J.J COLLEGE OF ENGINEERING AND TECHNOLOGY
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SOWDAMBIKAA GROUP OF INSTITUTIONS

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Institution Making Students Ready for "Industry 4.0"

EEE NEWS LETTER

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

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- To provide students with high quality education so that they are well prepared to become high caliber Electrical and Electronics Engineers, and it aspires to grow to the level of gaining global recognition.

- Developing competent technocrats who strive continuously in pursuit of professional excellence in the field of Electrical and Electronics Engineering.
- Developing and sustain a culture of research while promoting values, ethics and professionalism.
- Offering well balanced curriculum to help students acquire professional competencies and to arrange placements for students.
- Developing state of the art infrastructure and research for effective teaching learning process.
- Strengthening of soft skills especially for rural students through co-curricular and extra-curricular activities.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEOs	Content
PEO1	Find employment in Core Electrical and Electronics Engineering and service sectors.
PEO2	Get elevated to technical lead position and lead the organization competitively.
PEO3	Enter into higher studies leading to post-graduate and research degrees. Become consultant and provide solutions to the practical problems of core organization.
PEO4	Become an entrepreneur and be part of electrical and electronics product and service industries.

PROGRAM OUTCOMES (POs)

POs	Title	Content
PO1	Engineering knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering Problems.
PO2	Problem analysis	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering Sciences.
PO3	Design/development of solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage	Create, select, and apply appropriate techniques, resources, and modern engineering and communication tools including prediction and modeling to complex engineering activities with an understanding of the limitations .

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PO6	The engineer and society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the Professional engineering practice.
PO7	Environment and sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work	Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project management and finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Life-long learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSOs	Content
PSO1	Foundation of Electrical Engineering: Ability to understand the principles and working of electrical components, circuits, systems and control that are forming a part of power generation, transmission, distribution, utilization, conservation and energy saving. Students can assess the power management, auditing, crisis and energy saving aspects.
PSO2	Foundation of Mathematical Concepts: Ability to apply mathematical methodologies to solve problems related with electrical engineering using appropriate engineering tools and algorithms.
PSO3	Computing and Research Ability: Ability to use knowledge in various domains to identify research gaps and hence to provide solution which leads to new ideas and innovations.

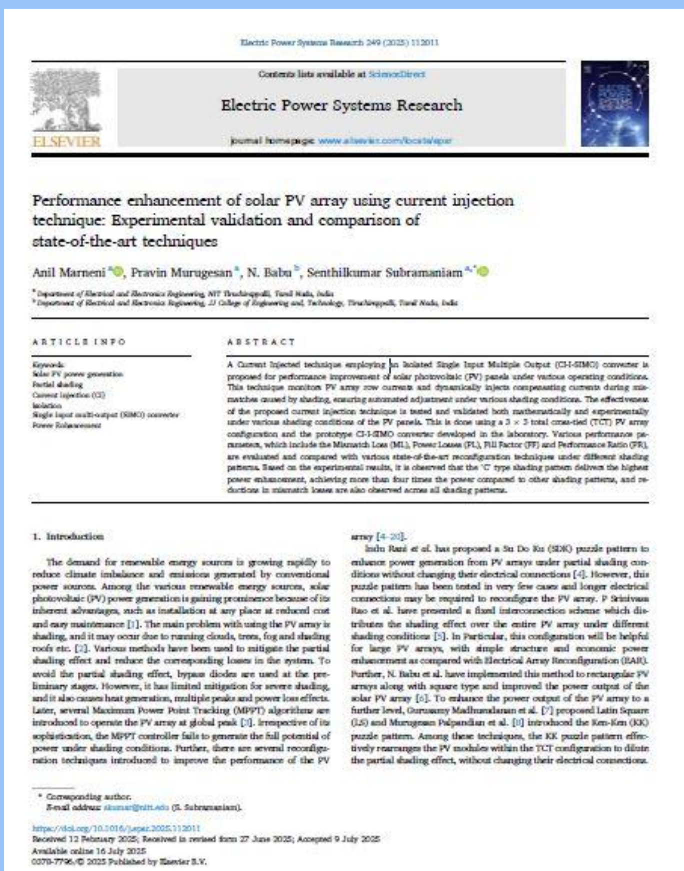
MAJOR EVENT

Our 1994-1998, 1995-1999, and 1996-2000 batch alumni celebrated their Silver Jubilee Reunion on July 12th, 2025. The event aimed to foster collaboration, share ideas, and strengthen the bond among former students.

FACULTIES' ACHIEVEMENTS

Dr. N. Babu, Associate Professor, has published a paper in an SCI journal *(*Electric Power Systems Research – *Elsevier)* titled 'Performance Enhancement of Solar PV Array Using Current Injection Technique: Experimental Validation and Comparison of State-of-the-Art Techniques*.*

Dr. G. Sundararajan participated in a one-week FDP on 'Recent Advancements in AI & ML' from 30th June to 4th July 2025, organized by the Department of ECE, St. Joseph's College of Engineering, Chennai, in association with STEP-NIT Surathkal and Pantech E-Learning.



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Performance enhancement of solar PV array using current injection technique: Experimental validation and comparison of state-of-the-art techniques

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ABSTRACT

A Current Injected technique employing an Isolated Single Input Multiple Output (CI-I-SIMO) converter is proposed for performance improvement of solar photovoltaic (PV) panels under various operating conditions. This technique monitors PV array row currents and dynamically injects compensating currents during mismatches caused by shading, ensuring automated adjustment under various shading conditions. The effectiveness of the proposed current injection technique is tested and validated both mathematically and experimentally under various shading conditions of the PV panels. This is done using a 3 × 3 total cross-tied (TCT) PV array configuration and the prototype CI-I-SIMO converter developed in the laboratory. Various performance parameters, which include the Mismatch Loss (ML), Power Losses (PL), Fill Factor (FF) and Performance Ratio (PR), are evaluated and compared with various state-of-the-art reconfiguration techniques under different shading patterns. Based on the experimental results, it is observed that the 'C' type shading pattern delivers the highest power enhancement, achieving more than four times the power compared to other shading patterns, and reductions in mismatch losses are also observed across all shading patterns.

1. Introduction

The demand for renewable energy sources is growing rapidly to reduce climate imbalance and emissions generated by conventional power sources. Among the various renewable energy sources, solar photovoltaic (PV) power generation is gaining prominence because of its inherent advantages, such as installation at any place at reduced cost and easy maintenance [1]. The main problem with using the PV array is shading, and it may occur due to running clouds, trees, fog and shading roofs etc. [2]. Various methods have been used to mitigate the partial shading effect and reduce the corresponding losses in the system. To avoid the partial shading effect, bypass diodes are used at the preliminary stages. However, it has limited mitigation for severe shading, and it also causes heat generation, multiple peaks and power loss effects. Later, several Maximum Power Point Tracking (MPPT) algorithms are introduced to operate the PV array at global peak [3]. Irrespective of its sophistication, the MPPT controller fails to generate the full potential of power under shading conditions. Further, there are several reconfiguration techniques introduced to improve the performance of the PV array [4–20].

Indu Rani et al. has proposed a Su Do Ku (SDK) puzzle pattern to enhance power generation from PV arrays under partial shading conditions without changing their electrical connections [4]. However, this puzzle pattern has been tested in very few cases and longer electrical connections may be required to reconfigure the PV array. P Srinivasa Rao et al. have presented a fixed interconnection scheme which distributes the shading effect over the entire PV array under different shading conditions [5]. In Particular, this configuration will be helpful for large PV arrays, with simple structure and economic power enhancement as compared with Electrical Array Reconfiguration (EAR). Further, N. Babu et al. have implemented this method to rectangular PV arrays along with square type and improved the power output of the solar PV array [6]. To enhance the power output of the PV array to a further level, Gurusamy Madhumalaran et al. [7] proposed Latin Square (LS) and Murugesan Palpandian et al. [8] introduced the Ken-Ken (KK) puzzle pattern. Among these techniques, the KK puzzle pattern effectively rearranges the PV modules within the TCT configuration to dilute the partial shading effect, without changing their electrical connections.

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