

ABDEL-RAHMAN FARRAJ

☎ +1 (217) 377 9459 ✉ afarraj2@illinois.edu 📄 afarraj

EDUCATION

- PhD in Mechanical Engineering** *Advisor: Prof. Predrag Hrnjak* **Aug. 2016 – June 2022**
University of Illinois at Urbana Champaign - CGPA - 3.85 *Urbana, IL*
- MSc in Mechanical Engineering** *Advisor: Prof. Dimitrios Kyritsis* **Sept. 2014 – June 2016**
Khalifa University - CGPA - 3.98 *Abu Dhabi, UAE*
- BSc in Mechanical Engineering** **Sept. 2010 – June 2014**
Khalifa University - CGPA - 3.84 *Abu Dhabi, UAE*

TECHNICAL SKILLS

Eng. Software: Solid Modeling, ANSYS: Fluent & Icepak, COMSOL, SolidWorks, EES, RefProp, LabView
Programming: Python, MatLAB, C/C++
Experimental: Calibration of measurement instruments (thermocouples, pressure transducers, coriolis, etc.), data acquisition systems, leak testing, Particle image velocimetry and Planar laser-induced fluorescence on flows.

EXPERIENCE

Research Assistant **Aug. 2016 – Present**
Air-Conditioning and Refrigeration Center, UIUC *Urbana, IL*

Experimental and simulation of two-phase flow and heat transfer within complex geometries.

- Develop an experimental tool to measure temperature and heat transfer distribution in plate heat exchangers.
- Visualize the flow regime in the corrugated channel using high speed camera.
- Simulate the single phase flow using ANSYS Fluent and validate results with the experiments.
- Provide a viable solution for optimizing performance for plate heat exchangers.
- Built experimental facility with integrated DAQ systems using LabView.

Teaching Assistant **Sept. 2017 – May 2021**
University of Illinois at Urbana-Champaign (UIUC) *Urbana, IL*

TA for Thermodynamics, Fluid dynamics, & Energy Conversion Systems (ME400)

- Instruct the theoretical background of the lab experiments.
- Train students in engineering programs: ANSYS, MATLAB, and LabView.
- Provide tutorials in solving engineering problems and supervising course projects.
- Prepare student to perform professional reports for lab submissions.

Research Assistant **Sept. 2014 – June 2016**
Khalifa University *Abu Dhabi, UAE*

Electric control of combustion for enhancing heat transfer.

- Experimental investigation of the counter-flow flame manipulation by high intense electric field.
- Simulate the laminar flame under the effect of external force Using COMSOL Multiphysics.
- Model for spark-ignition engine under electrostatic effect using Matlab.

Visiting Scholar **May 2015 – Aug. 2015**
Advanced Propulsion and Energy Laboratory, UIUC *Urbana, IL*

Investigating swirl-stabilized flame dynamics using laser diagnostic techniques.

- Experimentally visualize the flow field using the Particle Image Velocimetry technique.
- Involved in investigation properties of the flame using OH-Planar Laser Induced Fluorescence.

Internship Experience

ATKINS Global

now part of SNC-Lavalin

June 2013 – Aug. 2013

Abu Dhabi, UAE

- Simulated mass and heat transfer in primary/secondary reactor coolant systems for APR1400.
- Strategic Assessment for Nuclear Power Stations in UAE: nuclear engineering consultancy.

Institute of Systems and Robotics

University of Coimbra

May 2012 – Aug 2012

Portugal

- Measured and analyzed thermal performance of borehole heat exchangers using proper tools.
- Documented test procedures and reported results with conclusions to the team.

Other Selected Projects

Senior Undergraduate Project

Khalifa University

Sept. 2013 – May 2014

Abu Dhabi, UAE

Electrostatically Driven Fuel Injectors:

- Designed and built an injector drives the fuel by the action of electrostatic.
- Conducted CFD analysis on hydraulic performance of ionized fluid inside the injector.

Independent Study Project

Khalifa University

Sept. 2012 – May 2013

Abu Dhabi, UAE

Solar Thermal Desalination for GCC countries climate

- Developed automated testing for a solar thermal desalination unit using LabVIEW NXG.
- Created a model to control flow for optimizing the heat transfer in solar fields.

Student Design Competition

ASME IMECE conference

April 2012

Houston, TX

Relay race using four cars depend on different source of energy:

- Led the structural design group: load calculations, structural layout, CAD modeling, fabrication and testing.

List of Publications

- **Farraj, A. & Hrnjak, P.**, Combination of Local Heat Transfer and Flow Visualization of R245fa Flow Boiling in plate Heat Exchanger, *International Refrigeration and Air Conditioning Conference, 2021*.
- **Farraj, A. & Hrnjak, P.**, Locally Measured Heat Transfer Coefficient with Simultaneous Visualization of Evaporating Fluid Flow in the Plate Heat Exchanger, *ASHRAE Annual conferences, 2021*.
- **Farraj, A. & Hrnjak, P.**, New Method to Simultaneously Measure Local Heat Transfer Coefficient and Visualize Flow Regimes during Evaporation in the Plate Heat Exchanger, *ASHRAE Winter conferences, 2020*.
- **Farraj, A. et al.**, Laminar non-premixed counterflow flames manipulation through the application of external direct current fields, *ASCE, Journal of Energy Engineering, 2017*.
- **Farraj, A. et al.**, Phenomenology of electrostatically manipulated, laminar, counterflow, non-premixed methane flame, *ASCE, Journal of Energy Engineering, 2016*.
- **Abutayeh, M., Humood, M., Alshegri, A., Al Hammadi, A., & Farraj, A.**, Experimental Study of a Single-Stage Solar Thermal Desalination Unit, *ASME International Mechanical Engineering Congress and Exposition, 2013*.

Awards

- The Future of Fuel — Best presentation Award, KAUST, KSA
- Young Future Energy Leaders (YFEL) Award, Masdar institute, UAE
- 3rd place, ASME Student Design Competition, Houston, Texas