect of mitral-valve leaflet dynamics on intraventricular flow. *WCCM XI*, Barcelona, 2014.
35. **K. Shoele** and M. Previsic. Unified modeling and simulation of marine hydrokinetic devices. *EWTEC2013*, Aalborg, Denmark, 2013.
36. M.Previsic and **K. Shoele**. Cost reduction pathways for wave energy. *EWTEC2013*, Aalborg, Denmark, 2013.

Contributed Conference Presentations (* are the current research group members.)

- Investigating the relationship between phase-decorrelation OCT and compression OCE measurements.
BJ. Blackburn, S. Gu, **K. Shoele**, MW. Jenkins, AM. Rollins. SPIE, 2018.
- A Novel Computational Model for Predicting Thrombosis Risk in Bioprosthetic Transcatheter Aortic Valves.
R. Mittal , JH-Seo, **K. Shoele**, J. Resar, HVS Scientific Meeting, 2017.
- Ciliary Locomotion in Varying Viscosity Flow.
P. Eastham*, **K. Shoele**, 70th Annual Meeting of the Division of Fluid Dynamics, Denver, 2017.
- Wind-Induced Reconfigurations in Flexible Branched Trees.
O. Ojo*, **K. Shoele**, 70th Annual Meeting of the Division of Fluid Dynamics, Denver, 2017.
- Flow interaction with a flexible viscoelastic sheet.
K. Shoele, 70th Annual Meeting of the Division of Fluid Dynamics, Denver, 2017.
- Gravity effects on wind-induced flutter of leaves.
N Clemmer*, K Kopperstad*, T Solano*, **K. Shoele**, J Ordonez, 70th Annual Meeting of the Division of Fluid Dynamics, Denver, 2017.
- Flow-Induced Flutter of Multiple Inverted Flags for Improved Energy Harvesting.
A Rips, **K. Shoele**, R Mittal, 70th Annual Meeting of the Division of Fluid Dynamics, Denver, 2017.
- Flow-Induced Flutter of Multi-Inverted Flag Configurations: Vortex Dynamics and Flutter Behaviors.
A. Rips, **K. Shoele** and R. Mittal, *69th APS-DFD*, Nov. 20-22, 2016; Portland, Oregon.
- Collective Dynamics and Power variation of an Offshore Floating Wind Farm.
K. Shoele, Charles Meneveau and R. Mittal, *WindFarms 2016*, Richardson, Texas.

- Computational Models of Transcatheter Aortic Valves for the Prediction of Leaflet Thrombosis.
K. Shoele, J.H. Seo, H. Bakhshaei, S. Zimmerman, J. Resar, and R. Mittal., *BMES: Frontiers in Medical Devices*, 2016, Washington DC.
- Flow-induced vibration of a reed in a channel: effect of reed shape on convective heat transfer with application to electronic cooling.
A. Rips, K. Shoele, A. Glezer and R. Mittal, *68th APS-DFD*, Nov. 22-24, 2015; Boston, Massachusetts.
- Fluid dynamics of clap-and-fling with highly flexible wings inspired by the locomotion of sea butterflies.
Z. Zhou, K. Shoele, D. Adhikari, J. Yen, D. Webster, and R. Mittal, *68th APS-DFD*, Nov. 22-24, 2015; Boston, Massachusetts.
- Flag flapping in a channel.
S. Alben, K. Shoele, R. Mittal, S. Jha and A. Glezer, *68th APS-DFD*, Nov. 22-24, 2015; Boston, Massachusetts.
- Energy harvesting for micropower applications by flow-induced flutter of an inverted piezoelectric flag.
K. Shoele, R. Mittal, *68th APS-DFD*, Nov. 22-24, 2015; Boston, Massachusetts.
- Computational modeling of the effect of mitral-valve leaflet dynamics on intraventricular flow.
JH. Seo, K. Shoele, R. Mittal, WCCM XI, Barcelona, 2014.
- Simulations of intraventricular flows with physiological mitral valve models.
JH. Seo, K. Shoele, V. Vedula, R. George, R. Mittal, 7th World Congress of Biomechanics, Boston, 2014.
- Enhancement of convective heat transfer in a micro-channel using flexible self-oscillating reeds.
K. Shoele, A. Glezer, R. Mittal, 17th USNCTAM, Michigan, 2014.
- Unified modeling and simulation of marine hydrokinetic devices.
K. Shoele and M. Previsic, EWTEC2013, Aalborg, Denmark, 2013.
- Cost reduction pathways for wave energy.
M.Previsic and K. Shoele, EWTEC2013, Aalborg, Denmark, 2013.
- Performance of a wing with nonuniform deformability in hovering flight.
K. Shoele and Q. Zhu, *65th APS-DFD*, 18-20, 2012; San Diego, CA.
- Hovering performance of a two dimensional skeleton-reinforced flexible wing.
K. Shoele and Q. Zhu, *64th APS-DFD*, 20-22, 2011; Baltimore, MD.
- Two-dimensional study of fluid interaction with ray-strengthened fin using immersed boundary method.
K. Shoele and Q. Zhu, *63rd APS-DFD*, Nov. 23-25, 2010; Long Beach, CA.
- Fully coupled dynamic model of offshore wind turbines.
K. Shoele, *Prevention First 2010, An Onshore and Offshore Prevention Symposium*, Oct. 19-20, 2010; Long Beach, CA.
- Labriform swimming of a ray-strengthened pectoral fin.
K. Shoele and Q. Zhu, *62nd AAPS-DFD*, Nov. 22-24, 2009; Minneapolis, Minnesota.
- Performance of skeleton-reinforced biomembranes in locomotion.
Q. Zhu and K. Shoele, *61th APS-DFD*, Nov. 23-25, 2008; San Antonio, Texas.

MENTORSHIP

- **Postdoc, Graduate and Undergraduate Students**
 - Mehdi Vahab (Research Scientist), Florida State University, 2017-.
 - Tso-Kang Wang (PhD), Florida State University, 2017-.

- Al Shahriar (PhD), Florida State University, 2017-.
- Oluwafemi E. Ojo (PhD), Florida A & M University, 2017-.
- Tomas Solano(joint PhD with Dr. Juan Ordonez), Florida State University, 2016-.
- Gokhan Ozkan (joint PhD with Dr. Chris Edrington), Florida State University, 2016-.
- Patrick Eastham (PhD of Math-research assistant), Florida State University, 2017-.
- Karsten Kopperstad (MS), Florida State University, 2017-.
- Joshua Segall (BS), Florida State University, 2018,
- Nickalaus Clemmer (BS), Florida State University, REU Student, Summer 2017,

- **Graduate Committee**

- MSc Committee
 - Andrew Castro, Florida State University, 2018,
 - Joseph Rodriguez, Florida State University, 2017,
 - James Pace, Florida State University, 2017.
- PhD Committee
 - Naireeta Deb, Florida State University, 2017,
 - Chi-An Yeh, Florida State University, 2017.

- **Graduate Student Mentorship**

- Aaron Rips (P.hD.), Johns Hopkins University, 2015.
- Zhuoyu Zhou (P.hD.), Johns Hopkins University, 2015.
- Sara Salehyar (P.hD.), UC San Diego, 2010-2011.
- Evan Michael Harriger (M.S.), UC San Diego, 2010-2011,
- Thesis title: *Dynamic analysis of a 5 megawatt offshore floating wind turbine.*
- Daniele Cavaglieri (P.hD.), Mechanical Eng., UC San Diego, 2013.

- **Undergraduate Student Mentorship**

- Bonny Kuan (B.S.), UC San Diego, 2010.

TEACHING

- **Instructor**

- Analysis in Mechanical Engineering II, Graduate class, (EML5061), Spring 2018.
- ME graduate seminar, Fall 2017.
- ME graduate seminar, Spring 2018.
- Co-instructor of ME graduate seminar, Spring 2017.
- Thermal Fluid II, Undergraduate class, (EML3016C), Fall 2018.
- Analysis in Mechanical Engineering II, Graduate class, (EML5061), Spring 2017.

- **Instructor Assistant**, Numerical Methods (graduate course:EN530.766, primary instructor Prof. Rajat Mittal), Johns Hopkins University, Fall 2014.

- **Teaching Assistant**, Fluid Mechanics (undergraduate course, instructor Prof. Qiang Zhu), University of California, San Diego, Winter 2009.

- **Teaching Assistant**, Numerical methods for Engineering (undergraduate course, instructor Prof. Qiang Zhu), University of California, San Diego, Spring 2010.

- **Teaching Assistant**, Structural Analysis II (undergraduate course, instructor Prof. A. Ranjbaran), University of Shiraz, , Winter-Spring 2003.

PRESENTATIONS & INVITED TALKS

- Talk, 5th International Conference on Computational and Mathematical Biomedical Engineering, Pittsburgh, PA, 2017.
- Talk, 70th Annual Meeting of the Division of Fluid Dynamics, Denver, 2017.
- Invited speaker, Institute for Successful Longevity, FL, 2017.
- Talk, Mayo Clinic, Jacksonville, FL, 2017.
- Talk, Wind-Inspire meeting, MD, 2016.

- Invited speaker, Department of Mechanical Engineering, University of Nebraska, Lincoln, NE, 2016.
- Invited speaker, Department of Mechanical Engineering, Florida State University, 2016.
- Invited speaker, Department of Mechanical and Aerospace Engineering, University of Florida, 2016.
- Invited speaker, Department of Civil Engineering, Stony Brook University, 2016.
- Talk, 68th Annual Meeting of the Division of Fluid Dynamics, Boston, 2016.
- Talk, Wind-Inspire meeting, MD, 2015.
- Talk, CEA-FM-Burgers-GWU Research Symposium, MD, 2015.
- Invited speaker, Department of Mechanical Engineering, Michigan State University, MI, 2015.
- Invited speaker, Department of Civil & Environmental Engineering, Louisiana State University, LA, 2015.
- Invited speaker, Center for Environmental and Applied Fluid Mechanics, Johns Hopkins University, MD, 2014.
- Invited speaker, Department of Engineering and Technology, Texas A&M at Galveston, TX, 2013.
- Invited speaker, Center of Turbulent Research, Stanford University, CA, 2013.
- Invited speaker, Mathematics Department, University of Wisconsin-Madison, Madison, WI, 2013.
- Invited speaker, Department of Mechanical Engineering, M.I.T., Cambridge, MA, 2012.
- Invited speaker, 2011 WSLCA Winter conference, Long Beach, 2011.
- Invited speaker, Prevention 1st 2010, An Onshore and Offshore Symposium, Long Beach, 2010.
- Invited speaker, Department of Structural Engineering, UC San Diego, 2010.
- Talk, 65th Annual Meeting of the Division of Fluid Dynamics, San Diego, 2012.
- Talk, Reference Models Meeting, Richland, WA, June, 2012.
- Two talks, Reference Models Meeting, Sacramento, CA, March, 2012.
- Talk, 5th Southern California Symposium on Flow Physics, University of South California, Apr 2011.
- Talk, 63rd Annual Meeting of the Division of Fluid Dynamics, Long Beach, 2010.
- Talk, 4th Southern California Symposium on Flow Physics, University of California, Irvine, Apr 2010.
- Talk, 62nd Annual Meeting of the Division of Fluid Dynamics, Minneapolis, Minnesota, 2009.
- Poster, AGU Fall Meeting, San Francisco, 2012.
- Poster, Research Expo of Jacob Engineering School, University of California, San Diego, 2011.
- Poster, NASA Int. Workshop on Environment and Energy, UC, San Diego, 2010.
- Poster, Research Expo of Jacob Engineering School, University of California, San Diego, 2010.
- Poster, Research Expo of Jacob Engineering School, University of California, San Diego, 2009.

MEMBERSHIPS & SERVICES

- Organizing special session in AIAA Aviation, 2018 named "Flow-Induced Flutter: Advances in Modeling, Experiments and Applications".
- Organizer committee, TFEC - American Society of Thermal and Fluids Engineers (ASTFE), Lauderdale, FL, 2018.
- Session chair for APS/DFD 2015, M13- Aerodynamics: Membranes and Flutter
- Session chair for APS/DFD 2012, A1- Fluid Structure Interactions I
- Judge for AGU 2012
- Referee for: Journal of Bionic Engineering, Journal of Engineering Analysis with Boundary Element, Journal of Theoretical Biology, Physic of Fluids, Journal of Computational Physics, Journal of Fluid and Structures, Journal of Fluid Mechanics, Computers and Fluids, AIAA Journal, Physics Review Fluids
- Membership in APS, ASME, and AIAA