

# AMRO A. ZAHRAWI, CEE

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## PROFESSIONAL SUMMARY

Ph.D. candidate in Structural Civil Engineering specializing in wind engineering and computational wind engineering (CWE) for utility-scale solar infrastructure. Develops CFD + wind-tunnel workflows to predict and mitigate torsional galloping in single-axis solar trackers. Demonstrated mitigation performance in CFD: aerodynamic edge modifications delayed galloping onset up to 81.8% at 35 m/s (34.6% at 40 m/s) and, when combined with structural damping, reduced oscillation amplitudes by >60%. Experienced with OpenFOAM v24.06 (ALE dynamic mesh, WALE LES), Linux/HPC, and experimental system identification (FFT/PSD).

## PROFESSIONAL EXPERIENCE

**Louisiana State University (LSU)** Baton Rouge, LA, USA

Graduate Researcher - Computational & Experimental Wind Engineering || 2024 - Present

- Built and validated an OpenFOAM v24.06 CFD framework (incompressible ALE + WALE LES) to predict torsional galloping onset for a 2D tracker section based on Port Allen, LA geometry; produced stability diagrams versus tilt angle.
- Quantified mitigation via aerodynamic edge modifications, delaying instability by up to 81.8% at 35 m/s and 34.6% at 40 m/s; integrated multiple edge concepts within a consistent CFD evaluation workflow.
- Executed parametric studies of torsional stiffness and structural damping, showing small damping ratios ( $\zeta = 0.1-0.25$ ) suppress galloping growth and, combined with edge modifications, reduce oscillation amplitude by >60%.
- Designed and executed large-scale open-jet wind tunnel tests on a scaled tracker row; synchronized accelerometer measurements with video-based tracking to quantify response and validate CFD trends.
- Automated time-series post-processing (FFT/PSD via pwelch, RMS) to extract natural frequency, response amplitudes, and stability thresholds across wind speeds and tilts.
- Ran parallel simulations on Linux/HPC (MPI), managing meshing, grid sensitivity, and convergence checks to deliver design-oriented recommendations for wind-resilient tracker systems.

**The University of Texas at Tyler** Tyler, TX, USA

Teaching/Research Assistant || 2022 - 2023

- Assisted instruction in undergraduate mathematics and mechanical engineering courses; led problem-solving sessions and graded coursework.
- Supported students in SOLIDWORKS and engineering tool workflows to complete design and analysis tasks efficiently.
- Extended M.S. thesis work toward a journal publication on optimization and planning for fixed PV systems.

## **Al-Yarmouk for Energy Solutions** Jordan

Design & Mechanical Engineer Intern - PV Systems || 2017 - 2018

- Designed residential and commercial PV systems by collecting site data, estimating loads/energy demand, and sizing PV arrays and inverters.
- Produced PV layout drawings and installation visuals using AutoCAD and SketchUp 3D to communicate designs with clients and installers.
- Contributed to six PV installations, including two commercial projects, supporting both design and field implementation.

## **EDUCATION**

### **Louisiana State University (LSU), Baton Rouge, LA**

Doctor of Philosophy, Civil Engineering (Structural) || 2024 - Present

Selected coursework: Experimental Statistics Analysis, Finite Element Analysis, Advanced Mechanics of Materials, Structural Health Monitoring, Indeterminate Structures, Machine Learning.

### **The University of Texas at Tyler, Tyler, TX**

Master of Science, Mechanical Engineering || 2023

Thesis: Design and Implementation of an Optimization Platform for Common Fixed Photovoltaic Systems.

### **Jordan University of Science & Technology, Irbid, Jordan**

Bachelor of Science, Mechanical Engineering || 2019

## **TECHNICAL SKILLS**

- CFD: OpenFOAM (RANS/LES, dynamic mesh, ABL inlets), meshing (snappyHexMesh, cfMesh, ICEM), load/pressure post-processing.
- HPC & OS: Linux, MPI parallel runs, batch workflows for large 3D meshes and fast 2D studies.
- Programming: MATLAB (FFT/PSD, time-series automation), Python (data processing/automation), C++ (OpenFOAM environment).
- CAD/Design: SOLIDWORKS, AutoCAD, SketchUp 3D.
- Experimental: accelerometers, DAQ workflows, calibration, video-based motion tracking, Cobra probes.

## **PUBLICATIONS**

- Design and Implementation of an Optimization Platform for Common Fixed Photovoltaic Systems (M.S. thesis, published).
- A Review of Agrivoltaic Systems: Advancing Renewable Energy Integration and Enhancing Sustainability (Sustainability/MDPI, published).

- Aeroelastic Characterization of Solar Trackers Torsional Galloping Through CFD Modeling in OpenFOAM (submitted).
- Wind-Induced Torsional Galloping of Solar Panels: Large-Scale Experimental Tests and Mitigation Strategies (draft).
- Realistic ABL Turbulence Inflow Using a Vortex Method for CFD Prediction of Solar Tracker Galloping and Control Strategies (draft).
- Developing an AI-Based Predictive Model for Solar Tracker Stability with a Comparison with a SimScale Model (draft).

## **AWARDS & COMPETITIONS**

- 3rd Place - ETRC Research Contest (2023): Presented research on optimal design and planning for fixed photovoltaic systems.
- Jump Into STEM Competition (2022): Proposed a concept to reduce residential HVAC energy consumption; modeled reductions up to 68% (Las Vegas) and 49% (Albuquerque).