ARKA JAIN University
Jharkhand

NAAC GRADE A
ACCREDITED UNIVERSITY

Conference Proceedings

NATIONAL CONFERENCE ON RECENT TRENDS IN MACHINE, MANUFACTURING, MODELING, AND TECHNOLOGY (RTMMMT-2024)

28th – 29th June 2024

EDITED BY

Dr. Anupam Kumari, Dr. Kuldip Kumar sahu, Dr Viranshu Kumar, Dr. Anup Kumar, Mr. Nivedan Mahato, Mr. Mukesh Kumar Sharma, Mr. Basant Kumar Das

Organized by

Department of Mechanical Engineering, School of Engineering and IT, ARKA JAIN University, Jharkhand

ABOUT THE CONFERENCE

The National Conference on Recent Trends in Machine, Manufacturing, Modeling, and Technology (RTMMMT-2024) is an esteemed event organized by the Department of Mechanical Engineering, School of Engineering & IT at ARKA JAIN University. This conference is dedicated to exploring the latest advancements and innovations in the fields of machine design, manufacturing technologies, modeling techniques, and emerging technologies.

The primary objective of RTMMMT-2024 is to provide a high-quality platform for researchers, academicians, industrialists, and students to present their innovative ideas and recent developments. The conference aims to facilitate the exchange of knowledge, foster collaboration, and establish research or business relationships among participants from various disciplines.

The conference will be held periodically to make it an ideal platform for people to share views and experiences Science, Engineering and Technology such as Advance Optimization and characterization techniques, Advances in Additive Manufacturing, Advances in Machine Tool Design, Advances in Materials Technology, Advances in Metal Cutting Technology, Advances in Metal Joining, Advances in Metal Forming, Artificial Intelligence and Robotics, Automation and Smart Systems, Bio Materials, Cellular manufacturing, Characterization and Testing, Coatings and Surface Engineering , Composite and Polymer Processing, Cryogenic aspects of metal cutting, , Mechanical dynamics and vibration, Micro and Nano Manufacturing, Modelling, analysis, and simulation of manufacturing processes, Nano Technology, Non Destructive Testing, Non-Conventional Machining Processes, Plastic processing technology, Powder metallurgy and ceramic forming, Precision Engineering, Thermal aspects of metal cutting and Tribology.

The conference provides a unique opportunity for participants to exchange ideas and application experiences face-to-face, fostering an environment for establishing valuable business or research relationships. It also aims to find global partners for future collaborations, thereby contributing significantly to the advancement of these scientific fields.

RTMMMT-2024 is poised to be a significant event that brings together experts, scholars, and industry professionals from around the world. The conference aims to make a substantial contribution to the knowledge base and technological advancements in machine, manufacturing, modeling, and technology. We look forward to your participation and to a successful and enriching conference experience.

Message from Chief Guest

CSIR-NML

राष्ट्रीय धातुकर्म प्रयोगशाला
(वैज्ञानिक एवं औद्योगिक अनुसंधान परिषद्
विज्ञान एवं प्रौद्योगिकी मंत्रालय, भारत सरकार)
जमशेदपुर - 831 007, (झारखण्ड) भारत

National Metallurgical Laboratory
(Council of Scientific & Industrial Research
Ministry of Science & Technology, Govt. of India)
Jamshedpur - 831 007, INDIA

डॉ. संदीप घोष चौधुरी, एफ.एन.ए.ई
निदेशक

Dr. Sandip Ghosh Chowdhury, FNAE
Director

June 25, 2024

Message

It gives me immense pleasure to know that National Conference on **Recent Trends in Machine, Manufacturing, Modelling and Technology (RTMMMT'24)** is being organized by Dept. of Mechanical Engineering, ARKA JAIN University, Jharkhand in association with International Journal of Research & Analytical Reviews (IJRAR).

Manufacturing technology is a term that can refer to a number of modern methods of science, production, and engineering that assist in industrial production and various manufacturing processes. With the advent of Industry 4.0, advances in technology such as robotics and the increase in use, storage, and recording of data mean that digitalization is reinventing manufacturing.

Smart technology and other new methods are not simply increasing the efficiency and quality of production, but are changing the shape of the manufacturing industry. Manufacturing business systems are constantly being revolutionized and digitized.

I believe that this technical event will serve as an invaluable platform, bringing together Academicians, Industry practitioners as well as budding professionals to deliberate on various topics pertinent to Materials Technology, Metal Cutting Technology, Metal Joining and Additive Manufacturing, Metal Forming, Machine Tool Design, Artificial Intelligence and Robotics.

I am confident that participants will treasure the intellectually enriching sessions and stay updated with the latest developments. I wish this RTMMMT'24 a grand success.

With warm regards

Sandip Ghosh Chowdhury

दूरभाष/Phone : (0657) 2345202 / 2345028 (O), फैक्स/Fax : (0657) 2345213
ई-मेल/e-mail : director@nmlindia.org, वेबसाइट/Website : www.nmlindia.org
Working Days : Monday to Friday (09.15 am - 05.45 pm)

Message from Guest of Honor

राष्ट्रीय प्रौद्योगिकी संस्थान जमशेदपुर
National Institute of Technology Jamshedpur
(शिक्षा मंत्रालय, भारत सरकार के अधीन राष्ट्रीय महत्व का संस्थान)
(An Institute of National Importance under Ministry of Education, Government of India)

In the realm of mechanical engineering, the future is tightly intertwined with Industry 4.0 and the pursuit of carbon-free energy technologies. Industry 4.0, characterized by the integration of advanced digital technologies into manufacturing, promises a paradigm shift. Smart factories will leverage AI, IoT, and robotics to optimize production processes, enhance quality control, and enable predictive maintenance. Digital twins, virtual representations of physical assets, will allow for real-time simulations and testing, revolutionizing product design and efficiency.

Moreover, the transition to carbon-free energy sources is paramount. Mechanical engineers are at the forefront of developing renewable energy technologies such as wind turbines, solar panels, and advanced energy storage systems. Innovations in materials science are crucial for enhancing the efficiency and durability of these technologies. For instance, lightweight materials and advanced composites are enabling the design of more efficient wind turbine blades and solar panels.

Furthermore, the integration of mechanical engineering with emerging fields like nanotechnology holds promise for further breakthroughs. Nano-materials could revolutionize energy storage, catalysis, and water purification systems, contributing to sustainable development goals.

In essence, the future of mechanical engineering lies in harnessing digitalization and sustainable practices. As the world moves towards a greener economy, mechanical engineers will play a pivotal role in designing and implementing innovative solutions that are both technologically advanced and environmentally sustainable.

I wish the conference a grand success with pan India participation and representation from academia and industry and wish that the organizers plan to conduct the second edition of the same conference next year with even greater success.

With Warm Regards

[redacted]

Prof. Sanjay
Head Of Department
Department of Mechanical Engineering
NIT Jamshedpur

Message from the Vice-Chancellor

It is my great pleasure to welcome you to the National Conference on Recent Trends in Machine, Manufacturing, Modeling, and Technology (RTMMMT-2024) organized by the Department of Mechanical Engineering, School of Engineering & IT at Arka Jain University.

In today's rapidly evolving technological landscape, the significance of continuous research and innovation cannot be overstated. RTMMMT-2024 is a testament to our commitment to advancing knowledge and fostering innovation in the fields of machine design, manufacturing technologies, and modeling techniques.

Our goal with RTMMMT-2024 is to create an environment where innovative ideas can flourish, collaborations can be forged, and knowledge can be disseminated widely. The diverse range of topics covered in this conference highlights the interdisciplinary nature of modern engineering challenges and underscores the importance of a holistic approach to technological development.

We are delighted to have participants from various backgrounds, including delegates, research scholars, industrialists, academia, and students. Your active involvement and contributions are vital to the success of this conference. I am confident that the discussions, presentations, and interactions that will take place over the course of this event will lead to significant advancements and fruitful collaborations.

I extend my heartfelt thanks to the organizing committee, keynote speakers, authors, and participants for their efforts and enthusiasm in making RTMMMT-2024 a reality. Your dedication and hard work are deeply appreciated.

I encourage you to take full advantage of the opportunities presented by this conference, engage in meaningful discussions, and explore new avenues for research and collaboration. Together, let us strive to push the boundaries of what is possible and drive innovation in machine, manufacturing, modeling, and technology.

Once again, welcome to RTMMMT-2024. I wish you all a productive and inspiring conference.

Warm regards,

Prof. (Dr.) Easwaran Iyer
Vice Chancellor
Arka Jain University Jharkhand

Message from the Chairperson of Board of Management

On behalf of the Board of Management of Arka Jain University, it is my distinct honor to welcome you to the National Conference on Recent Trends in Machine, Manufacturing, Modeling, and Technology (RTMMMT-2024).

In an era defined by rapid technological advancements and dynamic shifts in the engineering landscape, the importance of such a conference cannot be overstated. RTMMMT-2024 is an invaluable opportunity for us to gather, share, and build upon the collective knowledge and innovations in the fields of machine design, manufacturing technologies, and modeling techniques.

Our university is deeply committed to fostering an environment that promotes cutting-edge research and innovation. This conference is a reflection of our dedication to bringing together experts from academia, industry, and research institutions to exchange ideas and explore new frontiers. The diverse range of topics covered in this conference underscores the interdisciplinary nature of the challenges and opportunities we face today.

I am particularly pleased to see the wide array of participants, including delegates, research scholars, industrialists, academia, and students. Your presence and active participation are what make this conference a success. The exchange of ideas, presentation of research, and collaborative discussions that will take place over the next few days are crucial for advancing our collective understanding and for driving technological progress.

I would like to extend my heartfelt gratitude to the organizing committee, keynote speakers, authors, and all participants for their dedication and hard work in making RTMMMT-2024 a reality. Your commitment to excellence is truly commendable.

I encourage all participants to engage fully with the conference, to share your insights and experiences, and to seek out new collaborations and partnerships. Let us use this platform to inspire and be inspired, to innovate and to drive forward the frontiers of knowledge in machine, manufacturing, modeling, and technology.

Welcome to RTMMMT-2024. I wish you all an enriching and productive conference experience.

Best regards,

Prof. (Dr.) S.S. Razzi
Chairperson, Board of Management
Arka Jain University

Message from the Desk of the Director cum Registrar:

Dear Participants, Esteemed Guests, and Colleagues, It is with great enthusiasm that I welcome you to the National Conference on "Recent Trends in Machine, Manufacturing, Modeling, and Technology (RTMMMT-2024)" organized by the Department of Mechanical Engineering, School of Engineering & IT at Arka Jain University.

In a time when technological innovation is crucial to addressing the complex challenges of our world, RTMMMT-2024 stands as a beacon of progress and collaboration. This conference is designed to bring together the brightest minds in the fields of machine design, manufacturing technologies, and modeling techniques, providing a dynamic platform for the exchange of ideas and the advancement of knowledge.

The objective of RTMMMT-2024 is not only to showcase the latest research and developments but also to foster a spirit of collaboration among participants from diverse backgrounds, including academia, industry, and research institutions. It is through such interdisciplinary interactions that we can push the boundaries of what is possible and drive meaningful progress in our respective fields.

I am particularly delighted by the participation of delegates, research scholars, industrialists, academia, and students. Your contributions are the cornerstone of this conference's success. The discussions, presentations, and networking opportunities provided by RTMMMT-2024 are invaluable for fostering innovation and establishing long-lasting professional relationships.

I would like to extend my sincere gratitude to the organizing committee, keynote speakers, authors, and all participants for their unwavering commitment and hard work in bringing this conference to fruition. Your dedication to excellence is deeply appreciated and instrumental in making RTMMMT-2024 a landmark event.

I encourage all attendees to actively engage with the conference, to share your insights and experiences, and to explore new avenues for research and collaboration. Let us seize this opportunity to learn from one another and to contribute to the advancement of machine, manufacturing, modeling, and technology.

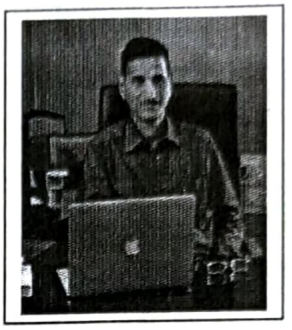
Welcome to RTMMMT-2024. I wish you a fruitful and inspiring conference experience.

a.k.shrivastav

Warm regards,

Dr. Amit Kumar Shrivastav
Registrar
ARKA JAIN University Jharkhand

Message from the Desk of the Dean of Student Welfare:



It is with great pleasure that I welcome you to the National Conference on "Recent Trends in Machine, Manufacturing, Modeling, and Technology (RTMMMT-2024)" at Arka Jain University. As the Dean of Student Welfare, I am particularly excited about the opportunities this conference presents for our students, alongside the distinguished professionals, researchers, and academicians gathered here.

RTMMMT-2024 isa platform that not only highlights the latest advancements in machine design, manufacturing technologies, and modeling techniques but also emphasizes the importance of nurturing young minds and future leaders in these fields. The conference provides a unique opportunity for our students to learn from experts, engage in meaningful discussions, and gain insights into cutting-edge research and developments.

One of our primary goals at Arka Jain University is to create an environment where students can thrive academically, professionally, and personally. This conference is an integral part of that mission, offering students a chance to showcase their research, network with industry leaders, and explore potential career pathways. The interactions and experiences gained here will undoubtedly contribute to their growth and development.

I am immensely proud of the dedication and enthusiasm shown by our students, faculty, and staff in organizing RTMMMT-2024. Their hard work and commitment to excellence have been instrumental in bringing this event to life. I also extend my heartfelt thanks to the keynote speakers, authors, and all participants for their valuable contributions and engagement.

To our students, I encourage you to make the most of this opportunity. Participate actively in the sessions, ask questions, and seek out new knowledge and connections. This conference is a stepping stone towards your future success, and I am confident that you will rise to the occasion.

Welcome to RTMMMT-2024. I wish everyone an inspiring, educational, and rewarding conference experience.

Warm regards,

Dr. Angad Tiwary
Dean of Student Welfare
Arka Jain University

Message from the Convener

It is my great honor and pleasure to welcome you to the National Conference on Recent Trends in Machine, Manufacturing, Modeling, and Technology (RTMMMT-2024), organized by the Department of Mechanical Engineering, School of Engineering & IT at Arka Jain University.

RTMMMT-2024 is designed to be a premier platform for the exchange of innovative ideas, research findings, and advancements in the fields of machine design, manufacturing technologies, and modeling techniques. This conference brings together a diverse group of experts, researchers, academicians, and industry professionals to foster collaboration and inspire new directions in these dynamic fields.

The primary objective of this conference is to facilitate a robust dialogue and knowledge exchange among participants. By providing opportunities for face-to-face interactions, we aim to build lasting connections, spark new research collaborations, and explore potential partnerships. The comprehensive range of topics covered in this conference highlights the interdisciplinary nature of our challenges and the innovative solutions required to address them.

I am particularly excited about the active involvement of delegates, research scholars, industrialists, academia, and students. Your participation is crucial to the success of this conference, and I am confident that the insights and experiences shared here will contribute significantly to the advancement of our collective knowledge and practices.

Organizing RTMMMT-2024 has been a remarkable journey, and I would like to extend my heartfelt gratitude to the organizing committee, keynote speakers, authors, and all participants for their dedication and hard work. Your contributions are the driving force behind this conference's success.

As Convenor, I encourage all attendees to engage fully with the sessions, participate in discussions, and take advantage of the networking opportunities available. Let us make RTMMMT-2024 a milestone event that not only advances our understanding but also inspires future innovations in machine, manufacturing, modeling, and technology.

Welcome to RTMMMT-2024. I wish you all a productive, enlightening, and enjoyable conference.

Warm regards,

Dr. Ashwini Kumar
Convenor
Assistant Dean
School of Engineering & IT

Keynote Speaker

Dr. Vishesh Ranjan Kar
Assistant Professor
Department of Mechanical Engineering
National Institute of Jamshedpur
Topic: Hetrogenous Material Applications and Challenges

Dr. Deepak Kumar Naik
Assistant Professor
Department of Mechanical Engineering
National Institute of Srinagar
Topic: Plasma Arc Cutting Process of Sailhard Steel

Dr. Sudhansu Ranjan Das

Associate Professor

Department of Production Engineering

Veer Surendra Sai University of Technology, Burla

Topic: Comparative performance evaluation between HSN2-TiALxN and TiCN coated carbide tools in hard turning of AISI D6 Steel

Dr. Thomas Benedict

Associate Professor Senior

Department of Design & Automation

School of Mechanical Engineering

VIT Vellore

Topic: Vibration Analysis of Functionally Graded Nanocomposite Structures

CHIEF PATRON

Dr. Easwaran Iyer, V. C. AJU

PATRON

Dr. Amit Kumar Srivastava, Director Cum Registrar, ARKA JAIN University, Jharkhand
Prof. (Dr.) S. S. Razi, Chairman, Board of Management, ARKA JAIN University Jharkhand
Mrs. Richa Garg, Chief Finance Officer, ARKA JAIN University, Jharkhand
Dr. Angad Tiwary, Director Campus & Dean Student Welfare, ARKA JAIN University, Jharkhand

ADVISORY COMMITTEE

Dr. Jasbir Dhanjal, Joint Registrar, ARKA JAIN University, Jharkhand

Dr. Praveen Kumar Thakur, Professor & Controller of Examinations, ARKA JAIN University, Jharkhand

Dr. Arvind Kumar, Director , IQA Cell and H.O.D CS & IT ARKA JAIN University, Jharkhand

Prof. Somnath Chattopadhyaya (IITD hanbad)

Prof. Afzal Ahmad (IIT Palkkad)

Prof. Sanjay (NIT Jamshedpur)

Dr. Vishesh Ranjan Kar (NIT Jamshedpur)

Prof. S. K. Panda (NIT Rourkela)

Prof. Akhtar Khan (IITDM Karnool)

Prof. Sourav Chandrakar (NIT Suratkal)

Prof. Apurv Sharma (IIT Roorkee)

Dr. Dulari Hansada (NIT Jamshedpur)

Prof. Amaresh Kumar (NIT Jamshedpur)

Dr. Tushar Banerjee (NITJamshedpur)

Dr. Ashok Mandal (NIT Jamshedpur)

Dr. Deepak Kumar Naik (NIT Srinagar)

Dr. Mukesh Kumar Sharma (BIT Mesra)

Prof. K. Jaikrishnan (VIT Vellore)

Dr. Amitesh Kumar (NIAMT/NIFFTRanchi)

Dr. Umesh Khandey (NIAMT/NIFFT Ranchi)

Dr. Arun Thakur (NIAMT/NIFFT Ranchi)

Prof. Apurab Layek (NIT Durgapur)

Dr. Abhishek Sharma (BITSindri)

Dr. M. Rajesh (VIT Vellore)

Dr. Arun Beura (VIT Vellore)

Prof. D. B. Laata (CUJ Ranchi)

Dr. Ajit Kumar Singh (IIT Dhanbad

REVIEWER COMMITTEE

Dr. Anup Kumar, Asst. Prof., Department of Mechanical Engineering, ARKA JAIN University, Jharkhand

Dr. Viranshu Kumar, Asst. Prof., Department of Electrical and Electronics Engineering, ARKA JAIN University, Jharkhand

Basant Kumar Das, Asst. Prof., Department of Electrical and Electronics Engineering, ARKA JAIN University, Jharkhand

Naresh Sharma, Asst. Prof., Department of Electrical and Electronics Engineering, ARKA JAIN University, Jharkhand

EDITORIAL COMMITTEE

Dr. Anupam Kumari, Associate Professor, Department of Mechanical Engineering, ARKA JAIN University, Jharkhand

Dr. Anup Kumar, Assistant Professor, Department of Electrical and Electronics Engineering, ARKA JAIN University, Jharkhand

Mr. Nivedan Mahato Assistant Professor Department of Electrical and Electronics Engineering, ARKA JAIN University, Jharkhand

Dr. Kuldip Kumar sahu Asst. Prof., Department of Mechanical Engineering, ARKA JAIN University, Jharkhand

Mr. Basant Kumar Das , Asst. Prof., Department of Mechanical Engineering, ARKA JAIN University, Jharkhand

Dr Viranshu Kumar Asst. Prof., Department of Mechanical Engineering, ARKA JAIN University, Jharkhand

Mr. Mukesh Kumar Asst. Prof., Department of Mechanical Engineering, ARKA JAIN University, Jharkhand

CONVENOR

Dr. Ashwini Kumar, Asst.Dean, Department of Mechanical engineering Engineering, ARKA JAIN University, Jharkhand

Email- dr.ashwinid@arkajainuniversity.ac.in |

CO- CONVENOR

Dr Anupam Kumar, Assosiate Professor, Department of Mechanical Engineering, ARKA JAIN University, Jharkhand

Email: dr.anupam@arkajianuniversity.ac.in |

Dr Kuldip Sahu, Assistant Professor Department of Mechanical Engineering, ARKA JAIN University, Jharkhand

Email. : dr.kuldip@arkajianuniversity.ac.in |

ORGANIZING COMMITTEE

Dr. Anupam Kumari, Associate Professor, Department of Mechanical Engineering, ARKA JAIN University, Jharkhand

Dr Anup Kumar, Assistant Professor, Department of Electrical and Electronics Engineering, ARKA JAIN University, Jharkhand

Mr.Nivedan Mahato Assistant Professor Department of Electrical and Electronics Engineering, ARKA JAIN University, Jharkhand

Dr. Kuldip Kumar sahu Asst. Prof., Department of Mechanical Engineering, ARKA JAIN University, Jharkhand

Mr. Basant Kumar Das , Asst. Prof., Department of Mechanical Engineering, ARKA JAIN University, Jharkhand

Dr Viranshu Kumar Asst. Prof., Department of Mechanical Engineering, ARKA JAIN University, Jharkhand

Mr. Mukesh Kumar Asst. Prof., Department of Mechanical Engineering, ARKA JAIN University, Jharkhand

Prof. Ranjeet Kumar, Asst. Prof., Department of Mechanical Engineering, ARKA JAIN University, Jharkhand

TECHNICAL SUPPORT COMMITTEE

Mr. Asish Jha, Department of Mechanical Engineering, ARKA JAIN University, Jharkhand

Mr. Suraj Pandit, Department of Mechanical Engineering, ARKA JAIN University, Jharkhand

Ms. Megha Srivastava, Department of CS and IT Engineering, ARKA JAIN University, Jharkhand

Mr. Abhijit Mandal, Department of Civil Engineering, ARKA JAIN University, Jharkhand

Ms, Aishwarya , Technical Assistant, Department of Mechanical Engineering, ARKA JAIN University

Mr. Arshad, Technical Assistant. Department of Electrical and Electronics Engineering ,ARKA JAIN University, Jharkhand

Ms. Richa Rani, Technical Assistant, Department of Electrical and Electronics Engineering ,ARKA JAIN University, Jharkhand

Md .Iqbal Ansari, Department of Mechanical Engineering, ARKA JAIN University, Jharkhand

Md. Nasim Ansari, Department of Electrical and Electronics Engineering, ARKA JAIN University, Jharkhand

IT Team, ARKA Jain University, Jharkhand

Index

RTAJU_2401

Campbell Diagrams for SiCf/SiC Blades and IN718 Blades: A Comparative Analysis

Souvik Singh Rathore, Nivedan Mahato
ARKA JAIN University – Jharkhand

Corresponding Email- souvik.r@arkajainuniversity.ac.in

Abstract

This paper reports a comparative vibration analysis of Ceramic Matrix Composite (SiC_f/SiC) gas turbine blades with nickel-based superalloy (IN718) gas turbine blades. For this, aerofoil-shaped pre-twisted cantilevered 3-D blade models representing the actual rotating blades mounted on the rotating hub of the gas turbine are considered. The material properties for SiC_f/SiC material are computed using extended Voigt's micromechanical model, and the material properties for IN718 properties are obtained from a published research article. The finite element-based rotating 3-D blade model built in Ansys APDL computational environment is used to compute the vibrational frequencies. Finally, the Campbell diagrams for the two blades are compared.

Keywords: gas turbine blades, Campbell Diagrams, Voigt's micromechanical model, Ansys APDL, vibration

RTAJU_2402

The Paradigm Shift from Industry 4.0 to 5.0: The Next Industrial Revolution

Suresh Tiwari[1], Pulkit Srivastava[2]
[1]Departement of Mechanical Engineering (PhD Scholar)
(Jharkhand University of Technology, Ranchi-834010)
{Corresponding author email: suresh.mech2k@gmail.com }

[2]Department of Mechanical Engineering (Assistant Professor)
(Noida Institute of Engineering & Technology)
(KP-2, Greater Noida, UP 201306)
{email: srivastavapulkit@gmail.com }

Abstract:

This review paper examines the emerging transition from Industry 4.0 to Industry 5.0, marking a significant paradigm shift in manufacturing and industrial processes. While Industry 4.0 focused on digitalization, interconnectivity and automation, Industry 5.0 introduces a more human-centric approach that emphasizes the synergy between humans and machines. This paper examines the core principles and achievements of Industry 4.0, including the Internet of Things (IoT), artificial intelligence (AI) and cyber-physical systems(CPS). The paper then explores the limitations of Industry 4.0 and the factors precipitating the shift towards Industry 5.0. Key aspects of Industry 5.0, such as human-machine collaboration, personalized manufacturing, and sustainable production, are discussed in detail. The paper also investigates the role of advanced technologies such as artificial intelligence, cognitive automation, digital twins and flexible manufacturing systems in enabling mass customization and personalized production.

Keywords:

Automation; Artificial Intelligence; Industry 4.0; Industry 5.0; Sustainable production; etc

RTAJU_2403

Advanced Analysis of Flexible Tapered Functionally Graded Beams: Nonlinear Deflection and Material Interactions

Abhay Kumar, Kunal Karan , Nivedan Mahato
ARKA JAIN University-Jharkhand
Nivedam.m@arkajainuniversity.ac.in

Abstract:

This research investigates the substantial deflection characteristics of flexible tapered functionally graded beams. Our study involves deriving a comprehensive nonlinear second-order differential equation that governs the beam's shape. This equation accounts for geometric nonlinearities arising from significant deflections, as well as considerations of infinitesimal local displacements and local rotation effects. Moreover, we incorporate the distinct physical properties inherent to functionally graded materials (FGMs). The primary objective of this work is to advance understanding regarding the mechanical behavior of FGM beams under substantial deflection conditions. By integrating these elements into our analysis, we aim to provide a robust framework that captures the complex interactions between beam geometry, material composition variations, and nonlinear deformation effects. Our findings contribute significantly to the field by elucidating how FGMs behave structurally when subjected to large deflections. This includes insights into how material gradients influence the beam's response to applied loads and environmental conditions. Such knowledge is crucial for optimizing the design and performance of FGM structures in practical engineering applications, where flexibility and resilience are key considerations.

Keywords: Large deflection, tapered beams, nonlinear analysis, functionally graded materials, mechanical response.

RTAJU_2404

Effect of Sensitization on Warm Forged Austenitic Stainless Steel Welded Joint

Viranshu Kumar 1, Mukesh Kumar Sharma1
[1]Assistant Professor, Department of Mechanical Engineering, Arka Jain University, Jamshedpur
dr.viranshu@arkajainuniversity.ac.in, mukesh.s@arkajainuniversity.ac.in

Abstract

The aim of this work is to study Sensitization Behavior of AISI 304L stainless steel with varying normalization time. Yield strength, Ultimate tensile strength, percentage of elongation and toughness across the weld has been reported. The tensile and impact properties of the welded joints have been evaluated using Electro mechanical controlled Universal Testing Machine and Pendulum type Impact Testing Machine. The microstructures of the sensitized samples, are analyzed using an optical microscopy. From this investigation, the following important results are derived: The yield strength, tensile strength, and impact toughness of austenitic stainless steel remarkably decreased as the temperature was increased.The microstructures of sensitized samples indicate that carbide precipitation increases with increasing time and normalization temperature;elements treated at 850°C with a 2 h holding time and then cooled in air are the most sensitized.

Key words: *Non-destructive technique, microstructure, sensitization, Hardness.*

RTAJU_2405

The Free Vibration Characteristics of A Functionally Graded Corrugated Composite Panel

Nivedan Mahato

[a]*ARKA JAIN University-Jharkhand,India*

Abstract

This study investigates the free vibration behavior of a composite panel that is functionally graded and sinusoidally corrugated. The functionally graded panel in this analysis is composed of ceramic on top and metal at the bottom, as well as a metal/ceramic phase between the top and bottom surfaces. The volume fractions of each material element are computed using the power-law distribution, while the effective material properties of the in-homogenous functionally graded material are obtained using the basic rule-of-mixture. Eight-noded shell elements (SHELL281) are used in the finite element analysis and modeling of the corrugated panel (ANSYS APDL). Six degrees of freedom in first-order shear deformation theory are used to express the displacement field. The corrugated panel's free vibration responses are obtained using the Block-Lanczos method. The comparison research, which compares the current results with the previously published results, demonstrates the accuracy of the current model. Furthermore, multiple examples are provided to demonstrate the effects of various geometrical and material characteristics, such as side-to-thickness ratio, corrugation, aspect ratio, power-law index, and support conditions, on the free vibration behavior of corrugated panels.

***Keywords:** Corrugation; Free vibration; FGM; ANSYS APDL; Block-Lanczos.*

RTAJU_2406

Design & Development on Four Wheel Steering Mechanism

Atul Kr. Jha, Anup Kumar*, Amit Prakash Sen
Arka Jain University, Jamshedpur
* Corresponding author: dr.anup@arkajainuniversity.ac.in

Abstract

In today's automotive landscape, the prevalent two-wheel steering system remains the standard, yet its efficiency pales in comparison to the four-wheel steering (4WS) alternative. This project aims to demonstrate the superiority of 4WS over 2WS, particularly concerning turning radius. Four-wheel steering represents a significant advancement in automotive engineering, striving to achieve nearly neutral steering characteristics. Especially in scenarios such as navigating tight city streets, parking in cramped spaces, and negotiating heavy traffic at low speeds, conventional vehicles with their larger wheelbase and track width encounter substantial manoeuvrability challenges. Therefore, there's a pressing need for a mechanism capable of reducing turning radius, a goal attainable through the adoption of four-wheel steering. In this study, the Maruti Suzuki 800 serves as the benchmark vehicle. The primary objective is to synchronize the rear wheel movement with the front wheels, achieved through the development of a mechanism comprising two bevel gears and an intermediate shaft capable of transmitting 100% torque while effecting out-of-phase rotation of the rear wheels. This mechanism underwent modelling in CATIA, with motion simulations conducted using ADAMS. Subsequently, a physical prototype was constructed and tested for cornering performance via constant radius tests, revealing a 50% reduction in turning radius when operating at a low speed of 10 kmph.

In today's context, the escalating challenges posed by urban traffic necessitate a revaluation of vehicle steering mechanisms. Manoeuvring through congested or narrow spaces demands responsive steering, which can be facilitated by alternative solutions. This entails leveraging energy-efficient innovations aligned with consumer needs. Urban driving scenarios accentuate the limitations of traditional vehicles with their wider track width and longer wheelbase, especially evident in low-speed cornering. The implementation of four-wheel steering addresses these issues by effectively reducing the vehicle's turning radius, thus enhancing its agility in confined spaces.

Keywords: Automotive, Four-wheel steering systems, CATIA, ADAMS

RTAJU_2407

Comparative Study of Solution Heat Treatment on Microstructure And Mechanical Properties of Al-Sic Metal Matrix Composites

Kuldip Kumar Sahu1, Sapan Kumar Dutta2
[1]*Department of Mechanical Engineering, SOE&IT*
Arka Jain University Jharkhand
[1]dr.kuldip@arkajianuniversity.ac.in

[2] *Department of Mechanical Engineering*
GGSESTC Bokaro, Jharkhand
[2]sapan dutta02@gmail.com

ABSTRACT

Solution heat treatment is a critical process in enhancing the mechanical and thermal properties of Aluminium-Silicon Carbide (Al-SiC) Metal Matrix Composites (MMC). This treatment involves heating the composite to temperatures above the solvus temperature of the aluminium alloy, leading to dissolution of SiC particles into the aluminium matrix. The dissolution promotes solid solution strengthening, resulting in improved strength, hardness, and wear resistance. The microstructural changes during solution heat treatment include the formation of a homogeneous solid solution, dissolution of existing precipitates, and potential grain coarsening. The primary crystallographic change during solution heat treatment is the formation of a solid solution between aluminium and any alloying elements present in the matrix. At elevated temperatures, typically above the solvus temperature of the alloy, the reinforcement materials (such as silicon carbide, alumina, or other metals) dissolve into the aluminium matrix. This dissolution occurs at atomic or submicron levels, leading to the formation of a homogeneous solid solution. These changes significantly influence the mechanical properties of Al-SiC MMCs, such as increased tensile strength, improved fatigue resistance, and enhanced creep performance. However, careful control of solution heat treatment parameters, such as temperature and soaking time, is crucial to achieve optimal material properties without detrimental effects like excessive grain growth or alloy over-aging. The abstract emphasizes the importance of solution heat treatment as a key step in tailoring Al-SiC MMCs for high-performance applications in aerospace, automotive, and structural engineering sectors, where superior mechanical properties and reliability under demanding conditions are essential.

Keywords— Solution Heat Treatment, Aluminium Metal Matrix Composite, Aging Heat Treatment, Artificial Aging. Al-SiC Composite.

RTAJU_2409

The Next Chapter: Delving into AI's Contribution to Content Creation

Prof. Gouri Shankar Paul
Assistant Professor
RVS College of Engineering & Technology
Jamshedpur, Jharkhand
Email: pgourishankar67@gmail.com

Abstract

The integration of Artificial Intelligence (AI) technologies has experienced substantial growth in recent years, resulting in a revolution across various industries, including content writing. This abstract examines the emerging trends, methodologies, and implications associated with the incorporation of AI into content creation. AI-powered content creation tools provide a wide range of capabilities beyond text generation, including keyword optimization, content personalization, and sentiment analysis. These tools equip writers to produce content that appeals to target demographics and adheres to Search Engine Optimization (SEO) best practices. Furthermore, AI-driven content duration platforms facilitate content ideation by scouring the internet for relevant topics and trending themes, thereby promoting creativity and diversity in content creation. At this juncture, it may be opportune to address the potential usefulness of AI in writing scientific papers, a topic that arises from recent questioning and exploration of ChatGPT-4.0.

In summary, this abstract highlights the potential of AI to transform content writing and emphasizes the need for continuous innovation, ethical guidelines, and human oversight to maximize the effectiveness of its application. As AI continues to advance, content creators must adapt to leverage its benefits while preserving the authenticity of their craft.

Keywords: *Artificial intelligence, ChatGPT, Editing, OpenAI, Paper writing, SEO*

RTAJU_24010

Examining the Fatigue, Wear, and Corrosion Resistance of Friction Stir-Welded Aluminum Metal Matrix Composites:A Review

Mohammad Akhtar1 , Kuldip Kumar Sahu2
[1]Lecturer, Al-Kabir Polytechnic Jamshedpur
[1]aktr.isr@gmail.com
[2]Asst. Professor, Arka Jain University Jharkhand
[2]dr.kuldip@arkajainuniversity.ac.in

Abstract In recent decades, aluminum steel matrix composites (AMMC) have seen significant growth in the aerospace, aeronautical, military, and automotive industries due to its exceptional combination of low weight, superior strength, and durability. Researchers have endeavored to improve the durability, strength, and resistance to corrosion of AMMC by using friction stir welding (FSW). Furthermore, many investigations have examined the mechanical and microstructural properties of friction stir welded lightweight aluminum matrix composites (FSW AMMC). These investigations have specifically identified the impact of operational variables such as spindle speed, feed rate, tool shape, and tilt angle. However, there is still a need to comprehend the corrosion, fatigue, and wear characteristics of various friction stir bonded AMMCs in order to fully recognize their qualities. This research aims to fill the current knowledge gap by examining the damage patterns of friction mix welded aluminum matrix composite joints in response to various processing issues, including welding speed, material feed rate, and equipment configuration. Furthermore, it investigates the fatigue resistance and wear characteristics of friction stir welded aluminum matrix composites, taking into account the latest advancements and technology in the area of friction stir welding.

Keywords: *Aluminum metal matrix composite, Friction stir welding, Corrosion, Fatigue, Wear*

RTAJU_24011

Manufacturing of Helmet Using Epoxy Based Composite Material

Naresh sharma1 Asst. Professor
Dept. of Mechanical Engineering ARKA Jain University Jamshedpur

.Abstract.

Recently, composite materials are prepare using natural cellulose fibers with matrix Which have attracted the eye of researchers thanks to their rarity with high specific mechanical strengths, availability, renewability, degradable and being environmental- friendly. This work attempts to form a typical specimen for tensile test and impact test methodology and materials wont to have better mechanical properties also on enhance the compatibility between fibers and therefore the matrix. The composite are prepared with the Epoxy matrix and fibers of sisal using hand lay-up method. The fabricated specimen are planned to gauge its mechanical properties like lastingness, Impact strength and finding application of prepared material.

Keywords: *Friction, Tensile test, Epoxy resin, Sisal Fiber, Bending.*

RTAJU_24012

An Overview: Challenges of Sustainable Manufacturing

Mukesh Kumar Sharma[1], Viranshu Kumar[1], Basant Kumar Das[1]
[1]Assistant Professor, Department of Mechanical Engineering, Arka Jain University, Jamshedpur
dr.viranshu@arkajainuniversity.ac.in, mukesh.s@arkajainuniversity.ac.in

Since the publication of the Brundtland Report in 1987, sustainable development has become increasingly important for companies worldwide. Sustainable production practices are designed to improve production efficiency, minimize environmental impact and maintain social equity. Research consistently shows that companies that embrace sustainability not only benefit society and the environment, but also reap significant business benefits such as improved product quality, increased market share and improved profitability.

However, the integration of sustainable practices into production activities entails several challenges for companies. One of the main obstacles is the initial investment required to switch to sustainable technologies and processes. Updating equipment, introducing new production methods and training employees creates costs that can strain budgets, especially in small businesses with limited resources. In addition, it is often believed that sustainable practices can threaten operational efficiency. Companies fear that focusing on environmental and social responsibility may lead to a decrease in productivity or an increase in production costs. Balancing sustainability and profitability remains a delicate task that requires careful planning and strategic decision-making.

Another major challenge is regulatory compliance. Environmental regulations are becoming stricter around the world and require strict standards to be met. Failure to do so can result in fines, legal liability and reputational damage, so it is imperative that companies keep up with changing regulations and adapt their practices accordingly.

In addition, the complexity of the supply chain hinders sustainability efforts. Many producers rely on global supply chains characterized by different stakeholders and different environmental standards. Ensuring that all suppliers follow sustainable practices can be daunting, requiring transparency, collaboration and sometimes restructuring of supplier relationships.

Keywords: sustainable manufacturing, sustainability, environment, life-cycle, environment

RTAJU_24013

Exploratory Investigation of Intensity Move and Contact Figure Twofold Line Intensity Exchanger Utilizing Wound Tape Supplement at Various Positions

Ranjeet Kumar,Ashwini Kumar
Assistant Professor Mechanical Engineering
ARKA JAIN University,Jamshedpur Jamshedpur
ranjeet.k@arkajainuniversity.ac.in, dr.ashwini@arkajainuniversity.ac.in

ABSTRACT

This trial examination of Intensity move and grating variable in twofold line heat exchanger utilizing wound tape with turn at various length position has been surrendered. In twofold line heat exchanger the hot liquid is gone through internal cylinder and cold liquid is passed in external cylinder. The external layer of inward line go about as isolating layer to try not to blend of two liquids. A relative report examination was finished to assess the impact of turned tape with contort at various length with plain cylinder without embed on the intensity move rate. Likewise, Nusselt number and grating element through roundabout line involving water as testing liquid with a scope of Reynolds number between 5500-14500. The outcome shows that the intensity move qualities of twofold line heat exchanger were upgraded with wound tape having most extreme wind while frictional opposition likewise expanded simultaneously. Most extreme expansion in heat move rate was viewed as 52.33% for full length curve, 29.9% for substitute turn; first half was 29.76% though 14.58% for final part wind concerning plain cylinder. Nusselt number shifts from 75.49 to 100.36 for turned tape with the most extreme worth of 100.36 for full length contort at Reynolds number 14500, and frictional component changes from 0.3215 to 0.139 for bent tape with curve at various length positions; though for plain cylinder it was 0.028-0.036 and the full length bend tape is found 8.78 times higher than plane cylinder, last part wind is 7.1 times, for substitute wind is 6.91 times, and 6.2 times for first half bend at Re= 5500. The exhibition assessment standards was viewed as diminishing with expansion in Reynolds number it was recorded 0.900 to 0.9361 for bent tape with bend at various length. PEC for full length turned tape was viewed as 20.32%, for substitute wind is 6.10%, for first half curve is 12.34% more than the final part contort. Wound tape put in first half improves more intensity move rate than the put in final part.

Key words: *Heat transfer characteristics, Nusselt number, friction factor, performance evaluation criteria, insert twisted tape.*

RTAJU_24014

Bending Of Thick, Sophisticated Composite Plates By Analytical Modeling

Nivedam Mahto
ARKA JAIN University-Jharkhand

Abstract

An effective and novel high-order shear and normal deformation theory for the study of functionally graded plates under free and static vibration is presented in this work. Here, the equations of motion are derived using the Hamilton's principle. The current theory is easier to utilize because there are fewer unknowns and governing equations. The current plate theory method satisfies the zero traction boundary requirements on the plate surfaces and takes into consideration both transverse shear and normal deformations without the need for a shear correction factor. In contrast to other shear and normal deformation theories, which contain five or more unknown functions, the displacement field theory only involves four. By contrasting it with other closed form solutions found in the literature, the suggested solution's accuracy is verified.

Keywords: ***Functionally graded plates, Normal deformations, Hamilton's principle, Shear deformation theory***

RTAJU_24015

Comparative Analysis of Hybrid and Traditional Manufacturing Methods

– A study at Tata Motors, Jamshedpur

Vivek Kumar#
#*Student (M.Tech, Manufacturing), ARKA Jain University, Jamshedpur*
[1]vivek007733@gmail.com

Abstract

This research paper presents a detailed comparative analysis of hybrid and traditional manufacturing methods at Tata Motors' Jamshedpur facility, a key player in the Indian automotive sector. The study evaluates the performance differences between these methods based on critical metrics such as production speed, setup time, material usage, and operator skill level. Data were meticulously collected from various production units within the facility, where both manufacturing techniques are actively utilized. Statistical analyses using SPSS were employed to rigorously assess the efficiency, quality, and resource utilization of each method. The results reveal that hybrid manufacturing methods significantly enhance production speed and reduce material waste, demonstrating superior efficiency in these areas. However, traditional methods outperform in terms of setup time and necessitate lower operator skill levels, indicating their continued relevance in certain production contexts. The findings underscore the potential of hybrid manufacturing to improve overall production efficiency and sustainability, although the initial transition may require substantial training and capital investment. This case study of Tata Motors Jamshedpur offers valuable insights into the practical implementation of hybrid manufacturing in a large-scale automotive manufacturing environment, providing a blueprint for other manufacturers considering similar technological integrations. The research contributes to the broader understanding of manufacturing process optimization and the evolving landscape of industrial production.

Keywords: Hybrid manufacturing, traditional manufacturing, Tata Motors, Jamshedpur, production efficiency, material usage, setup time, operator skill level, SPSS analysis.

Optimizing Solar PV Panel Efficiency via IOT-Enabled Parameter Analysis

Siju George Student
LNCT University Bhopal,India siju.3001@gmail.com
Dr Anand Singh Professor,Electrical & Electronics Department
LNCT, Bhopal Bhopal,India
anand24883singh@gmail.com
Dr. Keerti Rai Associate Professor
Department of Electrical and Electronics Engineering Arka Jain University

This research work proposed a control procedure for power quality in connected PV- Solar Panel Temperature And Humidity Using Nodemcu based framework with ESP8266 is introduced. IoT-based Parametric Evaluation of Solar PV Panel aims to enhance the efficiency and performance monitoring of solar photovoltaic (PV) panels through the integration of Internet of Things (IoT) technologies. Solar PV panels are widely usedfor harnessing renewable energy, but their performance can be affected by various factors such as shading, dust accumulation, and aging. Therefore, continuous monitoring and evaluation of PV panel parameters are crucial to ensure optimal energy generation.

***Keywords: IOT*, Solar PV, nodemcu, blynk**

RTAJU_24017

Digital Manufacturing: Applications - Past, Present, and Future Trends

Md Arif Razaa, Sunkara Tejaswara Raoa, Anupam Kumarib
ARKA JAIN University Jharkhand

Increasingly, the convergence of the natural environment (land, water, air, and life), built environment (housing, buildings, transportation, and infrastructure), and digital environment (computing power, the internet, big data, and technology) is shaping economies and societies. Smart living is becoming more prevalent, with a preference for mass customization of products and services over traditional mass production. Businesses aim to serve individual customers at competitive costs similar to mass production, with minimal development and production times. This shift requires a transformation from labour-intensive processes to information technology-enabled mechanical processes.

Digital manufacturing represents a broader concept of manufacturing innovation, where digital and material advancements enable companies to conceive products in the desired style and quantity within shorter timeframes than conventional methods, while efficiently managing the entire product lifecycle. It involves defining manufacturing processes and managing process information through a fully digital product definition. This includes visualization, manufacturing simulation, ergonomic and human factor analyses, a holistic view of product and process design, and product design sensitive to process constraints and capabilities.

Keywords: *Digital manufacturing, Additive manufacturing, Digital transformation, 3D Printing*

RTAJU_24018

A Review of Applications of IoT in Additive Manufacturing

Ayush Kumar Singh, Rohit Kumar, Anup Kumar
ARKA JAIN University Jharkhand

Abstract

The Internet of Things (IoT) is revolutionizing communication, fundamentally altering how monitoring and control are performed remotely. Companies are increasingly aiming to digitalize their production processes, implementing control and monitoring systems on the shop floor. By leveraging the Industry 4.0 concept, internet features and database services are being integrated into manufacturing processes, leading to innovative transformations.

This study proposes a proof-of-concept system for managing additive manufacturing (AM) machines. It explores how integrating beacon technology with internet capabilities in the manufacturing environment allows for the rapid and intuitive exchange of production data between machines and mobile devices across various applications. Although AM technologies enable customization of final products, they currently face challenges in mass-producing 3D-printed items for commercial use.

Therefore, this research-based study seeks to enhance the understanding and reliability of AM processes through IoT technologies, aiming to facilitate the large-scale production of 3D-printed smart materials for manufacturers globally. The study highlights the practical implications of successfully implementing internet-based technologies in AM, demonstrating their significance across various fields.

This paper provides an overview of IoT-based remote monitoring and control systems that address challenges in AM, with a particular focus on digital twins, human augmentation (HA), 3D bioprinters, 3D scanners, input parameter optimization, and electronics. The integration of IoT in AM enhances production efficiency, reduces waste, and better meets customer needs.

Keywords: *additive manufacturing, IoT, welding*

RTAJU_24019

Smart Manufacturing: Challenges, Opportunities, and Future Directions - A State-of-the-Art Review

Hritesh Kumar Deya, Vikash Kumara, Kuldip Kumar Sahub
ARKA JAIN University Jharkhand

Abstract

Smart manufacturing leverages interconnected machines and tools to enhance manufacturing performance and optimize energy and workforce requirements through the implementation of big data processing, artificial intelligence, and advanced robotics technology. This paper defines and discusses the smart manufacturing system, outlines its current implementation status, and analyses the gap between current manufacturing systems and the envisioned future of smart manufacturing. It examines the associated technologies and their contributions to smart manufacturing. To comprehensively understand this rapidly evolving technology, the paper also surveys the latest developments, their impacts, implementation challenges, opportunities, and future directions for smart manufacturing systems.

Keywords: *Industry 4.0, Smart manufacturing, Cyber-physical system, Internet of things, Future industry*

RTAJU_24020

Recent Trends in Manufacturing

Aman Nandia, Birendra Sinkua, Viranshu Kr. Singhb
ARKA JAIN University Jharkhand
dr.viranshu@arkajainuniversity.ac.in

Abstract

The aim of this paper is to offer an analysis of recent advancements in manufacturing systems through the lens of control. We believe that the expertise and terminology within the control community can significantly contribute to this field. To maximize this impact, it is crucial for researchers to grasp the current challenges, terminology, and ongoing research trends. Manufacturing is the use of machines, tools and labour to move things for use or sale the term refers to the range of human activity from handicraft to high-tech but it is most commonly applied to industrial production, in which raw materials are transformed into finished goods on a large scale. The increased integration of technology, operating and quality models, and integrated business models will be essential to helping the manufacturing sector survive and remain competitive in the global economy. This paper seeks to address key issues in manufacturing management, providing actionable insights to empower stakeholders in navigating these complexities effectively.

Keywords: *Manufacturing Trends, Lean Manufacturing, Demand Flow Manufacturing, Just-in-Time, Agile Manufacturing*

RTAJU_24021

Reviewing Artificial Intelligence Applications in Manufacturing Operations

Panda Hrushikesh Jagannath, Ankit Kumar Choudhary, Anupam Kumari
ARKA JAIN University, Jharkhand

ankitchoudhary2305@gmail.com

Abstract

Artificial intelligence (AI) and machine learning (ML) offer significant potential to enhance manufacturing efficiency, productivity, and sustainability. However, their integration into manufacturing also presents various challenges. These include issues with data acquisition, management, and labeling, as well as concerns related to human resources, infrastructure readiness, security risks, trust, and implementation complexities. Acquiring sufficient data for training AI models, especially for rare events or large datasets requiring extensive labeling, can be particularly challenging. Moreover, integrating AI models into industrial control systems can introduce security vulnerabilities.

Furthermore, some stakeholders in the manufacturing industry may hesitate to adopt AI due to a lack of trust or understanding of its workings. Despite these challenges, AI holds promise in critical manufacturing applications such as predictive maintenance, quality assurance, and process optimization. The suitability of AI implementation in manufacturing should be carefully evaluated based on specific operational needs and capabilities.

This review aims to highlight current advancements, challenges, and future directions in AI/ML relevant to manufacturing. By enhancing understanding of available AI/ML technologies for addressing manufacturing issues, it aims to assist decision-makers in prioritizing and adopting suitable AI/ML solutions. Additionally, it identifies areas where further research can drive transformative improvements in manufacturing efficiency and cost-effectiveness, particularly through leveraging vast amounts of data generated by manufacturing systems.

Keywords: *Artificial Intelligence in Manufacturing, Machine Learning Applications, Manufacturing Efficiency, Data Management Challenges, Security Risks*

Simulation in Manufacturing Systems Design and Operation: Current Status and Emerging Trends

Apurv Kumar, Abhishek Kumar Goutam, Anup Kumar
ARKA JAIN University Jharkhand
abhishekrajwansis7@gmail.com

Abstract

As industrial requirements evolve rapidly alongside technological advancements, the need to swiftly explore alternative system configurations for more efficient manufacturing system designs becomes increasingly critical. Manufacturing systems simulation has emerged as a powerful tool for designing and evaluating these systems, offering advantages such as cost-effectiveness, rapid analysis, low risk, and insightful decision support. It enhances understanding by assessing the impact of each component comprehensively.

Simulation encompasses essential IT tools and methodologies crucial for successful digital manufacturing implementation. It enables experimentation, validation of product, process, and system designs, and configuration optimization. This paper explores key historical milestones in the evolution of manufacturing systems simulation technologies and reviews recent industrial and research approaches across various manufacturing domains.

The study highlights how the push towards digitalization in manufacturing, driven by the Fourth Industrial Revolution, has reshaped simulation practices in designing and operating manufacturing systems. It surveys emerging approaches in the literature, with a particular focus on technologies gaining prominence in simulations for future digitalized factories. These advancements promise multiple benefits for industrial applications, advancing efficiency and innovation in manufacturing operations.

Keywords: *manufacturing systems simulation information and communication technologies digitalised manufacturing review*

RTAJU_24023

A Simplified Stress Analysis of Functionally Graded Beams and Influence of Material Function on Deflection

Avunash Kumar Varma, Shivam Pradhan, Nivedan Mahato
ARKA JAIN University-Jharkhand
Nivedam.m@arkajainuniversity.ac.in

This study introduces a simplified analytical approach to analyze stress in functionally graded beams, examining both power-law (P-FGM) and exponential (E-FGM) material variations. The primary focus lies in studying the distribution of normal and shear stresses throughout the thickness of the beam. Additionally, the research explores the optimization of material gradients to improve the deflection characteristics of FGM beams, considering configurations with both simply supported and cantilever ends. The findings underscore the potential of well-designed and optimized FGMs as viable alternatives for diverse structural applications. Specifically, our analytical framework offers insights into how different material functions influence stress behaviors within the beam. By leveraging these insights, engineers can tailor FGM designs to enhance specific mechanical properties such as deflection, thereby broadening the scope for their practical use in engineering structures. In conclusion, this study not only provides a clear analytical solution for stress analysis in FGM beams but also underscores the importance of optimized material grading in achieving enhanced structural performance. Future applications could benefit from these insights by implementing tailored FGM designs that cater to specific mechanical requirements, ultimately advancing the efficacy and versatility of these materials in various engineering applications.

Keywords: Functionally graded materials, stress analysis, deflection, optimization, structural applications.

RTAJU_24024

A Simplified Stress Analysis of Functionally Graded Beams and Influence of Material Function on Deflection

Avunash Kumar Varma, Shivam Pradhan, Nivedan Mahato
ARKA JAIN University-Jharkhand
Nivedam.m@arkajainuniversity.ac.in

This study introduces a simplified analytical approach to analyze stress in functionally graded beams, examining both power-law (P-FGM) and exponential (E-FGM) material variations. The primary focus lies in studying the distribution of normal and shear stresses throughout the thickness of the beam. Additionally, the research explores the optimization of material gradients to improve the deflection characteristics of FGM beams, considering configurations with both simply supported and cantilever ends. The findings underscore the potential of well-designed and optimized FGMs as viable alternatives for diverse structural applications. Specifically, our analytical framework offers insights into how different material functions influence stress behaviors within the beam. By leveraging these insights, engineers can tailor FGM designs to enhance specific mechanical properties such as deflection, thereby broadening the scope for their practical use in engineering structures. In conclusion, this study not only provides a clear analytical solution for stress analysis in FGM beams but also underscores the importance of optimized material grading in achieving enhanced structural performance. Future applications could benefit from these insights by implementing tailored FGM designs that cater to specific mechanical requirements, ultimately advancing the efficacy and versatility of these materials in various engineering applications.

Keywords: Functionally graded materials, stress analysis, deflection, optimization, structural applications.

RTAJU_24025

Advanced Analysis of Flexible Tapered Functionally Graded Beams: Nonlinear Deflection and Material Interactions

Abhay Kumar, Kunal Karan , Nivedan Mahato
ARKA JAIN University-Jharkhand
Nivedam.m@arkajainuniversity.ac.in

Abstract: This research investigates the substantial deflection characteristics of flexible tapered functionally graded beams. Our study involves deriving a comprehensive nonlinear second-order differential equation that governs the beam's shape. This equation accounts for geometric nonlinearities arising from significant deflections, as well as considerations of infinitesimal local displacements and local rotation effects. Moreover, we incorporate the distinct physical properties inherent to functionally graded materials (FGMs). The primary objective of this work is to advance understanding regarding the mechanical behavior of FGM beams under substantial deflection conditions. By integrating these elements into our analysis, we aim to provide a robust framework that captures the complex interactions between beam geometry, material composition variations, and nonlinear deformation effects. Our findings contribute significantly to the field by elucidating how FGMs behave structurally when subjected to large deflections. This includes insights into how material gradients influence the beam's response to applied loads and environmental conditions. Such knowledge is crucial for optimizing the design and performance of FGM structures in practical engineering applications, where flexibility and resilience are key considerations.

Keywords: Large deflection, tapered beams, nonlinear analysis, functionally graded materials, mechanical response.

RTAJU_24026

Advanced Theoretical Analysis of Functionally Graded Beams: Integrating Nonlinear Effects and Material Variability

Rohit Kumar Mahato, Bhaskar Singh Munda, Nivedan Mahato
ARKA JAIN University-Jharkhand
Nivedam.m@arkajainuniversity.ac.in

Abstract: In This theoretical study delves into the intricate dynamics of functionally graded beams, exploring various theoretical frameworks to enhance understanding. Our investigation encompasses classical, first-order, and third-order shear deformation theories, all adapted to accommodate the through-thickness variation typical of two-constituent functionally graded materials. In addition to these foundational theories, our analysis incorporates the nuanced effects of modified couple stress (strain gradient) and the nonlinearity described by the von Kármán model. These elements are crucial for capturing the intricate mechanical behaviors exhibited by functionally graded beams under different loading conditions. The primary aim of this research is to elucidate the complex mechanics governing functionally graded beams, emphasizing how variations in material composition across the beam's thickness influence its structural response. By integrating advanced theoretical frameworks and accounting for microscopic material effects such as strain gradients, we provide a comprehensive understanding of these beams' behavior beyond traditional linear approaches. Our findings contribute significantly to the theoretical foundation necessary for optimizing the design and performance of functionally graded structures. This knowledge is vital for engineers and researchers seeking to leverage the unique properties of FGMs in diverse applications, from aerospace to biomedical engineering, where precise control over material properties can lead to enhanced structural integrity and performance.

Keywords: ***Shear deformation theories, material gradation, strain gradient, nonlinear behavior, mechanical analysis.***

RTAJU_24027

Enhancing Thermal Performance of Functionally Graded Composite Plates: Material Gradation and Boundary Conditions Analysis

Sourabh Gope, Kunal Kumar, Nivedan Mahato
ARKA JAIN University-Jharkhand
Nivedam.m@arkajainuniversity.ac.in

Abstract: Understanding the thermal behavior of functionally graded composite plates is paramount for their effective application in engineering. This study focuses on investigating how material gradation influences thermal deflection characteristics under varying temperature distributions and boundary conditions. Our analysis delves into the complex interplay between material composition variations and thermal loading effects. By examining different scenarios of temperature distribution and boundary conditions, we aim to discern how these factors collectively impact the thermal stability and performance of functionally graded composite plates. The primary objective is to provide comprehensive insights into how the gradient in material properties across the plate thickness affects its response to thermal stimuli. This includes studying how thermal gradients induce deflections and deformations, crucial for predicting and optimizing the structural behavior of functionally graded composite plates in practical applications.Our findings are pivotal for engineers and researchers seeking to enhance the thermal efficiency and reliability of composite structures. By elucidating the mechanisms governing thermal deflection in functionally graded materials, we contribute valuable knowledge that can inform the design and development of more robust and efficient engineering solutions.

Keywords: Thermal behavior, composite plates, material gradation, temperature distribution, boundary conditions.

RTAJU_24028

Mechanical Insights into Flexural Behavior of Functionally Graded Materials for Structural Optimization

Md. Touseef Ansari, Kasif Aslam Nivedan Mahato
ARKA JAIN University-Jharkhand
Nivedam.m@arkajainuniversity.ac.in

Abstract: Understanding the flexural behavior of functionally graded materials (FGMs) is crucial for the design and reliability of structural components. This study focuses on analyzing the flexural strength of FGMs, with a specific emphasis on how material composition and gradation influence mechanical performance. Our investigation explores how varying material properties across the thickness of FGMs impact their ability to withstand bending forces. By studying the role of material composition gradients, we aim to uncover insights into how these materials behave under different loading conditions and environments. The primary objective is to contribute to the field of material science and structural engineering by providing a deeper understanding of the factors that govern the flexural strength of FGMs. This includes examining how the distribution of materials affects the stress distribution, deformation characteristics, and overall mechanical response during bending. Our findings are pertinent for engineers and researchers seeking to optimize the design and performance of FGM-based structures. By elucidating the relationship between material gradation and flexural behavior, we offer valuable insights that can inform the development of more resilient and efficient structural solutions.

Keywords: *Flexural strength, material composition, mechanical performance, structural engineering, material science.*

RTAJU_24029

Advanced Theoretical Analysis of Functionally Graded Beams: Integrating Nonlinear Effects and Material Variability

Rohit Kumar Mahato, Bhaskar Singh Munda, Nivedan Mahato
ARKA JAIN University-Jharkhand
Nivedam.m@arkajainuniversity.ac.in

Abstract: In This theoretical study delves into the intricate dynamics of functionally graded beams, exploring various theoretical frameworks to enhance understanding. Our investigation encompasses classical, first-order, and third-order shear deformation theories, all adapted to accommodate the through-thickness variation typical of two-constituent functionally graded materials. In addition to these foundational theories, our analysis incorporates the nuanced effects of modified couple stress (strain gradient) and the nonlinearity described by the von Kármán model. These elements are crucial for capturing the intricate mechanical behaviors exhibited by functionally graded beams under different loading conditions. The primary aim of this research is to elucidate the complex mechanics governing functionally graded beams, emphasizing how variations in material composition across the beam's thickness influence its structural response. By integrating advanced theoretical frameworks and accounting for microscopic material effects such as strain gradients, we provide a comprehensive understanding of these beams' behavior beyond traditional linear approaches. Our findings contribute significantly to the theoretical foundation necessary for optimizing the design and performance of functionally graded structures. This knowledge is vital for engineers and researchers seeking to leverage the unique properties of FGMs in diverse applications, from aerospace to biomedical engineering, where precise control over material properties can lead to enhanced structural integrity and performance.

Keywords: ***Shear deformation theories, material gradation, strain gradient, nonlinear behavior, mechanical analysis.***

RTAJU_24030

Enhancing Thermal Performance of Functionally Graded Composite Plates: Material Gradation and Boundary Conditions Analysis

Sourabh Gope, Kunal Kumar, Nivedan Mahato
ARKA JAIN University-Jharkhand
Nivedam.m@arkajainuniversity.ac.in

Abstract: Understanding the thermal behavior of functionally graded composite plates is paramount for their effective application in engineering. This study focuses on investigating how material gradation influences thermal deflection characteristics under varying temperature distributions and boundary conditions. Our analysis delves into the complex interplay between material composition variations and thermal loading effects. By examining different scenarios of temperature distribution and boundary conditions, we aim to discern how these factors collectively impact the thermal stability and performance of functionally graded composite plates. The primary objective is to provide comprehensive insights into how the gradient in material properties across the plate thickness affects its response to thermal stimuli. This includes studying how thermal gradients induce deflections and deformations, crucial for predicting and optimizing the structural behavior of functionally graded composite plates in practical applications.Our findings are pivotal for engineers and researchers seeking to enhance the thermal efficiency and reliability of composite structures. By elucidating the mechanisms governing thermal deflection in functionally graded materials, we contribute valuable knowledge that can inform the design and development of more robust and efficient engineering solutions.

Keywords: Thermal behavior, composite plates, material gradation, temperature distribution, boundary conditions.

RTAJU_24031

Mechanical Insights into Flexural Behavior of Functionally Graded Materials for Structural Optimization

Md. Touseef Ansari, Kasif Aslam Nivedan Mahato
ARKA JAIN University-Jharkhand
Nivedam.m@arkajainuniversity.ac.in

Abstract: Understanding the flexural behavior of functionally graded materials (FGMs) is crucial for the design and reliability of structural components. This study focuses on analyzing the flexural strength of FGMs, with a specific emphasis on how material composition and gradation influence mechanical performance. Our investigation explores how varying material properties across the thickness of FGMs impact their ability to withstand bending forces. By studying the role of material composition gradients, we aim to uncover insights into how these materials behave under different loading conditions and environments. The primary objective is to contribute to the field of material science and structural engineering by providing a deeper understanding of the factors that govern the flexural strength of FGMs. This includes examining how the distribution of materials affects the stress distribution, deformation characteristics, and overall mechanical response during bending. Our findings are pertinent for engineers and researchers seeking to optimize the design and performance of FGM-based structures. By elucidating the relationship between material gradation and flexural behavior, we offer valuable insights that can inform the development of more resilient and efficient structural solutions.

***Keywords**: Flexural strength, material composition, mechanical performance, structural engineering, material science.*

RTAJU_24032

Effect of Machining Parameters in Drilling of Glass Fiber Reinforced Polymer Composite with Modified AJM Process

Vishal Dutta, Puran Boipai, Kuldip Kr. Sahu
ARKA JAIN University Jharkhand
puranboipai56@gmail.com

Abstract

Conventional drilling of Glass Fiber Reinforced Polymer (GFRP) composites often results in delamination due to the peel-up and pull-out of layers. Conventional drilling of Glass Fiber Reinforced Polymer (GFRP) composites often results in delamination due to the peel-up and pull-out of layers. This research investigates the drilling of GFRP rectangular workpieces using the fluidized bed abrasive jet machining (FB-AJM) process with silicon carbide (SiC) abrasives. Experiments were designed based on the Box-Behnken design matrix to evaluate four responses: material removal rate (W), surface roughness (Ra), depth of cut (h), and taper angle (TA). The input parameters were bed pressure (P), nozzle tip distance (Z), and abrasive grain size (G). Desirability-based particle swarm optimization (PSO) was used for multi-objective optimization, identifying optimal input parameters as P = 6 kgf/cm², Z = 7 mm, and G = 260μm. A single experiment conducted under these predicted optimal conditions validated the model with minimal error. SEM analysis of the machined composite surface showed crack initiation and propagation, along with the embedment of erodent particles.

Keywords: Glass Fiber Reinforced Polymer (GFRP), fluidized bed abrasive jet machining (FB-AJM), silicon carbide (SiC), response surface methodology (RSM), desirability function, particle swarm optimization (PSO).

RTAJU_24033

Toward a technology road mapping methodology to enhance sustainable and digital transition in manufacturing

Kanhaiya Sharma, Hari Om Sharma
ARKA JAIN University, Jharkhand
kanhaiyasharma770@gmail.com

Abstract

This paper aims to integrate sustainability and business considerations in manufacturing by leveraging Industry 4.0 and process management. It introduces a novel methodology designed to assist companies in harnessing the dual drivers of the digital and sustainable transitions at the operational level to achieve business and strategic goals. The proposed approach serves as a comprehensive tool addressing strategic objectives, business outcomes, and sustainability through actionable managerial strategies and technological implementations. The methodology unfolds in five phases, beginning with defining corporate objectives and strategies, and culminates in a detailed, multidimensional plan for implementing Industry 4.0 technologies and associated changes in processes and ICT architectures. An application case in the aerospace sector, specifically in satellite assembly, integration, and testing, illustrates the methodology in practice.

***KEYWORDS**: Technology roadmap, Industry 4.0, sustainability, twin transition, manufacturing*

RTAJU_24034

Review of Hybrid Modeling in Manufacturing: Integrating Physics-Based and Data-Driven Approaches

Ankit Kumar Mishra
ARKA JAIN University Jharkhand
ankitkrmishra.06@gmail.com

Abstract

Manufacturing, traditionally rooted in the physical realm, is currently undergoing a digital transformation akin to the fourth industrial revolution. The integration of sensors, connectivity, and platforms has opened unprecedented avenues for collecting diverse and high-quality manufacturing data. The rapid advancement of data-driven modeling across industries prompts exploration into how hybrid modeling—combining physics-based and data-driven approaches—can enhance our understanding of manufacturing processes, materials, and systems.

This review focuses on discrete manufacturing, acknowledging that hybrid modeling is more established in process manufacturing. It aims to survey projects where hybrid modeling has been applied in manufacturing, exploring different methodologies for combining these models. The paper discusses case studies illustrating the implementation, structure, metrics for testing and validation, as well as challenges and future directions for hybrid modeling in manufacturing.

KEYWORDS: *AI, machine learning, hybrid modeling, smart manufacturing, hybrid analytics*

RTAJU_24035

Investigation on Mechanical Properties of Fibre Reinforced Composite Materials".

Subham Bera, Rahul Kumar Pandit, Basant Kr. Das
Arka Jain University Jharkhand
subhambera65@gmail.com, subhambera65@gmail.com, basant.d@arkajainuniversity.ac.in

ABSTRACT

Fiber reinforced composite materials have gained significant attention due to their enhanced mechanical properties compared to traditional materials. This investigation explores the mechanical behavior of fiber reinforced composites through experimental analysis and theoretical modeling. The study focuses on understanding how different types of fibers (such as carbon, glass, or aramid) influence properties like tensile strength, modulus of elasticity, toughness, and fatigue resistance. Experimental methods include tensile testing, flexural testing, impact testing, and fatigue testing, conducted on composite specimens with varying fiber orientations and volume fractions. The results are analyzed to establish correlations between microstructural parameters, manufacturing techniques, and mechanical performance. Additionally, finite element analysis (FEA) is employed to simulate and predict the mechanical response under different loading conditions, validating experimental findings and providing insights into optimizing composite design for specific applications. This investigation contributes to the broader understanding of fiber reinforced composite materials, aiming to enhance their utilization in industries such as aerospace, automotive, marine, and civil engineering, where lightweight and high-strength materials are crucial. Fiber reinforced composites can exhibit tensile strengths ranging from 200 MPa to 2500 MPa, depending on the type of fiber and its orientation within the matrix. The modulus of elasticity for fiber reinforced composites varies widely, typically falling between 10 GPa to 250 GPa, reflecting the stiffness imparted by the fibers. Fiber reinforced composites often show toughness values ranging from 10 MPa·m to 200 MPa·m, indicating their ability to absorb energy before failure under impact loading. These numerical values provide a broad overview and can vary based on the specific type of fiber, matrix material, manufacturing process, and testing conditions.

Keywords : Fiber reinforced composites, Mechanical properties, Tensile strength, Fatigue resistance, Composite manufacturing

RTAJU_24036

Design of free form surface using Bezier curve using multi-control point

Rohit Kumar Sharma, Aditya Jha, Kuldip Kumar Sahu
Arka Jain University Jharkhand
rohitsharma743194@gmail.com, iamadityajhaofficial@gmail.com,
dr.kuldip@arkajainuniversity.ac.in

ABSTRACT

The design of free-form surfaces using Bezier curves with multiple control points represents a fundamental technique in computer-aided design (CAD) and computer graphics. Bezier curves offer a powerful means to define complex shapes and surfaces by manipulating a series of control points that influence the curve's trajectory. This study explores the theoretical foundations, computational methods, and practical applications of utilizing multi-control point Bezier curves for surface design. Key aspects of the research include the mathematical formulation of Bezier curves, which enable precise control over curvature and continuity. By adjusting the positions of control points, designers can create smooth transitions and intricate surface geometries that meet specific aesthetic and functional requirements. The study investigates algorithms for interpolating and optimizing control point placements to achieve desired surface characteristics, such as convex or concave shapes, with minimal distortion. Practical implementations of multi-control point Bezier curves are exemplified in various industries, including automotive design, aerospace engineering, product design, and architecture. These curves facilitate the creation of aerodynamic car bodies, ergonomic furniture contours, and sculptural architectural elements that blend artistic vision with engineering precision.

Keywords: Bezier curve, Free-form surface design, Multi-control point, Computer-aided design (CAD), Computer graphics, Surface modeling, Curvature continuity, Interpolation algorithms, Industrial design, Computational geometry.

Roles of Sensors and Transducers in Industry 4.0"

Puran Boipai, Manish Kumar, Viranshu Kumar
Arka Jain University Jharkhand
puranboipai56@gmail.com, manishyadav896987@gmail.com,
dr.viranshu@arkajainuniversity.ac.in

ABSTRACT

In the era of Industry 4.0, sensors and transducers play pivotal roles in revolutionizing industrial processes by enabling enhanced automation, real-time data acquisition, and adaptive manufacturing capabilities. This study explores the multifaceted contributions of sensors and transducers within the context of Industry 4.0, focusing on their fundamental roles, technological advancements, and transformative impacts across various industrial sectors. Sensors serve as the primary data acquisition units, converting physical parameters such as temperature, pressure, vibration, and position into electrical signals. These sensors are integral to monitoring and controlling manufacturing processes with unprecedented precision and efficiency. Transducers, on the other hand, extend the functionality of sensors by converting one form of energy into another, facilitating seamless integration of different data streams and enabling comprehensive system monitoring. Key technological advancements include the proliferation of smart sensors equipped with microprocessors and communication interfaces, enabling autonomous decision-making and connectivity within cyber-physical systems (CPS). This connectivity fosters the creation of interconnected networks where data from sensors and transducers contribute to real-time analytics, predictive maintenance, and quality control. The study also examines how sensors and transducers support key aspects of Industry 4.0, such as the Internet of Things (IoT), digital twins, and adaptive manufacturing. IoT frameworks leverage sensor data to optimize supply chain management, enhance energy efficiency, and enable remote monitoring of industrial assets. Digital twins utilize sensor data to create virtual replicas of physical systems, enabling simulation, predictive modelling, and optimization of operational parameters. Overall, this research highlights the indispensable roles of sensors and transducers in driving the transition towards smart, interconnected industrial systems in Industry 4.0. By providing real-time data insights, enhancing automation capabilities, and supporting adaptive decision-making processes, sensors and transducers are essential enablers of efficiency, innovation, and competitiveness in modern manufacturing and industrial operations.

Keywords: Sensors, Transducers, Industry 4.0, Internet of Things (IoT), Smart manufacturing

RTAJU_24038

Advanced tool used in IOT for industrial Application for enhancement in quality and productivity

Ashwani Kumar Sinha, Avinash Kumar, Mukesh Kumar Sharma
Arka Jain University Jharkhand

ashwanisinha.0326@gmail.com, ak423232@gmail.com, mukesh.s@arkajainuniversity.ac.in

ABSTRACT

In the realm of Industry 4.0, advanced tools leveraging the Internet of Things (IoT) are pivotal in driving substantial enhancements in quality and productivity across industrial sectors. This study explores the integration and application of these tools, focusing on their transformative impact on manufacturing processes and operational efficiency. Key tools include edge computing, which facilitates real-time data processing and analysis at or near the data source, reducing latency and enabling faster decision-making. Edge computing enhances quality by enabling immediate responses to deviations and predictive maintenance based on sensor data, thereby minimizing downtime and optimizing production schedules. Predictive analytics emerges as another critical tool, leveraging machine learning algorithms to analyze historical and real-time data from IoT-connected devices. By identifying patterns and trends, predictive analytics anticipates equipment failures, quality issues, or process inefficiencies before they occur, enabling proactive measures to maintain high standards and boost productivity. Digital twins represent a virtual counterpart of physical assets or processes, continuously updated with data from IoT sensors. They enable simulation, optimization, and scenario testing without disrupting actual operations. Digital twins facilitate quality improvements by providing insights into performance variations and facilitating iterative improvements in product design and production processes. AI-driven optimization harnesses machine learning algorithms to optimize complex industrial processes autonomously. These algorithms analyse vast datasets to identify optimal parameters for maximizing throughput, minimizing waste, and ensuring consistent product quality. Remote monitoring tools allow real-time oversight of industrial operations from anywhere, ensuring timely interventions and proactive maintenance. This capability supports continuous improvement initiatives by providing actionable insights into performance metrics and operational trends.

Keywords: *IoT, Industry 4.0, Edge computing, Predictive analytics, Digital twins, AI-driven optimization, Remote monitoring, Quality enhancement, Productivity improvement, Industrial tools.*

RTAJU_24039

Advanced application of IOT in controlling thermal power plant

Sourav Gope, Ashish Kumar Jha, Mukesh Kumar Sharma
Arka Jain University Jharkhand
souravgope256@gmail.com, ashish00782@gmail.com, mukesh.s@arkajainuniversity.ac.in

ABSTRACT

In The advanced application of IoT in controlling thermal power plants represents a significant advancement in enhancing operational efficiency, reliability, and safety in energy generation. This study explores the integration and deployment of IoT technologies specifically tailored for managing and optimizing thermal power plant operations. Key IoT applications include real-time monitoring of critical parameters such as temperature, pressure, flow rates, and emissions using a network of sensors deployed throughout the plant. These sensors collect and transmit data to a centralized system for analysis, enabling operators to continuously monitor plant performance and detect anomalies promptly. This proactive monitoring helps in preventing equipment failures, optimizing combustion processes, and ensuring compliance with environmental regulations. IoT-enabled predictive maintenance is another crucial application, leveraging machine learning algorithms to analyze sensor data and predict potential equipment failures before they occur. By identifying early signs of wear or malfunction, maintenance schedules can be optimized, reducing downtime and extending equipment lifespan. Remote operation and control capabilities facilitated by IoT allow plant operators to monitor and adjust operations from a centralized location or via mobile devices. This remote accessibility improves responsiveness to changing operational conditions and facilitates timely decision-making to maintain efficient plant performance. Digital twins play a transformative role by creating virtual replicas of physical assets and processes. IoT-enabled digital twins continuously update with real-time data, enabling simulation, predictive modeling, and optimization of plant operations. These virtual models aid in testing scenarios, optimizing performance, and exploring potential improvements without disrupting actual operations.

Keywords: *IoT, Thermal power plant, Real-time monitoring, Predictive maintenance, Remote operation, Digital twins, Energy efficiency, Operational optimization, Safety, Environmental compliance.*

A review of precipitation phase on the surface quality in diamond turning of an Aluminium alloy

Abhishek Kumar Goutam, Panda Hrushikesh Jagannath, Viranshu Kumar
Arka Jain University Jharkhand
abhishekrajwansis7@gmail.com, hrushikeshp0013@gmail.com,
dr.viranshu@arkajainuniversity.ac.in

ABSTRACT

Diamond turning is a precise machining process crucial for manufacturing high-quality optical components. This study investigates the influence of precipitation phase on the surface quality during diamond turning of an Aluminium alloy. The precipitation phases, primarily Mg2Si and Al2Cu, significantly affect material properties, including hardness and machinability. The experiment employed a single-point diamond tool to machine Aluminium alloy samples with varying precipitation phases under controlled cutting conditions. Surface roughness (Ra) and surface morphology were analyzed using profilometer and scanning electron microscope (SEM), respectively. Results indicated that alloys with different precipitation phases exhibited distinct surface quality characteristics post-machining. Alloys containing Mg2Si precipitates showed smoother surfaces compared to those with Al2Cu, attributed to differences in particle distribution and hardness. Furthermore, tool wear mechanisms were influenced by precipitation phases, affecting machining forces and surface integrity. Key findings suggest that precipitation phases not only influence material properties but also significantly impact machining outcomes in diamond turning. Understanding these effects is critical for optimizing machining parameters to achieve desired surface quality in optical components manufacturing. This research contributes to enhancing the efficiency and precision of diamond turning processes by providing insights into the complex interplay between material microstructure and machining performance.

Keywords: *Diamond turning, Aluminium alloy, Precipitation phase, Surface quality, Machining parameters*

RTAJU_24041

Advances in Additive Manufacturing of Metallic Meta-materials with Enhanced Mechanical Properties

Uttam Kumar, Amarjeet Yadav, Nivedan Mahato
Arka Jain University Jharkhand
officialrana07@gmail.com, amarjeetyadav5416@gmail.com,
nivedam.m@arkajainuniversity.ac.in

ABSTRACT

Additive manufacturing (AM) has revolutionized the production of metallic metamaterials, offering unprecedented design freedom and the ability to create complex structures with tailored mechanical properties. This review explores recent advances in AM techniques for fabricating metallic metamaterials with enhanced mechanical properties. Metamaterials are engineered materials with unique structures at the micro or nano scale, enabling properties not found in naturally occurring substances. Key advancements discussed include the utilization of selective laser melting (SLM), electron beam melting (EBM), and binder jetting (BJ) technologies to fabricate intricate geometries such as lattices, auxetic structures, and architectured materials. These techniques allow for precise control over microstructural features, including porosity, grain size, and phase distribution, which directly influence mechanical performance. Moreover, researchers have focused on enhancing mechanical properties such as strength, stiffness, toughness, and fatigue resistance through optimization of processing parameters, alloy compositions, and post-processing treatments. Functional metamaterials exhibiting properties like negative Poisson's ratio, high specific stiffness, and superior energy absorption capabilities are highlighted as promising outcomes of these efforts.

This review also addresses challenges such as process-induced defects, residual stresses, and material integrity issues that impact the performance and reliability of AM-produced metallic metamaterials. Future directions include further refinement of process control, multi-material printing, and integration of advanced simulation tools to accelerate design optimization and material characterization.

Keywords: Additive manufacturing, Metallic metamaterials, Mechanical properties, Selective laser melting, Electron beam melting

Review on Micro/Nano scale Manufacturing: A Multidisciplinary Science

Sourav Kumar, Ankit Kumar Choudhary, Kuldip Kumar Sahu
Arka Jain University Jharkhand
sk34635574@gmail.com, ankitchoudhary2305@gmail.com, dr.kuldip@arkajainuniversity.ac.in

ABSTRACT

Micro/nanoscale manufacturing represents a multidisciplinary field at the intersection o engineering, physics, chemistry, and materials science, crucial for developing advanced miniaturized devices and systems. This review synthesizes recent developments and challenges in micro/nanoscale manufacturing techniques, emphasizing their diverse applications and interdisciplinary nature. Key manufacturing methods discussed include lithography-based techniques such as photolithography, electron beam lithography, and nanoimprint lithography, which enable precise patterning at scales ranging from micrometers to nanometers. Additionally, additive manufacturing approaches like two-photon polymerization and direct laser writing are explored for their capability to produce intricate three-dimensional nanostructures. The review also addresses subtractive techniques such as focused ion beam milling and chemical etching, essential for high-precision machining and surface modification at the micro/nanoscale. Furthermore, advancements in self-assembly and bottom-up fabrication methods are highlighted for their potential in creating complex nanostructures with controlled functionalities. Applications span various fields including electronics, photonics, biomedical devices, and energy harvesting, showcasing the broad impact of micro/nanoscale manufacturing on modern technology. Challenges such as scalability, reproducibility, and integration with existing manufacturing processes are discussed, underscoring the need for innovative solutions and collaborative research efforts across disciplines. This review aims to provide a comprehensive overview of the state-of-the-art in micro/nano-scale manufacturing, offering insights into future directions and opportunities for advancing this dynamic and transformative field.

Keywords: Micro/nanoscale manufacturing, Lithography, Additive Manufacturing, Subtractive manufacturing, Interdisciplinary research.

RTAJU_24043

Review on Advance in Mechatronics System

Shobha Hembram, Aman Nandi , Md Arif Raza, Anupam Kumari
Mechanical Department, Arka Jain University
Mohanpur, Gamharia District- Seraikela Kharswan Jharkhand- 832108 India
[1]shobhahembram804@gmail.com,
[3]arifkhanl500ma@gmail.com

ABSTRACT

In recent years, the field of mechatronics has experienced significant advancements, driven by the integration of sophisticated control systems, advanced materials, and emerging technologies such as artificial intelligence and the Internet of Things (IoT). This paper presents a comprehensive overview of the latest developments in mechatronic systems, focusing on innovative applications, improved system integration, and enhanced functionality. Furthermore, the paper explores the impact of machine learning and deep learning techniques in enhancing predictive maintenance and fault diagnosis capabilities. The integration of IoT in mechatronics has also enabled the creation of more autonomous and interconnected systems, facilitating seamless communication between devices and enhancing overall system efficiency. This paper aims to provide a comprehensive review of the latest developments in mechatronics, highlighting the key technological innovations and their applications across different sectors. The focus will be on how these advancements are shaping the future of engineering systems and the potential they hold for addressing complex challenges. Key areas of exploration will include the evolution of smart sensors and actuators, advancements in adaptive control systems, and the integration of AI for improved system intelligence and autonomy. Furthermore, the paper will discuss the implications of these advancements for future research and development, identifying emerging trends and potential directions for continued innovation in mechatronics.

Keywords—smart sensors and actuators, adaptive control algorithms, real-time data analytics, Artificial Intelligence (AI), IoT (Internet of Things).

RTAJU_24044

Effect of Warm Forging and Sensitization on Austenitic Stainless Steel Welded Joint

Md. Iqbal Ansari1, Md. Arsad
iqbal.a@arkajainuniversity.ac.in, arsad@arkajainuniversity.ac.in,

Abstract:

Influence of warm forging and sensitization on the microstructure and mechanical properties of ga tungsten arc welded 304L stainless steel (SS) joints was studied. 304L stainless steel was observe to be sensitized when heated to 450°C - 950°C and held for short soaking times of 0.5 – 2hrs. Thre heat input combinations designated as low heat (2.2 kJ/mm), medium heat (3.32 kJ/mm) and hig heat (3.8 kJ/mm) were selected from the operating window of the gas tungsten arc welding proces (GTAW) and weld joints made using these combinations were subjected to normalization at 750°C, 850°C and 1000°C for 0.5h,1h and 2h respectively microstructural evaluations, impact strength testing, micro-hardness and tensile testing are performed to analyze the effect of sensitization on the microstructure and mechanical properties of these joints. The results of this investigation indicate that the tensile strength is maximum at weld joints normalized at 750°C but remarkably decreased as the temperature was increased while the yield strength did not notably changed with increasing of the temperature. The Charpy impact energy and micro-harness showed higher value at weld joints normalized at 750°C but remarkably decreased as the temperature was increased. The major reason of Charpy impact energy decreasing was compound of manganese-silicon-Sulphur formed in the weld pool during solidification. The microstructures of sensitized samples have been observed by optical microscope. Heat treated weldment and parent are more sensitized than untreated weldments and parents. Specifically, weldments treated at 850°C with a 2 h holding time and then cooled in a furnace are the most sensitized.

Keywords: *Mechanical Properties, Microstructure, Micro hardness, Sensitization, Tensile Strength, Impact strength*

RTAJU_24045

Exploring the Impact of Digitalization and Automation: A Comprehensive Study of the Control Cabinet Manufacturing Industry

Satyendra Mahato, Gagandeep Singh
ARKA JAIN University Jharkhand
satyendramahato22@gmail.com

Abstract

This study examines the control cabinet manufacturing industry in Germany, exploring its opportunities, challenges, and levels of digitalization and automation. Through cluster analysis, companies are categorized into five groups based on their adoption of digitalization and automation, leading to the development of a new classification framework. This framework significantly enhances intra-cluster similarity by approximately 52.89% compared to existing models. While digitalization and automation levels vary across clusters, common barriers such as skill shortages and supply chain issues affect companies across all groups. To address these challenges, the study identifies key areas for improvement based on empirical data. The proposed classification framework serves as a tool for companies to assess their digital maturity, identify areas for enhancement, and underscores the importance of embracing digitalization and automation to enhance efficiency and competitiveness in the market.

KEYWORDS: *Control cabinet, digitalization, production automation, production strategies*

Enhancing Machining Performance: Evaluating Laser-Processed Microtextured Cutting Inserts

Anupam Kumari
ARKA JAIN University Jharkhand
dr.anupam@arkajainuniversity.ac.in

Abstract

This article delves into the importance of micro-texturing cutting tools to enhance tribological performance and reduce friction during machining operations. Inspired by biomimetic structures, the study examines the effects of laser surface micro-texturing on cutting forces and tool wear. The experiments utilize dot-patterned micro-textures, specifically created with a fibre laser. Long-term tests reveal the development of negative protrusions on the textured tools, yet also show reduced variability in cutting forces, indicating potential benefits for stable machining processes and extended tool life. These findings highlight the complex relationship between micro-texturing patterns and tool performance, providing valuable insights for energy-efficient machining.

Keywords: Micro-texturing, Tribology, Laser Surface Processing, Cutting Forces, Cutting Tool

Detection of Cancer Cell using Image Processing

Mr. Akash Kumar Bhagat,
Research Scholar, ARKA JAIN University, Jharkhand
akash.bhagat008@gmail.com
Dr. Arvind Kumar Pandey, Dean, School of Engineering & IT, ARKA JAIN University, Jharkhand
dr.arvind@arkajainuniversity.ac.in

Abstract:

In recent years the image processing mechanisms are used widely in several medical areas for improving earlier detection and treatment stages, in which the time factor is very important to discover the disease in the patient as possible as fast, especially in various cancer tumors such as the lung cancer. Lung cancer has been attracting the attention of medical and sciatic communities in the latest years because of its high prevalence allied with the difficult treatment. Early detection of lung cancer is very important for successful treatment. There are few methods available to detect cancerous cells. Here two methods of segmentation such as thresholding and watershed are used to detect the cancer cell and too find out better approach out of them.

Keywords – Extraction, Segmentation, K-means, Edge detection, ANN, SVM, Genetic algorithm.

APPLICATION OF TOTAL PRODUCTIVE MAINTENANCE IN AUTOMOBILE INDUSTRY

Basant Kumar Das
ASSISTANT PROFESSOR
School of Engineering & IT
ARKA JAIN University,
Jharkhand-832108
basant.d@arkajainuniversity.ac.in

ABSTRACT

With the rapid growing manufacturing industry and rising demands, the automotive industry needs a better management solution for better production rate and increasing profits. One of the best tools which make this task easy for the companies is TPM.

The project is aimed at providing a solution to accompany ABC ltd for better performances of their machines and for better production rate through TPM implementation. The data given by ABC ltd is first analyzed and OEE is calculated for each machine. After calculation, the problems were analyzed which were becoming root cause for the inefficiencies of the machines.

After finding all the problems, various kaizen methods were used and suggested to the company which will reduce the lag times and heavy loads. Now the final OEE is calculated for the result. Now after the result the graphs are plotted which shows the increase in efficiencies of the machines namely A01, A02, A03, A04, A05.

Keywords:-TPM, OEE,SIX SIGMA,PRODUCTS DEFECTS

RTAJU_24049

Modelling of aged porous anodic aluminium oxide thin film based moisture sensor

1Shailesh Kumar, 2Ashwini Kumar, 3Amit Prakash Sen
[1,3] Department of Electrical and Electronics Engineering, School of Engineering and IT,
[2]Assistant Dean, School of Engineering & IT, Arka Jain University India
shailesh_dgp@yahoo.co.in

Abstract

An electrical equivalent circuit and mathematical model of aged capacitive moisture sensor prepared through the anodization of Aluminium sheet is presented in this manuscript. The mathematical model of electrical circuit was utilized to simulate the response of the proposed sensor. The simulation follows the principle of dielectric theory of material engineering. The electrical equivalent of the proposed sensor consists of parallel combination of its structural and moisture dependent component. The structural component of sensor consist the aging component of the sensor. The simulation response of the sensor is consistent with the experimental results of the designed sensor. For the experimental response, the designed sensor was kept in open environment for ten months and the experiment was performed to determine the long-time drift and sensitivity which occurs under continuous operation in the range of 100 ppm to 600 ppm. The developed model can be used for computation of water stretch in the air pore, level of hydration of the sensing material and drift in the sensor output at any humidity.

Keywords—Materials, Anodization, Modeling, Porous structure, Morphology

RTAJU_24050

Welding of Thin Sheet Metal Products Using Cold Metal Transfer as a Welding Technique

Neeraj Kumar1, Abhijeet Mandal2, Suraj Kumar Pandit3
ARKA JAIN University, Jharkhand
neeraj.k@arkajainuniversity.ac.in

Abstract

While TIG welding is the most popular technique for welding stainless steel and aluminium alloys, semiautomatic technologies like MIG and MAG are also commonlyutilized for welding typical structural steels. The current study focuses on the use of a unique cold metal transfer (CMT) technology for the welding of thin sheet metal products made of aluminium and stainless steel. As an alternative to TIG, CMT technology offers benefits including lower distortion and higher productivity. This is mostly because of the low heat input, which is the result of the electrode moving undercontrol. Optimization of the CMT welding process is necessary to achieve these benefits. The purpose of this study was to validate the CMT method and optimize the process utilizing the current welding equipment (robots, manipulators, etc.).
Deformations, an increase in porosity, and an unsatisfactory welding bed shape are thevariables that are restricting the growth in productivity. Consequently, useful suggestions for the application of CMT technology for robotic welding are provided.

Key words: CMT process, welding automation, robotic welding, sheet metal.

Application of Radio Frequency Identification (RFID) in small scale Industry

Basant Kumar Das
ASSISTANT PROFESSOR
School of Engineering & IT
ARKA JAIN University,
Jharkhand-832108
Corresponding Author- basant.d@arkajainuniversity.ac.in

Abstract
A Product quality of any industry is formulated and implemented to check the product of such industry and access causes of its rejection through collecting products demerits data. After determination of demerits of products its remedies can be formulated. In this remedial technique one of is radio frequency identification (RFID) method can be used for quality assurance system. The present works shows the implementation of RFID in one industry i.e. small scale industry accessary of TATA Motors products situated Adityapur Jamshedpur. In this techniques various types production process which is handled by so many abnormalities and create defects. In this paper industry application data are provided to the RFID system for enhancing the production rate as well as production quality

Keywords:Tag, RFID,Reader ,Sensor,Transponder

Two days National Conference

On

"Recent Trends in Machine, Manufacturing, Modelling and Technology (RTMMMT'24)"

In Hybrid mode.

Organized by

Department of Mechanical Engineering

School of Engineering and IT

ARKA Jain University, Jamshedpur

Detailed Schedule of Two days National Conference
On
"Recent Trends in Machine, Manufacturing, Modelling and Technology (RTMMMT'24)"

(28th - 29th June 2024)
INAUGURAL FUNCTION (SESSION-1)
Day 1 Date: June 28, 2024 (Friday)

To Join the Inaugural session click on the Link:		https://meet.google.com/oqg-ghbw-muv	
Sl.No.	**Event**	**Time**	**Concerned Guest/Person**
1	Welcoming of the Guests & Participants	10:30 AM	Ms. Manaswita Sharma &Ms. Aditi Keshari, Assistant Professor, School of Engineering and IT, ARKA Jain University, Jharkhand
2	Lamp Lighting	10:35 AM	By All Dignitaries and Guests
3	Ganesh Vandana(Dance)	10:40 AM	Sania Ghoshal
4	Felicitation of Guests	10:45 AM	By All Dignitaries
3	Welcome Note & About the Conference by Address by Dean & Conference Chair (ICRTAPMS-2024), School of Engg. & IT,	10:50 AM	Dr. Anupam Kumari,
4	Address by the Vice Chancellor, AJU	10:55AM	**Prof. (Dr.) Easwaran Iyer**
5	Speech by the Honorable Chairperson , Board of Management	11:00 AM	**Prof.(Dr.) S. S. Razi**
6	Speech by the Director cum registrar	11:10 AM	**Dr. Amit Kumar Srivastava**

7	Address by the Joint Registrar	11:15 AM	**Dr. Jasbir Dhanjal**
8	Address by Director (Campus),	11:20 AM	**Dr. Angad Tiwary**
9	Address by the Chief Guest	11:25 AM	Dr. Sandip Ghosh Chowdhury, Director, NML Jamshedpur
10	Address by the Guest of Honour	11:35 AM	**Prof. Sanjay,** Dept. Of Mechanical Engineering, National Institute of Technology, Jamshedpur.
12	Vote of Thanks – Inauguration Ceremony	12:00 PM	Dr. Kuldip Kumar Sahu, Co- Convenor and Assistant Professor, Department of Mechanical Engineering, ARKA Jain University Jharkhand

Two days National Conference on"Recent Trends in Machine, Manufacturing, Modelling and Technology (RTMMMT'24)"						
Day 1 Date: June 28 2024 (Friday)_Session-2						
Track 1: 12:00 PM – 1:30 PM						
SLNo	**Paper Code**	**Paper Title**	**Author & Affiliation**	**Session Chair**	**Co-Session Chair**	**Google Meet**
1	**Speech by Keynote Speaker**	Topic " Comparative performance evaluation between HSN2-TiAlxN and TiCN coated carbide tools in hard turning of AISI D6 Steel.	**Dr.Sudhansu Ranjan Das, Associate Professor, Dept. of Production Engineering, Veer Surendra Sai University of Technology, Burla Odisha**	Dr Kuldip Kumar Sahu ,Assistant Professor,Department of Mechanical Engineering, School of Engg. And IT, ARKA Jain University	Prof.Surjit Paul, Asst. Professor,Department of Computer Science and Engineering, ARKA Jain University	meet.google.com/dxb-zsqx-hdc
2	**RTAJU_2401**	Campbell Diagrams for SiCf/SiC Blades and IN718 Blades: A Comparative Analysis	Souvik Singh Rathore, NivedanMahato ARKA JAIN University – Jharkhand			
3	**RTAJU_2402**	The Paradigm Shift from Industry 4.0 to 5.0: The Next Industrial Revolution	Suresh Tiwari1, 1Departement of Mechanical Engineering (PhD Scholar) (Jharkhand University of Technology,			
4	**RTAJU_2403**	Advanced Analysis of Flexible Tapered Functionally Graded Beams: Nonlinear Deflection and Material Interactions	Abhay Kumar, Kunal Karan , NivedanMahato ARKA JAIN University-Jharkhand			

5	RTAJU_2404	Effect of Sensitization on Warm Forged Austenitic Stainless Steel Welded Joint	Viranshu Kumar, Mukesh Kumar Sharma Assistant Professor, Department of Mechanical Engineering, Arka Jain University, Jamshedpur			
6	RTAJU_2405	The free vibration characteristics of a functionally graded corrugated composite panel	Nivedan Mahato *ARKA JAIN University-Jharkhand,India*			
7	RTAJU_2416	Digital Manufacturing: Applications - Past, Present, and Future Trends	**MdArif Raza, SunkaraTejaswara Rao, AnupamKumari** ARKA JAIN University Jharkhand			
8	RTAJU_2417	A Review of Applications of IoT in Additive Manufacturing	Ayush Kumar Singh, Rohit Kumar, Anup Kumar ARKA JAIN University Jharkhand			
9	RTAJU_2418	Smart Manufacturing: Challenges, Opportunities, and Future Directions - A State-of-the-Art Review	Hritesh Kumar Dey, Vikash Kumar Kuldip Kumar Sahu ARKA JAIN University Jharkhand			
10	RTAJU_2419	Recent Trends in Manufacturing	AmanNandi BirendraSinku, Viranshu Kr. Singh ARKA JAIN University Jharkhand			

11	RTAJU_2420	Reviewing Artificial Intelligence Applications in Manufacturing Operations	Panda HrushikeshJagannath, Ankit Kumar Choudhary, AnupamKumari ARKA JAIN University, Jharkhand			

Two days National Conference on"Recent Trends in Machine, Manufacturing, Modelling and Technology (RTMMMT'24)"						
Day 1 Date: June28 2024 (Friday)_Session-3						
2:00pm-2:45pm	Invited Speech By Keynote Speaker	**Hetrogenous Material: Applications and Challenges**	**Dr. Vishesh Ranjan Kar** Assistant Professor Department of Mechanical Engineering National Institute of Jamshedpur	meet.google.com/dxb-zsqx-hdc		
TRACK 2 : 3:15PM – 4:15 PM						
Sl.No.	Paper Code	Paper Title	Author & Affiliation	Session Chair	Co-Session Chair	Google Meet Joining link
1	**RTAJU_2406**	Design & Development on Four Wheel Steering Mechanism	Atul Kr. Jha, Anup Kumar*, Amit Prakash Sen Arka Jain University, Jamshedpur			
2	**RTAJU_2407**	Comparative study of Solution Heat Treatment on Microstructure and Mechanical Properties of Al-SiC Metal Matrix Composites	Kuldip Kumar Sahu· *Department of Mechanical Engineering, SOE&IT Arka Jain University Jharkhand* *And* Sapan Kumar Dutta , *Department of Mechanical Engineering*	Dr Anupam Kumari Associate Professor,Department of Mechanical Engineering Engineering,ARKA Jain University	Dr. Keerti Rai, Assoc. Professor, Dept. of Electrical and Electronics Engineering, School of Engineering & IT, Arka JAIN University, Jamshedpur	meet.google.com/dxb-zsqx-hdc

			GGSESTC Bokaro, Jharkhand			
3	**RTAJU_2408**	The Next Chapter: Delving into AI's Contribution to Content Creation	***Prof.Gouri Shankar Paul*** ***Assistant Professor*** ***RVS College of Engineering & Technology*** ***Jamshedpur, Jharkhand***			
4	**RTAJU_2409**	Examining the Fatigue, Wear, and Corrosion Resistance of Friction Stir-Welded Aluminum Metal Matrix Composites: A Review	Mohammad Akhtar Lecturer, Al-Kabir Polytechnic Jamshedpur Kuldip Kumar Sahu Asst. Professor, Arka Jain University Jharkhand			
5	**RTAJU_2410**	Manufacturing of Helmet Using Epoxy Based Composite Material	***Naresh sharma, Asst. Professor*** ***Dept. of Mechanical Engineering ARKA*** ***Jain University Jamshedpur***			
6	**RTAJU_2421**	Simulation in Manufacturing Systems Design and Operation: Current Status and Emerging Trends	**Apurv Kumar, Abhishek Kumar** **Goutam, Anup Kumar** **ARKA JAIN University Jharkhand**			
7	**RTAJU_2422**	A Simplified Stress Analysis of Functionally Graded Beams and Influence of Material Function on Deflection	Avunash Kumar Varma, Shivam Pradhan, NivedanMahato ARKA JAIN University-Jharkhand			
8	**RTAJU_2423**	A Simplified Stress Analysis of Functionally Graded Beams and	Avunash Kumar Varma, Shivam Pradhan, Nivedan Mahato ARKA JAIN University-Jharkhand			

		Influence of Material Function on Deflection				
9	RTAJU_2424	Advanced Theoretical Analysis of Functionally Graded Beams: Integrating Nonlinear Effects and Material Variability	Rohit Kumar Mahato, Bhaskar Singh Munda, NivedanMahato ARKA JAIN University-Jharkhand			
10	RTAJU_2425	Enhancing Thermal Performance of Functionally Graded Composite Plates: Material Gradation and Boundary Conditions Analysis	Sourabh Gope, Kunal Kumar, NivedanMahato ARKA JAIN University-Jharkhand			
11	RTAJU_2426	Mechanical Insights into Flexural Behavior of Functionally Graded Materials for Structural Optimization	Md. Touseef Ansari, KasifAslam, NivedanMahato ARKA JAIN University-Jharkhand			

Two days National Conference on"Recent Trends in Machine, Manufacturing, Modelling and Technology (RTMMMT'24)"						
Day 2 _Date: June 29, 2024 (Saturday))_Session-1						
9:30 AM -10:00 AM	Invited Speech by Keynote Speaker	Topic: Plasma Arc Cutting Process of Sailhard Steel	Dr. Deepak Kumar Naik Assistant Professor Department of Mechanical Engineering National Institute of Srinagar	meet.google.com/dxb-zsqx-hdc		
Track 1- 10:00AM – 12:00 PM						
Sl No.	Paper Code	Paper Title	Author & Affiliation	Session Chair	Co-Session Chair	Google Meet
1	RTAJU_2411	An Overview: Challenges of Sustainable Manufacturing	Mukesh Kumar Sharma, Viranshu Kumar, Basant Kumar Das	Dr. Viranshu Kumar, Assistant	Prof. Nivedan Mahato, Assistant	

			Assistant Professor, Department of Mechanical Engineering, Arka Jain University, Jamshedpur	Professor, Dept. of Mechanical Engineering, School of Engineering & IT, Arka JAIN University, Jamshedpur	Professor, Dept. of Mechanical Engineering, School of Engineering & IT, Arka JAIN University, Jamshedpur	
2	RTAJU_2412	Exploratory Investigation of Intensity Move and Contact Figure Twofold Line Intensity Exchanger Utilizing Wound Tape Supplement at Various Positions	Ranjeet Kumar, Ashwini Kumar, Assistant Professor, Department of Mechanical Engineering, Arka Jain University, Jamshedpur			
3	RTAJU_2413	Bending of thick, sophisticated composite plates by analytical modeling	Nivedan Mahto ARKA JAIN University-Jharkhand			
4	RTAJU_2414	Comparative Analysis of Hybrid and Traditional Manufacturing Methods – A study at Tata Motors	Vivek Kumar Student (M. Tech, Manufacturing), ARKA Jain University, Jamshedpur			
5	RTAJU_2415	Optimizing Solar PV Panel Efficiency via IoT- Enabled Parameter Analysis	Siju George Student *LNCT University* Bhopal, India Dr Anand Singh Professor, Electrical & Electronics Department LNCT, Bhopal Dr. Keerti Rai Associate Professor Department of Electrical and Electronics Engineering Arka Jain University			meet.google.com/dxb-zsqx-hdc
6	RTAJU_2435	A review of precipitation phase on the surface quality in diamond turning of an Aluminium alloy	Abhishek Kumar Goutam, Panda Hrushikesh Jagannath, Viranshu Kumar Arka Jain University Jharkhand			

7	RTAJU_2436	Advances in Additive manufacturing of metallic metamaterials with enhanced mechanical properties	Uttam Kumar,Amarjeet Yadav, Nivedan Mahato Arka Jain University Jharkhand			
8	RTAJU_2437	Review on Micro/Nanoscale Manufacturing: A Multidisciplinary Science	Sourav Kumar,Ankit Kumar Choudhary, Kuldip Kumar Sahu Arka Jain University Jharkhand			
9	RTAJU_2438	Review on Advance in Mechatronics System	Shobha Hembram, Aman Nandi , Md Arif Raza, Anupam Kumari Mechanical Department, Arka Jain University Mohanpur, Gamharia District-Seraikela Kharswan Jharkhand- 832108 India			
10	RTAJU_2439	Effect of Warm Forging and Sensitization on Austenitic Stainless Steel Welded	Md. Iqbal Ansari, Md. Arsad Arka Jain University, Jharkhand			
11	RTAJU_2440	Exploring the Impact of Digitalization and Automation: A Comprehensive Study of the Control Cabinet Manufacturing Industry	Satyendra Mahato, Gagandeep Singh ARKA JAIN University Jharkhand			

Two days National Conference on "Recent Trends in Machine, Manufacturing, Modelling and Technology (RTMMMT'24)"						
Day 2 _Date: June 29, 2024 (Saturday))_Session-2 12:00 PM- 1:00 PM						
9:30 AM -10:30 AM	Invited Speech by Keynote Speaker	Topic: Vibration Analysis of Functionally Graded Nanocomposite Structures	**Dr. Thomas Benedict** Associate Professor Senior Department of Design & Automation School of Mechanical Engineering VIT Vellore	meet.google.com/dxb-zsqx-hdc		
Track 1- 1:00PM – 03:00 PM						
Sl No.	Paper Code	Paper Title	Author & Affiliation	Session Chair	Co-Session Chair	Google Meet
1.	RTAJU_2427	Effect of Machining Parameters in Drilling of Glass Fiber Reinforced Polymer Composite with Modified AJM Process	Vishal Dutta, Puran Boipai, Kuldip Kr. Sahu ARKA JAIN University Jharkhand	Dr. Anup Kumar Assistant Professor, Dept. of Mechanical Engineering, School of Engineering & IT, Arka JAIN University, Jamshedpur	Prof. Mukesh Kumar Sharma,, Assistant Professor, Dept. of Mechanical Engineering, School of Engineering & IT, Arka JAIN University, Jamshedpur	meet.google.com /dxb-zsqx-hdc
2.	RTAJU_2428	Toward a technology roadmapping methodology to enhance sustainable and digital transition in manufacturing	Kanhaiya Sharma, Hari Om Sharma ARKA JAIN University, Jharkhand			
3.	RTAJU_2429	Review of Hybrid Modeling in Manufacturing: Integrating Physics-Based and Data-Driven Approaches	Ankit Kumar Mishra ARKA JAIN University Jharkhand			
4.	RTAJU_2430	Investigation on mechanical properties of Fibre reinforced composite materials	Subham Bera, Rahul Kumar Pandit, Basant Kr. Das Arka Jain University Jharkhand			
5.	RTAJU_2431	Design of free form surface using Bezier curve using multi-control point	Rohit Kumar Sharma, Aditya Jha, Kuldip Kumar Sahu Arka Jain University Jharkhand			
6.	RTAJU_2432	Roles of sensors and transducers in industry 4.0	PuranBoipai, Manish Kumar, Viranshu Kumar Arka Jain University Jharkhand			

7.	RTAJU_2433	Advanced tool used in IOT for industrial Application for enhancement in quality and productivity	Ashwani Kumar Sinha, Avinash Kumar, Mukesh Kumar Sharma Arka Jain University Jharkhand			
8.	RTAJU_2434	Advanced application of IOT in controlling thermal power plant	Sourav Gope, Ashish Kumar Jha, Mukesh Kumar Sharma Arka Jain University Jharkhand			
9.	RTAJU_2435	A review of precipitation phase on the surface quality in diamond turning of an Aluminium alloy	Abhishek Kumar Goutam, Panda HrushikeshJagannath, Viranshu Kumar Arka Jain University Jharkhand			
10.	RTAJU_2441	Enhancing Machining Performance: Evaluating Laser-Processed Microtextured Cutting Inserts	Anupam Kumari ARKA JAIN University Jharkhand			
11.	RTAJU_2442	Detection of Cancer Cell using Image Processing	Mr. Akash Kumar Bhagat, Research Scholar, ARKA JAIN University, Jharkhand Dr. Arvind Kumar Pandey, Dean, School of Engineering& IT, ARKA JAIN University, Jharkhand			
12.	RTAJU_2443	Application Of Total Productive Maintenance In Automobile Industry	Basant Kumar Das ASSISTANT PROFESSOR School of Engineering & IT	Dr. Anup Kumar,, Assistant Professor, Dept. of Mechanical Engineering, School of Engineering & IT, Arka JAIN University, Jamshedpur	Prof. Mukesh Kumar Sharma,, Assistant Professor, Dept. of Mechanical Engineering, School of Engineering & IT, Arka JAIN University, Jamshedpur	meet.google.com /dxb-zsqx-hdc
13.	RTAJU_2444	Modelling of aged porous anodic aluminium oxide thin film based moisture sensor	Shailesh Kumar Department of Electrical and Electronics Engineering Ashwini Kumar, Assistant Dean Amit Prakash Sen Department of Electrical and Electronics Engineering School of Engineering and IT, Arka Jain University, Jharkhand, India			

14.	RTAJU_2445	Welding of thin sheet metal products using cold metal transfer as a welding technique	Neeraj Kumar, Abhijeet Mandal , Suraj Kumar Pandit ARKA Jain University Jamshedpur Jharkhand			

Two days National Conference on"Recent Trends in Machine, Manufacturing, Modelling and Technology (RTMMMT'24)"			
Day 2, Date: June 29 , 2024 (Saturday)			
Valedictory Function			
Time: 3:00PM-3:30PM			
To Join the Valedictory Function click on the Link:		https://meet.google.com/oqg-ghbw-muv	
SLNo.	**Event**	**Time**	**Concerned Guest/Person**
1	**Welcoming of the Guests & Participants**	3:00 PM	Ms. Manaswita Sharma, Assistant Professor School of Engineering and IT, ARKA Jain University
2	**Address by the Convenor**	3:05 PM	Dr. Ashwini Kumar, Assistant Dean, School of Engineering And IT, ARKA Jain University
3	**Feedback By Participant's**	3:15 PM	Dr. ChandraPrabhaSahu, Assistant Professor, Department of Electrical and Electronics Engineering, ARKA Jain University
4	**Announcement of Best Paper Award**	3:18 PM	Dr. Viranshu Kumar, Assistant Dean, School of Engineering And IT, ARKA Jain University
4	**Conference Brief**	3:20 PM	Dr. Kuldip Kumar Sahu, Assistant Professor, Department of Electrical and Electronics Engineering, ARKA Jain University
5	**Vote of Thanks**	3: 25 PM	Dr. Anupam Kumari, Co- Convenor and Associate Professor, Department of Electrical and Electronics Engineering, ARKA Jain University

ABOUT THE CONFERENCE

The National Conference on Recent Trends in Machine, Manufacturing, Modeling, and Technology (RTMMMT-2024) is an esteemed event organized by the Department of Mechanical Engineering, School of Engineering & IT at ARKA JAIN University. This conference is dedicated to exploring the latest advancements and innovations in the fields of machine design, manufacturing technologies, modeling techniques, and emerging technologies.

The primary objective of RTMMMT-2024 is to provide a high-quality platform for researchers, academicians, industrialists, and students to present their innovative ideas and recent developments. The conference aims to facilitate the exchange of knowledge, foster collaboration, and establish research or business relationships among participants from various disciplines.

The conference will be held periodically to make it an ideal platform for people to share views and experiences Science, Engineering and Technology such as Advance Optimization and characterization techniques, Advances in Additive Manufacturing, Advances in Machine Tool Design, Advances in Materials Technology, Advances in Metal Cutting Technology, Advances in Metal Joining, Advances in Metal Forming, Artificial Intelligence and Robotics, Automation and Smart Systems, Bio Materials, Cellular manufacturing, Characterization and Testing, Coatings and Surface Engineering , Composite and Polymer Processing, Cryogenic aspects of metal cutting, , Mechanical dynamics and vibration, Micro and Nano Manufacturing, Modelling, analysis, and simulation of manufacturing processes, Nano Technology, Non Destructive Testing, Non-Conventional Machining Processes, Plastic processing technology, Powder metallurgy and ceramic forming, Precision Engineering, Thermal aspects of metal cutting and Tribology.

JGI

ARKA JAIN University
Jharkhand

NAAC GRADE A
ACCREDITED UNIVERSITY

Address :
Opposite to Kerala Public School, Mohanpur, Gamharia, Distt – Seraikela Kharsawan, State – Jharkhand, Pin – 832108