

## Md Safayatullah

Google Scholar: <https://scholar.google.com/citations?user=8ZFpgKsAAAAJ&hl=en>

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### CONTACT INFORMATION

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### RESEARCH INTEREST

Power Electronics  
Multi-Port Converter Design  
Dual Active Bridge, Dual Active Bridge Resonant DC-DC Converter  
Power Converter Design and Control for EV and PV Applications  
Grid-Tied Energy Storage Control  
Model Predictive Control  
GaN Power Device Characterization and Reliability Testing

### EDUCATION

Ph.D. in Electrical Engineering (August 2018-Present)  
University of Central Florida, FL, USA

- CGPA **3.973/4.00**
- Ph.D. Candidate

B.Sc. in Electrical and Electronic Engineering (May 2012-February 2017)  
Bangladesh University of Engineering and Technology (BUET),  
Dhaka, Bangladesh

- CGPA **3.73/4.00**

### JOB

- ✓ Graduate Research Assistant (August 2018 - Present) in Electrical and Computer Engineering Department, University of Central Florida, USA
- ✓ Graduate Teaching Assistant (August 2019 - Present) in Electrical and Computer Engineering Department, University of Central Florida, USA
- ✓ Lecturer (April 2017- July 2018) in Department of Electrical and Electronic Engineering, Daffodil International University, Dhaka, Bangladesh.

### SKILLS

- **Programming:** C, C++, Matlab, Verilog HDL, 8086 Assembly
- **Circuit Simulator:** PSpice, LTspice, Simulink, PSIM, PLECS, Proteus
- **Embedded System:** Code Composer Studio, STM32CubeIDE, Texas Instruments TMS320F28335 (C2000 Microcontrollers), STMicroelectronics STM32F407G-DISC1 (Arm Microcontroller),

Texas Instruments MSP430FR6989 Launchpad,  
Texas Instruments BOOSTXL-EDUMKII

- **VLSI:** Cadence Tools
- **Graphics Software:** Origin, MS Visio, AutoCAD
- **Research Software:** Matlab/Simulink, PSIM, PLECS, Altium PCB Design, Code Composer Studio, STM32CubeIDE, LabVIEW, TCAD Sentaurus, COMSOL Multiphysics.
- **Experimental:** PCB design and test, Soldering, Power converter hardware design and test, LabVIEW based test setup, Power device characterization and reliability test, Lab equipment- solar array simulator, logic analyzer, power analyzer, oscilloscope, power supply, probe station, Keithley 4200A-SCS parameter analyzer etc.

NSF  
PROJECTS

**1. Advanced and Highly Integrated Power Conversion Systems for Grid Stability and Resiliency (NSF-ECCS-2103442)**

Design, development, and hardware validation of three-port microinverter (dual active bridge, flying capacitor multilevel topology) integrating PV, grid, and battery. Development of model predictive control for multiport operation including maximum power point tracking, state of charge control and voltage regulation.

**2. Highly Integrated Grid-Tied Multi-Port Power Module for PV and Storage System (NSF-ECCS-1810733)**

Design, development, and hardware validation of quad-input isolated DC-DC converter (LLC resonant topology) for four PV panels.

**3. Development and Optimization of GaN-based Integrated Power Converter Platform (NSF MIST CENTER-2019-506)**

Design of test platform to evaluate GaN device performance with circuit interaction. Switching loss characterization of GaN device in power converter and finding its relationship to gate charge under different substrate biases.

PROJECT:  
EXELON &  
A.F.MENSAH

**Controller Design for Grid Connected Battery System in Florida Solar Energy Center**

Development of a controller for 1.86MWh battery and 540kVA inverter to maintain charging from grid, discharging to the local load and discharging to the grid if necessary.

GRADUATE  
COURSE  
PROJECTS

1. Power Electronics I: Effects of the Gate Charge on the Power Converter Efficiency.
2. Grid Connected PV System: Smoothing of PV Output Power Using a Battery Energy Storage System with Model Predictive Control.

3. Adaptive Control: Model Reference Adaptive Control of Dual Active Bridge DC-DC Converter.
4. Power Electronics II: Multi-frequency Averaging Method of DC-DC Converter.
5. Digital Control System: Design and Experimental Study of a High Voltage Gain Bidirectional DC-DC Converter for Electric Vehicle Application.

UNDERGRADUATE  
PROJECTS

1. Sensitivity analysis and modelling of X-ray image detector for non-uniform electric field and polarization effect.
2. Design of a 4-bit arithmetic logic unit with shifter using Cadence Virtuoso Design Environment.
3. Elevator system design.
4. Matrix calculator design for the dimension with graphics user interface (GUI) in Matlab.
5. Design and layout of a 4 bit synchronous decade counter with load, asynchronous reset and ripple carry output using Cadence Virtuoso Design Environment.

SELECTED  
GRADUATE  
COURSE

Power Electronics I, Power Electronics II, Systems Control, Digital Control Systems, Linear Systems Theory, Nonlinear Control Systems, Adaptive Control, Grid Connected PV Systems

GRADUATE  
TEACHING  
ASSISTANT

Embedded System, Embedded System Lab, Engineering Analysis and Computation, Introduction to Smart Grid

REVIEWER

Journal: Energy Systems  
Conference: IEEE Energy Conversion Congress and Exposition (ECCE)  
Annual Conference of IEEE Industrial Electronics Society

PUBLICATIONS

1. R. Rezaii, M. Nilian, **M. Safayatullah**, S. Ghosh and I. Batarseh, "A Bidirectional DC-DC Converter with High Conversion Ratios for the Electrical Vehicle Application," IECON 2021 – 47th Annual Conference of the IEEE Industrial Electronics Society, 2021, pp. 1-6.
2. **M. Safayatullah**, S. Ghosh, S. Gullu and I. Batarseh, "Model Predictive Control for Single-Stage Grid-Tied Three-Port DC-DC-AC Converter Based on Dual Active Bridge and Interleaved Boost Topology," IECON 2021 – 47th Annual Conference of the IEEE Industrial Electronics Society, 2021, pp. 1-6.

3. S. Ghosh, **M. Safayatullah**, M. T. Elrais and I. Batarseh, "A Novel Four-port LLC Converter for Dual PV and Battery Integration," IECON 2021 – 47th Annual Conference of the IEEE Industrial Electronics Society, 2021, pp. 1-6.
4. **M. Safayatullah**, R. Rezaii, M. T. Elrais and I. Batarseh, "Review of Control Methods in Grid-Connected PV and Energy Storage System," 2021 IEEE Energy Conversion Congress and Exposition (ECCE), 2021, pp. 951-958.
5. **M. Safayatullah**, Q. Zhou and I. Batarseh, "Smoothing of PV Output Power in Grid-Tied Energy Storage System with Model Predictive Control and Battery Lifetime Consideration," 2021 IEEE Energy Conversion Congress and Exposition (ECCE), 2021, pp. 504-511.
6. **M. Safayatullah** and I. Batarseh, "Small Signal Model of Dual Active Bridge Converter for Multi-Phase Shift Modulation," 2020 IEEE Energy Conversion Congress and Exposition (ECCE), 2020, pp. 5960-5965.
7. **M. Safayatullah**, W. Yang, J. -S. Yuan and B. Krishnan, "Switching Loss Characterization of GaN-based Buck Converter under Different Substrate Biases," 2019 IEEE 7th Workshop on Wide Bandgap Power Devices and Applications (WiPDA), 2019, pp. 374-377.
8. A. Dastider, B. Basak, **M. Safayatullah**, C. Shahnaz and SA Fattah, "Cost Efficient Autonomous Navigation System (E-Cane) for Visually Impaired Human Beings," 2017 IEEE region 10 humanitarian technology conference (R10-HTC), 2017, pp. 650-653.
9. R. Rezaii, M. Nilian, **M. Safayatullah**, and I. Batarseh, "Design and Experimental Study of a High Voltage Gain Bidirectional DC-DC Converter for Electric Vehicle Application," 2021 IEEE Applied Power Electronics Conference and Exposition (APEC), 2021 (*Accepted*).
10. **M. Safayatullah**, M. T. Elrais, S. Ghosh, R. Rezaii, and I. Batarseh, "A Comprehensive Review of Power Converter Topologies and Control Methods for Electric Vehicle Fast Charging Applications," IEEE Access (*Revised*).
11. R. Rezaii, M. Nilian, **M. Safayatullah**, and I. Batarseh, "A Hybrid Structure of a Bidirectional, Wide Voltage Gain DC-DC Converter for Electric Vehicle Hybrid Energy Sources," IEEE Transactions on Circuits and Systems I (Submitted).
12. R. Rezaii, S. Ghosh, **M. Safayatullah**, S. M. Tayebi, and I. Batarseh, "Quad-Input Single Resonant Tank LLC Converter for PV Applications," IEEE Transactions on Power Electronics (Submitted).
13. M. T. Elrais, **M. Safayatullah**, and I. Batarseh, "Generalized GaN-based Modular Multifunction Multiport Multilevel Flying Capacitor Converter," IEEE Transactions on Power Electronics (Submitted).