

*A Century of Service to the Nation*

**Volume 10 | Issue 2 | February 2025**

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# Notification for IEI R&D Grant-in-Aid

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To promote appropriate technology, assist in building up design & research talents and, most importantly, to help in nurturing potential R&D venture amongst engineering students pursuing Diploma/UG/PG/PhD courses. The Institution of Engineers (India) had instituted the R&D Grant-in-Aid program way back in 2001.

Every year, the Institution invites applications for funding industry-oriented R&D projects and research initiatives aimed at improving the life-style of common people from engineering students pursuing full time Diploma/UG/PG/PhD engineering program in AICTE/UGC/NAAC approved Institutions / Colleges / Universities. The application form and guidelines are available in our website <https://www.ieindia.org>. The projects should be carried out under the guidance of faculty members who are Corporate Members of IEI. Membership criteria for student(s), guide(s) and institution(s) are as follows:

Project Category	Student/Applicant Membership	Guide(s) Membership	Institutional Membership
1. Diploma	Exempted [Membership of Student Chapter is desirable]	AMIE/MIE/FIE	Not Mandatory
2. UG (BE/BTech/ Equivalent)	'Student Member' (SMIE)	AMIE/MIE/FIE	Applicant's Institute should preferably be an Institutional Member with NBA/NAAC Accreditation or valid NIRF Rank
3. PG (ME/MTech/ Equivalent)	AMIE/MIE/FIE	MIE/FIE	Applicant's Institute should preferably be an Institutional Member with NBA/NAAC Accreditation or valid NIRF Rank
4. PhD	AMIE/MIE/FIE	MIE/FIE	Applicant's Institute should preferably be an Institutional Member with NBA/NAAC Accreditation or valid NIRF Rank

The soft copy of the duly filled-up applications (in editable format), as per the proforma available on our website [www.ieindia.org](http://www.ieindia.org), should be sent through email to [research@ieindia.org](mailto:research@ieindia.org) and one printed copy of the same should reach the following address:

**The Deputy Director (Technical)**

The Institution of Engineers (India)  
8 Gokhale Road, Kolkata 700 020

Kindly go through the guidelines (visit link: <https://www.ieindia.org/webui/IEI-Activities.aspx#RnD-Initiative>) before filling up the application.

# Members in the News

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**Dr Satyananda Swain, FIE**  
Professor  
GIFT Autonomous, Bhubaneswar, Odisha  
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**Dr Satyananda Swain** was conferred the **Indian Society of Agricultural Engineers (ISAE) Gold Medal 2024** for life time achievements in the field of Agricultural Engineering presented in the 58th ISAE Annual Convention and International Symposium organised by Vasatrao Naik Marathwada Krishi Vidyapeeth, Parbhani during 12-14 November 2024.



**Dr Arpan Bipinchandra Kharva, MIE**  
Research Scholar  
Faculty of Technology and Engineering (FTE), The Maharaja Sayajirao University of Baroda,  
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**Dr Arpan Bipinchandra Kharva** received the Degree of **Doctor of Philosophy** in Textile Engineering for his thesis titled “Development of Eco Friendly Sanitary Products” on the 29 December 2024.



**Dr Kamal Harikrishna Dhandha, MIE**  
Sr Inspection Engineer  
TUV India Pvt. Ltd.  
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**Dr Kamal Harikrishna Dhandha** had satisfactorily fulfilled the requirements established by American Society for Quality Excellence (ASQE) for professional attainment of the **Certified Quality Engineer** on 23 December 2024.

## Corporate Air Ticketing for IEI Members

Corporate Members may book Corporate Air Ticket through M/s EBIX Travels Private Ltd.  
For details please visit: <https://www.ieindia.org/webui/IEI-AirTickets.html>

# Publication by Members

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## Book



### **Dr Purnanand Pundalik Savoikar, FIE**

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### **Eco-friendly Sustainability**

Co-author: **Dr Narayan V Nayak**

#### **About the book**

United Nations has declared 17 Sustainable Development Goals (SDGs) for our Planet. These goals aim at fulfilling needs and stopping greed of all. “**Eco-Friendly Sustainability**” is the book which explores the SDGs 4, 7, 11 and 15 to make it a universal title.

Civil Engineering Industry and Infrastructure projects have contributed significantly in development of the Earth. However, this development should not result in exploitation of natural resources and devastation of environment and ecology. “Eco-Friendly Sustainability” delves with shaping the sustainability approach through its 15 chapters. It attempts the issues of sustainability, provides the solutions, suggests the alternatives, and explores the use of eco-friendly materials.

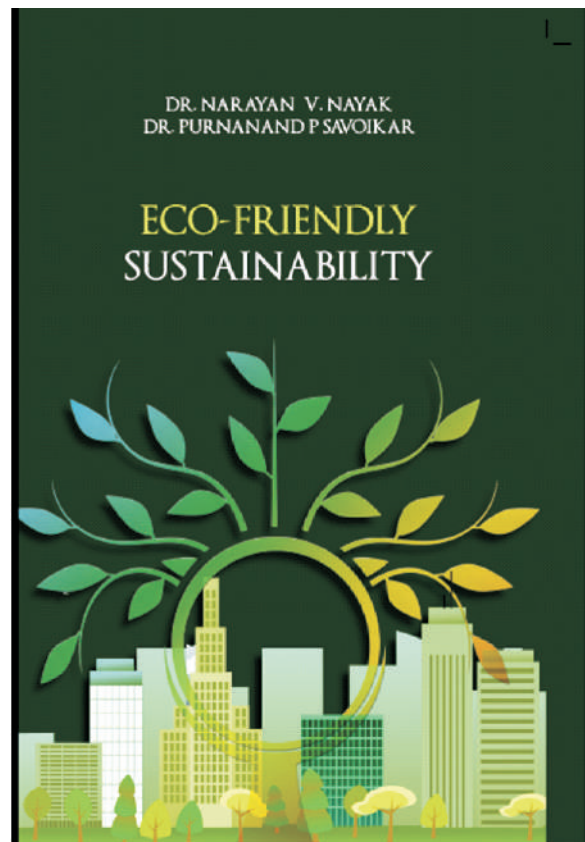
The extensive coverage to the topics on construction and Demolition waste, curing, water Binder ratio, and Plastic Waste Management has enriched the value of the book. The lucid and simple language; exposure to concepts of carbon negative concrete; strength, durability and quality of concrete; net zero energy buildings and nicely illustrated figures supported by substantially tabulated data are the strengths of this book due to which it will serve as an invaluable reference resource for UG and PG students, academicians, research scholars and field professionals.

#### **Details of the Book:**

ISBN: 978-81-968406-8-6

Date of Publication : 19/09/2024 (Released in DFI 2024 Conference),  
Edition 2025

Publisher Details: Creative Books, C-91/1, Yadav Nagar, Samaypur  
Badli, Delhi 110042



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Exclusive access to the Samsung e-store for IEI Corporate Members. This shall enable the Corporate Members to procure the Samsung Products at a discounted rate. The Samsung e-store can be accessed at [www.samsung.com/in/multistore/iei](http://www.samsung.com/in/multistore/iei) using your Membership No. and email id/Mobile number.

# Publication by Members

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## Book Chapter



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**Title of Book Chapter: [Advancements in Mechatronic Systems for Manufacturing, Robotics, and Automation](#)**

Chapter Number 07, Mechatronics Concepts, Tools, Applications, and New Trends, CRC Press, Taylor and Francis, 19-February-2025, e-ISBN:9781003494478

**DOI:** <https://doi.org/10.1201/9781003494478-7>

***Abstract:** Modern mechatronics has transformed automation, robotics, and production, resulting in higher accuracy, flexibility, and efficiency. This chapter examines the evolution of mechatronic systems with particular reference to the manufacturing applications of the Yaskawa Motoman GP12 robot. An overview of the capabilities of the Motoman GP12 robot is given at the beginning of this chapter. The discussion of mechanical engineering in the manufacturing sector is then expanded upon. The book then discusses the application of bots in flexible production systems, with a particular emphasis on modular mechatronic systems and reconfigurable manufacturing. This case study demonstrates how to set up a versatile production system using the Motoman GP12 robot.*

*This chapter contains more information about the programming, control, and mechatronic design issues associated with integrating the Motoman GP12 robot into the manufacturing process. The effectiveness of a production technique using the GP12 robot is tested in a controlled trial. The use of robots in high-precision manufacturing procedures is examined in this book. It emphasises potential issues as well as upgraded motors, sensors, and control systems. A Motoman GP12 robot assembly method is planned and verified in this case study.*

*The technology that enables the Motoman GP12 robot to be used in complicated mechatronic production is the main topic of discussion. Among these technologies are wireless communication protocols, machine learning algorithms for adaptive control, and sensor fusion methods. Examining future trends and challenges, this chapter discusses Industry 4.0, the potential impact of AI and the IoT on mechatronic systems using the Motoman GP12 robot, and the challenges in implementing advanced mechatronic solutions in industry.*

*The Motoman GP12 robot is highlighted in this chapter together with important results regarding the development and application of mechatronic systems in the manufacturing industry. It also offers ideas for future studies and developments.*

## ANNOUNCEMENT

### Elevate your status as a Certified Professional Engineers (PE) and International Professional Engineers (IntPE)

#### Professional Engineers (PE) Certification by IEI

##### Eligibility Requirement

To attain the Professional Engineers (PE) certification through The Institution of Engineers (IEI), you must meet the following eligibility criteria:

1. Hold a BE/BTech or equivalent degree recognized by a Statutory Authority or the Government of India.
2. Have accumulated five years or more of professional experience.
3. Be a member of a recognized professional engineering institution or association.
4. Maintain a satisfactory level of Continued Professional Development (CPD).

Please visit the following link :

[https://www.ieindia.org/webui/IEI\\_PE\\_Certification.aspx](https://www.ieindia.org/webui/IEI_PE_Certification.aspx)

#### International Professional Engineers (IntPE) Certification by IEI

##### Eligibility Requirement

To be eligible for IntPE Certification by IEI, candidates must meet the following criteria:

1. Hold a BE/BTech or equivalent degree recognized by the Statutory Authority or the Government of India.
2. Possess seven years or more of professional experience.
3. Have a minimum of two years of professional experience in a significant engineering activity.
4. Be a member of a recognized professional engineering institution or association.
5. Maintain a satisfactory level of Continued Professional Development (CPD).

Please visit the following link:

[https://www.ieindia.org/webui/IEI\\_IntPE\\_Certification.aspx](https://www.ieindia.org/webui/IEI_IntPE_Certification.aspx)

The eligible candidate can submit application in the prescribed format to: The Deputy Director (Technical), The Institution of Engineers (India), 8 Gokhale Road, Kolkata 700020; For any query and assistance, please send email to: [pe@ieindia.org](mailto:pe@ieindia.org)

# Publication by Members

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## Paper published in the Journals / Proceedings



**Dr Kudiyarasan Swamynathan**, FIE & PE7004309 (Certified Professional Engineer, IIE)  
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### **Title of Paper: Design and Performance Analysis of Manchester Coder-based Body Channel Communication using FPGA**

e-Prime - Advances in Electrical Engineering, Electronics and Energy, Elsevier, 9, September 2024, 100660, Online ISSN: 2772-6711

DOI: <https://doi.org/10.1016/j.prime.2024.100660>

**Co-authors:** Vijayalakshmi S, Paramasivam A, Nagarajan Velmurugan, Kamatchi S & Hasheetha Jayashankar

***Abstract:** In general, the Body Channel Communication (BCC) is used to transmit human physiological signals over vast distances. Also, the Error-correcting codes can detect and rectify faults in long-range data transmission. Data is encoded in a predetermined manner for secure transmission. In this paper, a Manchester encoding-based high throughput architecture is proposed for a body channel communication system with a low-power operation mode. Further, the Manchester encoder is designed for high throughput performance with a low complexity architecture, and an analog front-end processing circuit which includes two stage pre-amplifiers. Also, the transmission rate on the BCC transceiver side is boosted by the maximum Consecutive Identical Digit (CID), which is limited by Manchester codes. The Manchester code format is generated by encoding the sensed data. Additionally, a full gain buffer is used to reduce data loss and hardware overhead. Results demonstrate that the suggested Manchester encoder is implemented in 90 nano meter (nm) technology, and the 10 Megabits per second (Mbps) data rate is obtained with a configurable operating frequency ranging from 1 to 100 Megahertz (MHZ).*

***Keywords:** Body Channel Communication (BCC); Consecutive Identical Digit (CID); Error Correcting Code; Low-power Operation Mode; Pre-amplifier*

### **Title of Paper: A Novel Method for Detecting Cardiac Arrhythmias in Electrocardiogram Signals using the ANFIS Classifier**

e-Prime - Advances in Electrical Engineering, Electronics and Energy, Elsevier, 9, September 2024, 100734, Online ISSN: 2772-6711

DOI: <https://doi.org/10.1016/j.prime.2024.100734>

**Co-authors:** P. Premalatha, N. Shilpa, Sankaran Vijayalakshmi, Alagumariappan Paramasivam, Pavan Sai Kiran Reddy Pittu, S. Kamatchi & Hasheetha Jayashankar

***Abstract:** In general, ventricular repolarization instability with Premature Activations (PA) plays a significant role in the detection of arrhythmia using an electrocardiogram (ECG) signal. However, clinical detection of this instability is challenging. In this work, a unique technique for analyzing QT Interval (QTI) dynamics unreliability and other abnormalities in the ECG signal are utilized to detect ventricular tachycardia based on the identified anomalies. Further, a feature extraction method based on Chopped Displacement Gaussian (CDGa) is adopted and the features are retrieved from the CDGa signal and its size is reduced using Fisher Discrimination Analysis (FDA). Also, the results of the FDA are fed into the Adaptive Neuro-Fuzzy interference (ANFIS) classifier. The performance of the ANFIS classifier is enhanced in this study by integrating the Grasshopper optimization algorithm for optimizing network parameters. As a result, the values in the signals are predicted using an adaptive Least Mean Square (LMS)-based prediction algorithm, which is utilized to forecast the future status of VT-affected patients. Results indicate that the proposed work has an overall accuracy of 96% which is higher than any other conventional methods. Also, the various additional performance criteria are tested, and it is demonstrated that the CDGa with adaptive LMS outperforms all previous approaches.*

***Keywords:** Classification; Classifier Optimization; Electrocardiogram; Feature Extraction; QT Interval; QT Interval Instability*

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## **Title of Paper: Optimization of the Overall Heat Transfer Coefficient of the Frozen Seal Valve Fin Tube Assembly for Fast Reactors**

SAE International Journal of Materials and Manufacturing, 17(4), November 2024, pp 329-340, ISSN: 1946-3979, e-ISSN: 1946-3987

DOI: <https://doi.org/10.4271/05-17-04-0023>

**Co-author:** Sitangshu Sekhar Biswas

**Abstract:** Sodium is used as a coolant in the fast reactor's primary and secondary loops to transfer enthalpy from the reactor and transport it to the expander. However, handling sodium is difficult, and it can be hazardous if it comes into contact with air, which causes an exothermic reaction. During maintenance of sodium loop components, isolation is typically accomplished with valves. The valve leaking is caused by the seal or the gland. Seal leakage is compensated because it occurs within the line, but gland leakage should be zero because the liquid is harmful. To address this requirement, the author attempted to design a special type of valve in which sodium is allowed to rise through an annular path along the stem and heat transfer is augmented in such a way that the required enthalpy is evacuated to freeze sodium inside the annular path, confirming the fail-safe zero gland leakage. A finned tube assembly is fitted around the stem to achieve this concept of expanded surface heat transfer. However, the issue is to design the fin tube assembly, as well as the number of fins and their dimensions. Normally, these things are done through a series of physical model studies, which is inefficient. In our study, we used conjugate heat transfer analysis to design the fin tube assembly, which was then tested using a physical model.

**Keywords:** Heat Transfer; Valves; Seals And Gaskets; Sodium; Optimization; Failure Analysis; Nuclear Energy; Heat Exchangers

## ANNOUNCEMENT

### Know-Your-Member (KYM)

Is your mobile number & e-mail updated with us ? If not, then please forward your Know-Your-Member (KYM) form immediately for participating in IEI Election process.

You are requested to forward your KYM along with the self-attested copy of photo ID proof to the address given below:-

#### **Deputy Director (Membership)**

The Institution of Engineers (India)

8 Gokhale Road, Kolkata 700020

Email: [datamemb@ieindia.org](mailto:datamemb@ieindia.org)

The form is available on IEI Website or scan the code:

[https://www.ieindia.org/WebUI/ajax/Downloads/WebUI\\_PDF/HIGHLIGHTS\\_DOCUMENT-3332.pdf](https://www.ieindia.org/WebUI/ajax/Downloads/WebUI_PDF/HIGHLIGHTS_DOCUMENT-3332.pdf)



# Publication by Members

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**Title of Paper:** [Numerical Simulation of Micro Wind Turbine for Low Speed Applications](#)

Journal of Mines, Metals and Fuels, 73(1), 2025, pp. 221-228, Print ISSN: 0022-2755

**DOI:** <https://doi.org/10.18311/jmmf/2025/46440>

**Co-author:** Vishnu Wakchaure

**Abstract:** The primary objective of this work is to utilize numerical modeling techniques to optimize the performance of a micro wind turbine specifically built for low-speed applications. A meticulous 3D model of the turbine blade was created and examined using Computational Fluid Dynamics (CFD). The methodology involved generating a precise fluid domain, carrying out a thorough meshing process, and completing a grid independent study to assure the accuracy of the solution. The simulations were conducted using several blade radii, specifically 200 mm, 220 mm, 240 mm, and 260 mm, in order to assess their effects on power generation and turbine speed. The results showed that increasing the size of the blade radius had a substantial impact on power generation, with the 260 mm radius achieving the highest power output. The increased efficiency of the turbine in low-speed wind conditions commonly found in metropolitan areas is due to its greater swept area, which allows it to absorb more wind energy. Nevertheless, greater blade radii led to decreased rotational speeds as a consequence of heightened inertia, hence alleviating mechanical strain and diminishing levels of noise and vibration. The 260 mm blade radius is the optimum choice for low-speed wind applications because to its ability to efficiently gather power while minimizing mechanical stress.

**Keywords:** Computational Fluid Dynamics (CFD); Micro Wind Turbine; Power Generation; Turbine Speed

## ANNOUNCEMENT



# IEI-Springer Journals



Journal Title	ISSN Print	ISSN Electronic	CiteScore 2023	Google Scholar: h5 Index 2022
Journal of The Institution of Engineers (India): Series A	2250-2149	2250-2157	2.2	22
Journal of The Institution of Engineers (India): Series B	2250-2106	2250-2114	3.1	24
Journal of The Institution of Engineers (India): Series C	2250-0545	2250-0553	2.4	24
Journal of The Institution of Engineers (India): Series D	2250-2122	2250-2130	2.0	19
Journal of The Institution of Engineers (India): Series E	2250-2483	2250-2491	2.0	11



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# Publication by Members

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## **Title of Paper: Edge Preparation Impact on Tool Wear and Surface Roughness: Experimental Analysis and Machine Learning Predictions**

Proceedings of 2024 International Conference on Advanced Computing and Emerging Technologies (ACET), IEEE-2024, 29 October 2024, Electronic ISBN:979-8-3503-6772-0, Print on Demand (PoD) ISBN:979-8-3503-6773-7

**DOI:** <https://doi.org/10.1109/ACET61898.2024.10730109>

**Co-authors:** Arun Bhosale, S Ashfaque Ahmed, Mukuloth Srinivasnaik, Maaz Allah Khan & Aniket B Kolekar

**Abstract:** This study investigates the impact of different edge polishing conditions on milling tool performance and surface roughness, focusing on the roughness parameters  $R_a$ ,  $R_t$ , and  $R_z$ . Using AISI P20 material and solid carbide straight end mills, the tools were subjected to various edge treatments: standard, HSC 1/300, and H 4/400. Tool wear was monitored through  $VB_{max}$  measurements. Multiple regression models were developed, including Linear Regression, Random Forest, XGBoost, Gradient Boosting, Ada Boost, SVR, NuSVR, Extra Trees, and ANN, utilizing Python's scikit-learn, Keras, and TensorFlow libraries. The models were optimized using Cross Validation and GridSearchCV. Data revealed that polished tools exhibited reduced wear and more consistent surface roughness compared to standard tools. NuSVR emerged as the optimal model for predicting tool wear, while Random Forest and ANN excelled in predicting roughness parameters. Polished tools (H 4/400 and HSC 1/300) demonstrated a 20.49% and 18.62% increase in tool life, respectively. The findings support the utility of machine learning models in optimizing milling processes, enhancing tool longevity, and improving surface quality, benefiting industrial applications through increased efficiency and cost savings.

**Keywords:** Milling Tool; Multiple Regression; Polished Tools; Machine Learning



**Dr Bangshidhar Goswami, AMIE**

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## **Title of Paper: Understanding and Controlling Metal Pad Roll Instability in High-Capacity Liquid Metal Battery Systems**

International Journal of Energetic Materials, JournalsPub, An Imprint of Dhruv Infosystems Pvt Ltd, 10(2), 2024, pp 12-16, ISSN: 2456-3978

**URL:** [https://journalspub.com/wp-content/uploads/2024/12/12-16-MS\\_Understanding-and-Controlling-Metal-Pad-Roll-Instability-in-High-Capacity-Liquid-Metal-Battery-Systems-1.pdf](https://journalspub.com/wp-content/uploads/2024/12/12-16-MS_Understanding-and-Controlling-Metal-Pad-Roll-Instability-in-High-Capacity-Liquid-Metal-Battery-Systems-1.pdf)

**Abstract:** The present study delves into the roll instability of metal pads within cylindrical liquid metal battery cells, focusing on the characteristics, control, and modeling of the instability within an energetic materials context. Explicit formulas are derived that offer theoretical benchmarks for magnetohydrodynamic solvers OpenFOAM and SFEMaNS, revealing an excellent alignment with experimental observations on gravity wave damping rates in multilayered liquid metal battery systems. Instability thresholds are analyzed for metal pad roll instability, particularly with Mg-Sb liquid metal batteries, and demonstrate effective application for large-scale liquid metal battery cells. Findings highlight the significance of the vertical magnetic field strength, which, even at minimal values, can trigger instability, suggesting implications for both cell design and operational stability within energy storage systems.

**Keywords:** Metal Pad Roll Instability; Cylindrical Liquid Metal Batteries; Magnetohydrodynamics (MHD); Gravity Wave Damping; Vertical Magnetic Field Influence

# Publication by Members

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## **Title of Paper: Advancements and Innovations in Superalloy Coating Techniques: A Comprehensive Review of ECAP and High-Temperature Aluminization**

International Journal of Metallurgy and Alloys, JournalsPub, An Imprint of Dhruv Infosystems Pvt Ltd, 10(2), 2024, pp 16-20, ISSN: 2456-5113

**URL:** <https://journalspub.com/wp-content/uploads/2024/12/16-20-Advancements-and-Innovations-in-Superalloy-Coating-Techniques-A-Comprehensive-Review-of-ECAP-and-High-Temperature-Aluminization.pdf>

**Abstract:** Equal Channel Angular Pressing (ECAP) is a pivotal technique within Severe Plastic Deformation (SPD), widely recognized for its exceptional capability to refine grain structures in metals and alloys down to the micro- and nanometer scales. This review offers an in-depth examination of the ECAP process, highlighting its effectiveness in generating ultra-fine grain microstructures that significantly enhance the mechanical properties of materials, such as strength, hardness, and ductility. We provide a detailed analysis of the critical parameters that influence the outcomes of ECAP, including die geometry, processing temperature, and the number of passes. Each of these factors plays a crucial role in determining the resultant microstructure and overall material performance. The review further delves into recent advancements and innovations in ECAP, such as modifications aimed at improving process efficiency and making the technique more scalable for industrial applications. Despite the notable progress achieved in the field, several challenges persist in transitioning ECAP from laboratory settings to large-scale production environments. These challenges include maintaining process consistency, scaling up without compromising quality, and addressing technical limitations inherent in current methods. This article offers valuable insights into contemporary trends in ECAP technology, evaluates the effectiveness of various processing routes, and explores potential future directions for advancing the development and application of ECAP in metallurgy and materials science. By addressing both the achievements and ongoing issues, this review contributes to a comprehensive understanding of ECAP and its role in the advancement of material processing techniques.

**Keywords:** Equal Channel Angular Pressing; Magnesium Alloys; Process Optimization; Severe Plastic Deformation; Ultra-Fine Grain Microstructure

## **Title of Paper: Nanotechnology in Refractory Materials: Innovations and Applications**

International Journal of Metallurgy and Alloys, JournalsPub, An Imprint of Dhruv Infosystems Pvt Ltd, 10(1), 2024, pp 7-11, ISSN: 2456-5113

**URL:** <https://journalspub.com/wp-content/uploads/2024/11/7-11-Nanotechnology-in-Refractory-Materials-Innovations-and-Applications.pdf>

**Abstract:** Nanotechnology has become a focal point of research across diverse scientific fields, including chemistry, medicine, materials science, and engineering. Its integration into refractory products has led to groundbreaking advancements in industries such as steel, glass, casting, and cement, particularly using nanomaterials like nanoparticles, nano additives, and nanostructured materials. This article provides an in-depth examination of the latest developments in monolithic refractories, focusing on how nanotechnology has enhanced their performance, durability, and overall efficiency in high-temperature applications. Special attention is given to the role of specific nanomaterials in improving the mechanical, thermal, and chemical properties of castable refractories. These advancements not only extend the lifespan of refractory materials but also offer significant economic and environmental benefits, making them indispensable in modern industrial processes. This comprehensive review serves as a valuable resource for researchers and engineers seeking to leverage nanotechnology in the development of more robust and efficient refractory solutions.

**Keywords:** Nanotechnology; Refractories; Monolithic Refractories; Castable Refractories; Corrosion Resistance; High-Temperature Applications; Nanomaterials

## **Title of Paper: Optimizing Gas Turbine Performance: Preventive Measures and Blade Durability Solutions**

International Journal of Renewable Energy and its Commercialization, JournalsPub, An Imprint of Dhruv Infosystems Pvt Ltd, 10(2), 2024, pp 36-40, ISSN: 2582-4120

**URL:** <https://journalspub.com/wp-content/uploads/2025/01/36-40-MS-Optimizing-Gas-Turbine-PUBLISH.pdf>

**Abstract:** The article explores the various failure mechanisms and preventive methods related to gas turbine blades, which operate mechanical and thermal conditions. The increasing demand for energy and efficiency in turbojet engines has led to larger and more complex turbomachines. As gas turbine blades are subjected to high operational temperatures, pressure, and stress, they are prone to various failure modes, including fatigue, creep, oxidation, corrosion, and erosion. To mitigate these issues, advancements in super-alloy manufacturing techniques are being developed. Enhanced metallurgical properties and innovative cooling methods help reduce thermal stress. The study also highlights the importance of analyzing stress fields in blades using the conjugate heat transfer method, which demonstrates higher stress in temperature-sensitive materials. The impact of high-temperature corrosion, particularly in gasification combined cycle plants, is addressed, showing how corrosive impurities in fuel gas cause significant damage to turbine blades. The life estimation of turbine blades, based on stress cycles and failure mechanisms, such as thermomechanical fatigue and creep, is analyzed using various predictive models. Through case studies, the paper provides insights into the role of advanced alloy CMSX-4, failure

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investigation techniques, and the development of preventive strategies to extend the safe life of gas turb improving overall turbine efficiency and reliability.

**Keywords:** Gas Turbine Blades; Failure Mechanisms; Superalloys; High-temperature Corrosion; Finite Element Analysis; Thermal Stresses

## **Title of Paper: Exploring the Ettingshausen Effect: Magnetothermoelectric Transport in Graphene Nanoribbons and Iron-Carbon Alloy**

International Journal of Energetic Materials, JournalsPub, An Imprint of Dhruv Infosystems Pvt Ltd, 10(1), January-June 2024, pp 31-35, ISSN: 2456-3978

**URL:** <https://journalspub.com/wp-content/uploads/2024/12/31-35-Exploring-the-Ettingshausen-Effect.pdf>

**Abstract:** This study investigates the magnetothermoelectric effects, specifically the Ettingshausen effect, in graphene nanoribbons and iron-carbon alloys and explores their implications in plasma physics through self-similar modeling. The Ettingshausen effect, which involves the generation of a transverse heat current from a longitudinal charge current in the presence of a magnetic field, is analyzed using the Landauer-Büttiker formalism and nonequilibrium Green's function methods. Results reveal that in graphene nanoribbons, the Ettingshausen effect is highly sensitive to device parameters in weak magnetic fields and shows a strong dependence on the Fermi energy, with significant oscillations observed when the Fermi energy deviates from the Dirac point. Additionally, the study examines the application of magneto-inertial fusion techniques to plasma, where magnetic fields are employed to suppress heat loss and trap alpha particles. Self-similar solutions to the extended Magnetohydrodynamics (MHD) equations reveal the critical roles of the Nernst and Ettingshausen effects in these high-energy environments. Furthermore, the anomalous Ettingshausen effect (AEE) in iron-carbon alloys, including cast irons and steel, is explored, demonstrating that these materials exhibit significantly enhanced thermoelectric properties compared to pure iron, with potential applications in thermal management technologies. This work provides new insights into the behavior of magnetothermoelectric phenomena in advanced materials and their potential for applications in energy conversion and plasma physics.

**Keywords:** Ettingshausen Effect; Graphene Nanoribbons; Magnetothermoelectricity; Iron-carbon Alloys; Plasma Physics; Magneto-inertial Fusion



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## **Title of Paper: Deep Feature Blend Attention: A New Frontier in Super Resolution Image Generation**

Neurocomputing, Elsevier, 618, 14 February 2025, 128989, Online ISSN: 1872-8286, Print ISSN: 0925-2312

**DOI:** <https://doi.org/10.1016/j.neucom.2024.128989>

**Co-authors:** P.B. Dhanusha & A. Muthukumar

**Abstract:** Super Resolution (SR) images contain more useful information than Low Resolution (LR) images. Generally, SR images are highly preferred over LR images in the medical field due to their high quality. Generally, SR images are affected by many factors, like blur, noise, and decimation. Therefore, the present study proposes Deep Feature Blend Attention Mechanism for generating SR images with optimal outcomes. In this study, a Deep Learning (DL) based encoder-decoder is used to extract the detailed information from the LR image, assist in noise removal, and improve image quality. Using Gaussian blur, an LR image is produced, which is given as input to the encoder-decoder. The Attention mechanism with feature blending is performed to produce the reconstructed SR image. The low and high frequency component issues from feature map are improved using the attention mechanism. Also, feature blend attention mechanism is implied to reconstruct SR images from LR images. The present study utilizes the feature blend technique, which helps select the optimal features and blending to attain the optimal feature set. The study is performed with and without the feature blend technique in attention mechanism to expose the impact of the feature blend technique, and it is used to avoid overfitting issues and produce optimal results. The performance of the proposed system is assessed by using PSNR and SSIM to show the system's efficiency. The proposed system is compared with other state-of-the-art studies to expose the efficacy of the present system.

**Keywords:** Super Resolution; Gaussian Blur; Encoder-Decoder; Deep Learning; Attention Mechanism

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We would like to thank our erudite members for sharing their professional achievements through the IEI Epitome and making the content more abounding and at the same time inspiring many others to share their accomplishments as well. To streamline the process and make it convenient for the member to give their inputs we would like to obtain the information in a more structured and comprehensive manner. We would request our members to send the details of their achievements as per the appended formats only.

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1.	Management of Training for Training & HR Managers	04 - 06 Mar 25
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9.	Contract Management E-Tendering and Condition of Contract for EPC/Turnkey projects-FIDIC 99	10 - 14 Mar 25
10.	Condition based Maintenance aspects of Power Plant Equipment & Process Industries	11 - 14 Mar 25
11.	Soil & Water Conservation: Importance and Best Practices	17 - 19 Mar 25
12.	Laboratory Management System Awareness & Internal Auditing (As per ISO / IEC 17025: 2017 & NABL Requirements)	17 - 20 Mar 25
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16.	Surface Engineering - Concepts, Applications and Emerging Technologies	18 - 21 Mar 25
17.	Generator & its Auxiliaries incl. Excitation System	18 - 21 Mar 25
18.	City Water Action Planning	19 - 21 Mar 25
19.	Engineering Simulation using ANSYS & CFD - With Hands-on Approach	24 - 27 Mar 25
20.	Power Trading, Power Exchanges & Merchant Power Plants	25 - 28 Mar 25
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22.	Super Critical and Sub Critical Boilers; Issues and Challenges of Cooling Water Chemistry in Power Plants and Process Industries	26 - 28 Mar 25
23.	Key Aspects of TQM	27 - 29 Mar 25