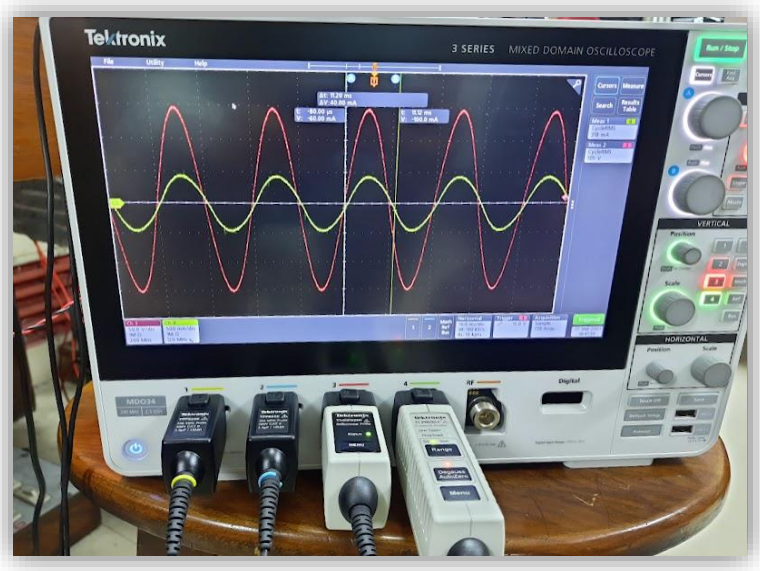
Applied Power Electronics Research Group

Welcome to

Power Electronics and Renewable Energy Lab (PEARE)



Area of Research:

- Designing and Developing Analog Circuits and Power Converters along with their Controllers
- Renewable Energy Systems
- Electric Vehicles (EVs)
- Permanent Magnet Synchronous Motors (PMSM), Brushless DC Motors (BLDC), and Induction Motors (IM) Drives

Group Members:

1. Dr. Sumana Chowdhuri, *Professor*, Department of Applied Physics, University of Calcutta. [https://scholar.google.co.in/citations?user=pufHg6kAAAAJ&hl=en]

2. Sri. Dipak Kumar Mandal, *Assistant Professor*, Department of Applied Physics, University of Calcutta.[https://scholar.google.com/citations?user=ReUsghoAAAAJ&hl=en]

Research Scholars:

1.	Sri. Arkendu Mitra	*Assistant Professor,* Department of Electrical Engineering, Narula Institute of Technology.[https://scholar.google.co.in/citations?user=fq16yKUAAAAJ&hl=en]
2.	Sri. Abhishek Majumder	*Assistant Professor,* Department of Electrical Engineering, Future Institute of Technology. [https://scholar.google.co.in/citations?user=VmNR4z8AAAAJ&hl=en]
3.	Sri. Arijit Basak	*Junior Research Fellow,* Department of Science & Technology, Government of India.[https://scholar.google.co.in/citations?user=jwmVlXAAAAAJ&hl=en]
4.	Sri. Souvik Roy	*IT Analyst,* Tata Consultancy Services.[https://scholar.google.co.in/citations?user=wU8kJccAAAAJ&hl=en]
5.	Sri. Sarbojit Mukherjee	*Assistant Professor,* Department of Electrical Engineering, RCC Institute of Information Technology.[https://scholar.google.co.in/citations?user=2n63vNwAAAAJ&hl=en]

Collaborators and Expert Members:

1. Dr. Sujit K. Biswas, *Professor & Dean Academic*, Department of Electrical Engineering, St. Thomas' College of Engineering and Technology.
2. Dr. Biswajit Majumdar, *Professor*, Department of Physics, Acharya Jagadish Chandra Bose College, Kolkata.
3. Dr. Shib Sankar Saha, *Professor*, Department of Electrical Engineering, Kalyani Government Engineering College, Kalyani, West Bengal.
4. Sri. Dipten Maiti, *Assistant Professor*, Department of Electrical Engineering, Jadavpur University.

PhD Awarded:

1. Dr. Soumyajit Datta, *Manager- Embedded Controller Development,* Megatherm, Kolkata.[https://scholar.google.com/citations?user=b1sBivYAAAAJ&hl=en]

2. Dr. Arabindo Chandra, *Manager- R&D Power Electronics,* Galaxi Engineering Technology Services Private Limited, Mysore.[https://scholar.google.com/citations?user=wB4X5C0wLsgC&hl=en]
3. Dr. Tista Banerjee, UEM Kolkata, [https://scholar.google.com/citations?user=owr9dzkAAAAJ&hl=en]
4. Dr. Jinia Dutta, *Principal*, Abacus Institute of Engineering & Management, West Bengal.

Sponsored Project:

Sl. No.	Project Title	Sponsoring Agency	Sanction Amount	Details of Sanction
01	Development of SMART Grid-interactive SPV Systems	DST, Ministry of Science & Technology, Government of India	INR: 94,30,000.00	Memo No. DST/TM/SERI/D31(G) dated: 10/08/2016.
02	Development of Compact and Efficient Grid Tied Solar Powered Inverter (SPI) Systems	DST, Ministry of Science & Technology, Government of India	INR: 1,28,81,808.00	Memo No. DST/TMD/CERI/RES/2020/22(G) dated: 03/09/2021.
03	Development of Remote Energy Metering System towards the Estimation of Zonal Energy Consumption with AMR	CPRI, Ministry of Power, Government of India.	INR 27,00,000.00	Sanction year 2011-2013

Consortium Partners for Projects enlisted at Sl. No. 1 and 2:

- University of Calcutta
- Kalyani Government Engineering College
- Jadavpur University
- Indian Institute of Engineering Science and Technology, Shibpur (IIEST)
- St. Thomas College of Engineering and Technology
- Statcon Energiaa Pvt. Ltd., Noida, U.P *(Technical Collaborator)*.

Some Notable Research Publication:

Journals/Book Chapters

1. Mitra, S. Das, S. Bhowmik, S. Chowdhuri, “Performance Improvement of Three-Phase AFE Rectifier During Switching of Loads with Fractional Feedback Current Control”, accepted for publication in Sādhanā, the Journal of the Indian Academy of Sciences, Springer indexed in SCI, Impact Factor: 1.6.

2. S. Das, K Sankar Chakraborty, A Ghosh, S. Chowdhuri, “Harmonic Mitigation in Distribution System Using Active Power Filter”, published in ECLECTIC, September 2023, CESC, pp 49-59.

3. Arabindo Chandra, Soumyajit Datta, Aritro Dey, and Sumana Chowdhuri. "Performance Evaluation of CKF Based Sensorless Vector Controlled PM Synchronous Motor Drive." *Journal of Electrical Engineering & Technology, Springer, Volume 16, Issue 2, Springer Singapore,March, 2021 , pp 889-897, SCIE*

4. Arabindo Chandra, Soumyajit Datta, and Sumana Chowdhuri. “Design and Implementation of Hybrid Self-Control Scheme for PM Synchronous Motor Drive” *Journal of The Institution of Engineers (India): Series B, Springer Nature, 14-22, 2021.*
5. Arabindo Chandra, Soumyajit Datta, Aritro Dey, and Sumana Chowdhuri. "Sensor-less Vector Control of PM Synchronous Motor by Hybrid Estimation Technique Considering Effect of Non-Ideal Physical Attributes." *Electrical Engineering, Springer Nature, 2022.*

6. “High performance sensor-less V/f control of surface PMSM in voltage vector plane with ZVV injection and SMO-based position estimation method”, Soumyajit Datta, Arabindo Chandra and Sumana Chowdhuri, Springer, April 2022, DOI:10.1007/s00202-021-01325-2, Vol 104, Issue 2, PP 657-666.

7. “High-Performance Control of Surface PM Synchronous Motor by Power Factor Angle-Based Control of Stator Voltage Vector”, Soumyajit Datta, Arabindo Chandra, Sumana Chowdhuri, Journal of Control, Automation and Electrical Systems, Springer US, 2021 Print ISSN 2195- 3880, Vol 32, Issue 3, June, 2021, pp 703-710.

8. “Active Cell Balancing of Lithium-ion Battery Pack Using Dual DC-DC Converter and Auxiliary Lead-acid Battery”, A Samanta, S Chowdhuri, Journal of Energy Storage, volume 33, Elsevier,2021, pp102-109

9. “Design and Implementation of Hybrid Self-Control Scheme for PM Synchronous Motor Drive”, Arabindo Chandra, Soumyajit Datta, Sumana Chowdhuri, Journal of The Institution of Engineers (India): Series B, (), 1-7, DOI 10.1007/s40031-021-00580-y, pp-671-677

10. “Machine Learning-Based Data-Driven Fault Detection/Diagnosis of Lithium-Ion Battery: A Critical Review”, Akash Samanta, Sumana Chowdhuri and Sheldon S. Williamson, Electronics 2021, MDPI, 10(11), 1309; doi:10.3390/electronics10111309

11. “Solar PV Battery Charger Using MPPT-Based Controller”, Shreya Das, Avishek Munsi, Piyali Pal, Dipak Kumar Mandal, Sumana Chowdhuri, book: Advances in Control, Signal Processing and Energy Systems, Springer,pp 169-182.

12. “Analysis of single phase PWM rectifier for different applications”, Arkendu Mitra, Sumana Chowdhuri, Journal of The Institution of Engineers (India): Series B, Volume 98, Issue 2, springer, 2017, pp 161-169

13. “Channel Efficiency with Security Enhancement for Remote Condition Monitoring of Multi Machine System Using Hybrid Huffman Coding”, Jinia Datta, Sumana Chowdhuri, Jitendra nath Bera, Vol 47, Issue 4, Springer, PP 469-480

14. “Remote monitoring of different electrical parameters of multi-machine system using PC”, Datta (Das), Jinia, S Chowdhuri, J Bera, G Sarkar, Measurement 45 (1), 118-125.

15. “A simplified state-of-the-art Sample Shifting technique for microcontroller based single phase power measurement” R Saha, J Bera, G Sarkar, S Chowdhuri, A Deb, Measurement 58, 459- 467, pp 459-467, Measurement (Elsevier), Volume 58, Issue 1, 2014.

16. “A Novel Standalone and GRID-tied Single Phase SPWM Inverter”, D Bhattacharya, D Hazra, PP Das, S Chowdhuri, International Journal of Applied Engineering Research 9 (3), 267-274.

Conferences:

1. A. Basak, S. Roy, A. Majumder, D. K. Mandal and S. Chowdhuri, "Design of a Digital PR Controller for Harmonic Compensation of Single-Phase Grid-Tied Inverter with System Parameter Uncertainty," 2022 IEEE 1st Industrial Electronics Society Annual On-Line Conference (ONCON), kharagpur, India, 2022, pp. 1-6. doi:.1109/ONCON56984.2022.10126860.

2. A. Majumder, S. Roy, A. Basak and S. Chowdhuri, "Design of State Observer for a Grid-Connected Inverter with LCL Filter using a Hybrid-SOGI Resonant Controller," 2022 IEEE International Conference on Power Electronics, Drives and Energy Systems (PEDES), Jaipur, India, 2022, pp. 1-6, doi: 10.1109/PEDES56012.2022.10080593.

3. “Design of Duty-Ratio and Phase-Shift Control Circuits for MPPT of SPV Source using ZVZCS PSFB Converters”, Sarbojit Mukherjee, Shib Sankar Saha, Sumana Chowdhuri, 2021 Devices for Integrated Circuit (DevIC), DOI: 10.1109/DevIC50843.2021.9455893

4. “A Soft-Switching DC-DC Boost Converter for Extracting Maximum Power from SPV Array”, Dipak Kumar Mandal; Sumana Chowdhuri; Sujit K Biswas; Shib Sankar Saha, 2020 IEEE 5th International Conference on Computing Communication and Automation (ICCCA), DOI: 10.1109/ICCCA49541.2020.9250818

5. “ZigBee Based Real Time Energy Monitoring for Preventive Maintenance of Solar Photovoltaic System”, Dipak Kumar Mandal, Rakesh Das, Sumana Chowdhuri, 6th International Conference on Nanoelectronics, Circuits & Communication Systems 19th -20th December, 2020

6. “Improved Droop Control Strategy for Single Phase Micro-Grid Inverters in Stand-Alone Mode”, Santanu Bera; Dipak Kumar Mandal; Sumana Chowdhuri, 2019 International Conference on Computing, Power and Communication Technologies (GUCON).

7. “Efficient Power Extraction from SPV system in Partially Shaded Condition: A Comparative Study between Classical and Fuzzy logic Control”, Dipak Kumar Mandal, Sumana Chowdhuri, Shib Sankar Saha, Biswajit Majumdar, Dipten Maiti, Sujit Kumar Biswas, Fifth IEEE International conference on Emerging Application of IT(EAIT),2018, DOI: 10.1109/EAIT.2018.8470408.

8. “Solar PV Battery Charger Using MPPT Based Controller,” Shreya Das, Avishek Munsi, Piyali Pal, Dipak Kumar Mandal, Sumana Chowdhuri, National Conference on Control, Signal Processing and Energy systems (CSPES2018), November 16th -18th, 2018.

9. “Performance Analysis of a Micro Grid VSI under Asymmetric Conditions,” Abhishek Majumder, Souvik Roy and Sumana Chowdhuri, published in IEEE Conference proceedings of 2018 Power Electronics, Drives and Energy System Conferences (PEDES2018), 2018.

10. A. Majumder, S. Roy and S. Chowdhuri, "Grid-tied VSI protection against grid side faults based on voltage," 2017 IEEE Calcutta Conference (CALCON), Kolkata, India, 2017, pp. 274-278, doi: 10.1109/CALCON.2017.8280738.

11. Mitra, P. S. Bhowmik, S. Chowdhuri, “Performance Analysis of a Three-Phase Active Front-End PWM Rectifier without Current Loop PI Controller”, published in the proceedings of IEEE 2nd International Conference on Control, Instrumentation, Energy & Communication (CIEC16) and IEEE Digital Xplore, organized by Department of Applied Physics, University of Calcutta, Kolkata, India from 28th to 30th January, 2016,

Electronic ISBN: 978-1-5090-0035-7, Print on Demand (PoD) ISBN: 978-1-5090-0036-4, DOI: 10.1109/CIEC.2016.7513752, pp. 343-347.

Facility At PEARE Laboratory

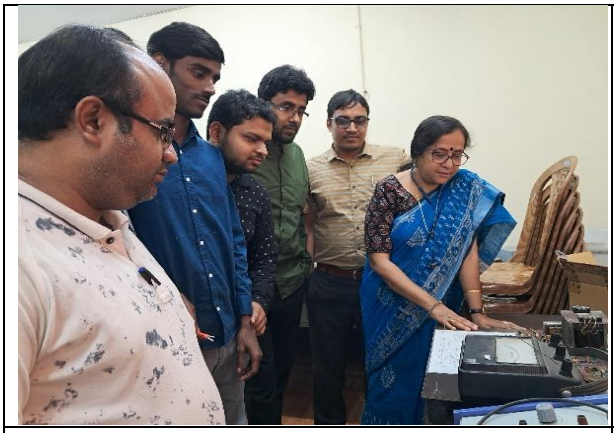
Developed Research Facility:

Developed Systems	Controller
Three-Phase Grid Connected Inverter based System	dsPIC30F4011 & PIC18F4550
Single-Phase Grid Connected Inverter based System	STM32G474RE
Permanent Magnet Synchronous Motor Drive	Atmel SAM3X8E ARM Cortex-M3
Brushless DC Motor Drive	STM32F303RE
Three-Phase Induction Motor Drive	dsPIC30F4011
Single-Phase Induction Motor Drive	PIC18F4550
DC Motor Drive	PIC16F877A
DC Buck Converter Setup	PIC16F877A
DC Quasi-Resonant Boost Converter Setup	??
Three-Phase Active Front-End PWM Rectifier	STM32G474RE
Wireless Battery Charger	??

Major Equipment Acquired:

- SPV Simulator
- D-Space 1104
- High Voltage Differential Probe
- Current Probe
- DSO

Glimpses of the Developed Prototypes:

	
DC Buck Converter	**DC Motor Drive**
	
Wireless Battery Charger	**DC Quasi-Resonant Boost converter**

	
PR Controlled Single Phase Inverter using d-Space 1104	**Permanent Magnet Synchronous Motor Drive**
	
Three-Phase Grid Connected Inverter based System	**Power Electronics and Drives Laboratory**

Participation and Collaborations:

Members and Collborators participating at 4Xth AGM of IEEE Kolkata Section

Members and Collborators participating at IEEE Kolkata IAS Chapter's Annual Meeting

A visit to Kalyani Government Engineering College regarding the progress of Consortium Project funded by DST, Ministry of Science & Technology, Government of India.

Distinguished Lecture by Prof. V. Khadkikar, *an IEEE Kolkata IAS Chapter event.*