

MD ERFANUL ALAM

Google Scholar

Assistant Professor

Department of Mechanical Engineering
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EDUCATION

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|---|------------------------------|
| University of Central Florida, FL, USA
PhD, Mechanical Engineering | <i>Aug. 2017 – Aug. 2021</i> |
| Georgia Southern University, GA, USA
Master of Science in Applied Engineering | <i>Aug. 2015 – May 2017</i> |
| Bangladesh University of Engineering & Technology, Bangladesh
Bachelor of Science in Mechanical Engineering | <i>Mar. 2009 – Jul. 2014</i> |

RESEARCH INTERESTS

- **Insect inspired flight** : Flutter stroke mechanics in live insects and investigation the moisture removal techniques employed by insects
- **Damping by drop sloshing** : Mechanics of viscous liquid damping imposed by sessile drops. An experimental approach to find optimum viscosity that most effectively damps a millimetric vibrational system
- **Jet stability from soft membranes** : Coupled mechanics influencing the temporal jet stability and breakup distance imposed by deformable orifices
- **Environmental hazards in MAV flight** : Physics underlying MAV survival from natural disturbances more forceful than the weight micro aerial vehicle itself

TEACHING INTERESTS

- Fundamental courses in mechanical engineering such as fluid mechanics, heat transfer, thermodynamics, statics, and dynamics
- Basic mechatronics and Robotics courses including control and vibration, Introduction to Robotics and mechatronics design
- Advances courses such as applications of machine learning in mechanical engineering, probabilistic methods, and multidisciplinary design optimization
- Courses that are consisting of both in-class teaching and a lab component. Willing to teach hands-on courses and those with intensive SolidWorks, AutoCAD, MATLAB and Python components

PUBLICATIONS

- **Alam, Md Erfanul**, and Andrew Dickerson. "Sessile liquid drops damp vibrating structures" *Physics of Fluids* (2021). [Link](#)

- **Alam, Md Erfanul**, Dazhong Wu, and Andrew Dickerson. "Predictive modelling of drop ejection from damped, dampened wings by machine learning" Proceeding of Royal Society A (2020). [Link](#)
- **Alam, Md Erfanul**, Jeffrey L. Kauffman, and Andrew Dickerson. "Drop ejection from vibrating damped, dampened wings." Soft Matter (2020). [Link](#)
- **Alam, Md Erfanul**, Smith, N., Watson, D., Hassan, T., Neupane, K. (2019, April). Early Screening of DDH using SVM Classification. In 2019 SoutheastCon (pp. 1-4). IEEE. [Link](#)
- **MDE Alam** G Molina 1, E Onyejizu and V Soloiu, "Wear from oil-dilution by biodiesels: a tribometer study on effects of biodiesel methyl-ester components", STLE Annual Meeting and Conference 2018 [Link](#)
- **MDE Alam** , B Samanta, "Performance Evaluation of Empirical Mode Decomposition for EEG Artifact Removal", ASME International Mechanical Engineering Congress and Exposition, 2017 [Link](#)
- **MDE Alam** , and B Samanta, "Empirical mode decomposition of EEG signals for brain computer interface", IEEE SouthEastCon, 2017 [Link](#)

RESEARCH EXPERIENCE

University of Central Florida

Aug. 2017 – Present

ORC Fellowship, Graduate Research Assistant

Research Area :

- **Droplet ejection from dampened, damped wings:** *Develop contact mechanics of different viscous fluid on a hydrophobic surface. Investigate the physics of droplet motion on a vibrating wings and experimentally validate using millimetric wings across a range of hydrophobicity, amplitude, and frequency. An electrodynamic shaker is used to produce flying insects' flutter stroke experimentally which is controlled by NI DAQ using LabVIEW. Quantify the drop motion on a hydrophobic surface using high speed videography. Finally we employ machine learning technique in Python platform to classify the ejection mode and the minimum inertial force needed to eject a drop.*
- **Structural vibration with base motion:** *Experimental approach to measure of energy dissipation and specific damping in cantilever structure using high speed videography and theoretically simulate the cantilever motion combining Euler-Bernoulli beam theory and Elastica theory. Develop a simulation model for mechanical response to find inertial force distribution along cantilever length under the application of periodic force distribution.*
- **Insect-inspired flight:** *Comparison of liquid adhesion of mosquito wings and hydrophobic surface using SEM imaging. Characterisation of flutter stroke mechanics in live insects and investigate the moisture removal technique of mosquito during flutter stroke.*
- **Drop sloshing damping** *Exploration of the vibration damping characteristics of singular liquid drops of varying viscosity and surface tension resting on a millimetric cantilever. Experimental approach to find optimum viscosity that most effectively damps a vibrational system.*
- **Jet stability through the soft membrane:** *Investigation of the influences of outermost membrane stiffness on the jet's orifice temporal jet stability and breakup distance. Exploration of effect of material stiffness and fracture characteristics on the generation of pressure and explosive fluid release from a precise crafted orifices which is made using UCF's Advanced Materials Processing and Analysis Center (AMPAC) facility via machining tools.*

Georgia Southern University

Aug. 2015 – May 2017

Graduate Research Assistant

Thesis : *Electroencephalographic (EEG) signal processing and classification techniques for noninvasive motor imagery-based brain computer interface* [Link](#)

- *EEG signal preprocessing: Artifact removal using ICA and EMD*
- *Feature selection using r square topography and sample entropy*
- *Classification using LDA and SVM*

Bangladesh University of Engineering and Technology

Mar. 2013 – Jul. 2014

Undergraduate Researcher

Thesis : *Analysis of Effects of Surface Roughness on Muffler Performance and Effect of Absorptive Materials on Performance of an Acoustic Board*

- Comparison between the performance of mufflers for different grade of surface roughness
- Analysis of effect of absorptive material on performance of an acoustic board and compare the performance for different absorptive materials

ACADEMIC PROJECT EXPERIENCE

- **A finite element approach to simulate surface response of a cylinder due to a subsurface acoustic source** : Analytical and numerical integral solutions that account for compression, shear and surface wave response to the buried sources are formulated and compared with numerical finite element simulations using ANSYS and ABAQUS.
- **Energy Audit Recommendation of Energy Conservation Opportunities for a Campus Building**: In order to assess how much energy is consumed by a typical Campus Office building and to propose potential energy conservation measures that can be implemented to save energy to make the building more energy efficient, reduce utility bill and carbon di oxide emission.
- **Energy Audit HVAC design of a small office space**: Design a simple office space in Revit and calculate the total heating and cooling load. Generate duct pressure loss report for every section of the duct. Optimize duct sizing to minimize duct and fitting pressure loss. Recommend fan type and power of the AHU
- **Design and implementation of a weight carrying stair climbing robot for industrial application using AutoCAD** : The control circuit of eight-wheeled stair boat for the motors was implemented using DPDT switches and the mechanical construction was designed in AutoCAD to improve the performance of the stairbot.
- **Automatic pickup and packaging machine with 3D motion** : Provide a pick-up device in which it is possible to adapt the relative position between the pick-up members easily to the spacing between the rows of objects which are to be held, as well as to vary the relative position selectively during the transport of the object so as to adapt it to the dimensions of a conveyor line.
- **Predictive modeling of droplet ejection from mosquito wings using ensemble based machine learning** Implement Data analysis technique and machine learning in beam droplet dynamics. Present a new data driven approach to predict the drop ejection modes and inertia force required to remove a drop from damped cantilever. Application of Random Forest, support vector machine and Boosting algorithm in Python for predicting inertia of cantilever structure.
- **Early screening of DDH using ensemble based machine learning** Early screening of DDH using SVM classification : proposed method that tested different simplified models of the hip joint, investigate early detection of DDH using machine learning technique through support vector machine (SVM) technique using Python and MATLAB.
- **Experimental investigation on photostrictive materials for MEMS application** : Designed and organized the full experimental setup for measuring transverse deflection of the PLZT material methylammonium lead iodide perovskite

- **Investigations of the tribological effects of engine oil dilution by vegetable and animal fat feedstock biodiesel on selected surfaces.** : Designed and constructed the full experimental setup and programmed the data acquisition using LabVIEW and programmable logic controllers (PLCs).

TEACHING EXPERIENCE

Assistant Professor

Aug. 2021 – present

North Central College:

MECH 440: Robotics I: Instructor of newly introduced senior level course. Preparation of lecture materials, in person lecture, lab design and lab experiment instruction, and project design.

MECH 420: Manufacturing Process: Instructor of senior level Manufacturing Process course. Manufacturing lab setup and experiment design for undergraduate level cutting edge lab.

Graduate Teaching Assistant

Aug. 2017 – July 2021

University of Central Florida :

Working as a teaching associates for courses mainly focused on fundamental mechanical engineering. Teaching **EML 4142:Heat transfer**, **EML 3701: Fluid Mechanics** and **EML 3343: Thermodynamics** which are consisting of around 300 students each semester.

Graduate Teaching Assistant

Aug. 2015 – May 2017

Georgia Southern University:

- **ENGR 1133: Engineering Graphics:** prepare drawing for in class demonstration and present example of new tools usage in AutoCAD and Solidworks, Instruct students during in class practice session, hold office hours and grading homework and lab quizzes.
- **ENGR 2231: Dynamics of Rigid Bodies:** Occasional in class teaching and hold office hours, grading homework and finals.
- **MENG 3531: Introduction to Mechatronics:** Prepare lab manual and organize experimental setup, design lab experiments in LabVIEW, Arduino and Matlab interfaces, grading lab reports and lab quizzes, mentor students in their final projects.
- **MENG 5135: Vibration and Preventative Maintenance:** Occasional in class teaching and hold office hours, design lab experiments in Matlab and Simulink, grading homework and finals
- **MENG 5536: Mechanical Control:** Prepare lab manual and organise experimental setup, design lab experiments in Matlab and Simulink, grading homework and finals.
- **TMAE 7136: Mechatronics:** Prepare lab manual and organise experimental setup, design lab experiments in LabVIEW, Arduino and Matlab interfaces, grading lab reports and lab quizzes.

PRESENTATIONS

INVITED UNIVERSITY COURSES

- 18 Mar, 2021. **Georgia Institute of Technology.** Department of Mechanical Engineering. “The coupled mechanics of drop release from elastic substrates”, ME 8863. Fluid Mechanics.

CONFERENCE PRESENTATIONS

- 11 April, 2019. **IEEE SouthEastCon, 2019**, “Early Screening of DDH using SVM Classification. In 2019 SoutheastCon”

- 19 Nov, 2018. **American Physical Society's Division of Fluid Dynamics (DFD) 2018**, "To eject a droplet from a dampened, damped beam"
- 30 Mar, 2017. **IEEE SouthEastCon, 2017**, "Empirical mode decomposition of EEG signals for brain computer interface"

POSTER PRESENTATION

- 31 Mar, 2019. **University of Central Florida**.student scholar symposium. "To eject a droplet from a dampened, damped beam."
- 30 Mar, 2021. **University of Central Florida**.student scholar symposium. "Sessile liquid drops damp vibrating structures."

MENTORING

Student	Years	Project	Major	Awards/Notes
Spencer Dyen	2020	Cantilever drying/Jet Stability	ME	
Kevin Shitaho	2019	Predictive modeling of drop ejection	ME	
Michael Cassette	2019	Cantilever damping	ME	
Dana Mikkelsen	2019	Jet stability	ME	SURE best poster winner
Sam Kleiner	2018	Cantilever drying	ME	SURE best poster winner
Craig Stuart	2018	Cantilever drying	ME	

TECHNICAL SKILLS

- **CAD tools** : Solidworks, AutoCAD, CATIA, Inventor, Revit (MEP)
- **CAE tools** : ANSYS, ABAQUS
- **Programming** : Python, SQL, MATLAB, MathCAD, LABVIEW, R, C/C++, plclogix 5000
- **Machine Learning** : Deep learning (TensorFlow, Keras), Random Forest, Boosting, Time-Series
- **Data Visualization** : Microsoft, Minitab, Power BI, Tableau, Microsoft Azure, Excel

FUNDED PROJECTS

- **NSF CAREER AWARD #1941341, PI: Andrew Dickerson** "Tuning liquid jet and splash dynamics by deformable and heterogeneous boundaries."
 - **Contribution to the Project:** work primarily on jetting and machine learning aspects of the activity in this reporting period: experimental design and execution, data analysis, manuscript cultivation, manuscript editing, model generation, coding, and undergraduate mentoring.
 - Grant started on January 2021 - will expire December 2024

AWARDS AND ACTIVITIES

- Showcase of Research Excellence, University of Central Florida, 2019
- ORC fellowship, University of Central Florida, 2017
- Summa Cum Laude Award, Georgia Southern University, 2017
- Reviewer, IEEE SouthEastCon, 2017, 2019

- Student Member, American Physical Society (APS)

REFERENCES

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