International Conference
on
Research & Innovative Perspectives in Engineering

ICRIPE-2025

23rd -24th January 2025

Organised By

Government College of Engineering, Nagpur

In Collaboration with

Bureau of Indian Standards

BOOK OF ABSTRACTS

In Association with

GOVERNMENT COLLEGE OF ENGINEERING, NAGPUR

शासकीय अभियांत्रिकी महाविद्यालय, नागपूर

NAAC Accredited with B++ (CGPA 2.93)

VISION : To be an Institution of national repute creating globally competent technocrats to serve the society

INSTITUTE PROFILE

INSTITUTE

- NAAC Accredited Institute
- MoU with 20+ renowned Institutions & Organizations
- Digital Classrooms & Seminar rooms
- State of the Art Gymnasium
- Entire Campus Wi-fi and Centralized Computer Center
- Digital language lab and library
- Community services through Unnat Bharat Abhiyan
- Excellent placement record and internship opportunities
- Approved 5.05 crores for establishing center of excellence

FACULTY

- Experienced & highly qualified faculty including Ph.D. supervisors
- Faculty representation on various committee of University/Autonomous Institution/Professional bodies/International organizations
- Faculty authored books & Recipient of Patents & Awards
- Training, Testing & Consultancy provider to Industries, Institutions & Government organizations
- NPTEL star and UHV certified faculty
- AICTE Innovation Ambassadors

ACADEMIC PROGRAMS

B.Tech in Civil Engineering	60
B.Tech in Mechanical Engineering	60
B.Tech in Electrical Engineering	60
B.Tech in Computer Science & Engineering	60
B.Tech in Electronics & Telecommunications	60
M.Tech in Infrastructure Engineering Technology	18

STUDENTS

- Meritorious input & graduands as university rankers
- NPTEL star students
- IEI,ISTE,BIS and IIC student's chapter
- e-Yantra, Robotics, Drone club along with 6 other clubs
- Active involvement in International Hackathon, International Patenting, Toycathons & State/National/Sport Events
- Students qualified in GATE/GRE/CAT/TOEFL/GMAT/IELTS
- B.Tech Honours, Minor & Major Degree achievers & skills through Digital Platforms

FUTURE PLANS (For next 4 years)

- NBA of all eligible departments
- Effective Participation in NIRF, ARIIA ranking
- Starting of PG courses, Research Centers
- Establishment of FAB Lab, Center-of-Excellence facility
- Autonomy from UGC, New Delhi

INSTITUTE DTE CODE >>> 04025

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Contact :

Prof. R. P. Borkar, Principal

B.E. , M.Tech, Add. B.A., Ph.D. (IIT Mumbai)

principal@gcoen.ac.in

Address:-

Sector 27 , MIHAN Rehabilitation Colony,
New Khapri, Nagpur-441108

Phone:- 07103-295220, 07103-295226

Book of Abstracts

of

International Conference on

Research & Innovative Perspectives in Engineering

(ICRIPE-2025)

Organized by

Government College of Engineering, Nagpur

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23rd -24th January 2025

Devendra Fadnavis
Chief Minister
Maharashtra

सत्यमेव जयते

Mantralaya
Mumbai-400 032

Date: 17th January, 2025

MESSAGE

I am very glad to know that Government College of Engineering, Nagpur is organizing an International Conference on Research & Innovative Perspectives in Engineering (ICRIPE-25) during 23-24 January 2025.

During the conference, research works in the emerging area such as Urban Infrastructure, Sustainable Development, Robotics and Automation, Green Energy, Renewable Energy Systems & Smart Grid, Electric Vehicle, Hydrogen Energy System, Biomedical Engineering, Signal Processing, Cyber Security and Networking, Artificial Intelligence, Machine Learning and Deep Learning, Internet of Things, and Advancement in standards will be presented and discussed.

The conference will provide a broad forum for initiating as well as enhancing knowledge and grasping recent updates in the field. It will help for addressing societal challenges globally and supporting interdisciplinary and cross-disciplinary scientific problems through innovative approaches. Such technical conference will certainly assist the state of Maharashtra to be Technologically advanced state.

I wish all the success to the conference and extend my warmest greeting to all the delegates and participants.

(Devendra Fadnavis)

Tel. : 022-2202 5151/2202 5222, **E-mail :** cm@maharashtra.gov.in,
Website : www.maharashtra.gov.in

MESSAGE

It’s a pleasure to know that Government College of Engineering, Nagpur is organizing International Conference on “Research and Innovative Perspective in Engineering (ICRIPE-25)” during 23 & 24 January 2025. The conference will provide an opportunity to academicians, researchers and student community to discuss cutting edge technologies in diversified and emerging areas such as Biomedical Engineering, Urban Infrastructure, Robotics and Automation, Electrical Vehicle, Signal Processing, Cyber Security and Networking, Internet of Things, Artificial Intelligence, etc.

This conference will provide a platform to know the recent updates and development in engineering and technical areas. It is a good mix of multidisciplinary, interdisciplinary and cross disciplinary domains. The efforts to organize such conference will surely help technical education to cater societal needs in a appropriate way.

I wish organizers of conference great success and extend my greetings to the delegates and participants.

(Dr. Vinod M. Mohitkar)
Director,
Technical Education
Maharashtra State, Mumbai

चन्दन बहल
CHANDAN BAHL
वैज्ञानिक-जी एवं उप महानिदेशक (अंतर्राष्ट्रीय सम्पर्क)
Scientist-G & Deputy Director General (International Relations)
दूरभाष/Phone : + 91-11-2323 2134
मोबाईल/Mobile : + 91-9810420200
ई-मेल/E-mail : ddgirsc@bis.gov.in
: ddgmscd@bis.gov.in
वैबसाईट/Website : http://www.bis.gov.in

सत्यमेव जयते

भारतीय मानक ब्यूरो
(भारत सरकार)
मानक भवन, 9, बहादुरशाह ज़फर मार्ग,
नई दिल्ली - 110 002
Bureau of Indian Standards
(Government of India)
Manak Bhawan, 9, Bahadur Shah Zafar Marg,
New Delhi - 110 002

MESSAGE

It is my pleasure to extend warm greetings to all participants of the *International Conference on Research and Innovative Perspectives in Engineering*, organized by Government College of Engineering, Nagpur.

As we navigate a rapidly evolving global landscape, the significance of research, innovation, and standards in driving sustainable development and technological advancements has never been more crucial. Bureau of Indian Standards (BIS) is proud to play a pivotal role in formulating and promoting national standards that ensure the quality, safety, and efficiency of products and services across diverse sectors. Standards are not merely about compliance; they embody a commitment to fostering innovation, ensuring sustainability, and creating a competitive edge for India on the global stage.

I am particularly delighted to note the inclusion of a dedicated track on *Indian Standards in Engineering and Sciences* in the conference. This initiative will undoubtedly raise awareness among stakeholders about the critical role Indian Standards play in ensuring safety, reliability, and supporting the nation's growth trajectory.

This conference is a valuable platform for global engineers, researchers, and innovators to share knowledge and collaborate. I am confident the discussions here will contribute significantly to advancing engineering practices and solutions.

I encourage all attendees to actively engage and seize this opportunity to drive positive change through innovation and research. Let us work together for a future that is technologically advanced, safe, and sustainable.

Wishing you all a successful and fruitful conference.

Chandan Bahl

(Chandan Bahl)

From Joint Director's Desk

I am delighted to share that Government College of Engineering Nagpur in collaboration with Bureau of Indian Standards is organizing an International Conference on Research & Innovative Perspectives in Engineering **"ICRIPE- 2025"** on 23rd & 24th January 2025.

This conference is a unique forum for exchange of innovative ideas, technical expertise for technological advancements etc. I hope that the deliberations in the convention will help researchers from academia and provide a platform for initiating collaborative research projects.

I extend my best wishes to all participants, invited delegates and speakers.

Finally, I congratulate Principal, Convenor & Co-Convenor, faculties & student representatives for their efforts in organizing the conference.

Dr.Manoj Daigavane
Joint Director
Technical Education Regional Office, Nagpur

Form Principal's Desk

Dear all,

It is my great honour to welcome you to the International Conference on Research and Innovative Perspectives (ICRIPE 2025), hosted by Govt. College of Engineering, Nagpur on January 23-24, 2025.

As we gather here today, I am delighted to note that ICRIPE 2025 has attracted an overwhelming response from the global academic community. The conference features a diverse range of papers from multidisciplinary areas, showcasing the latest research and innovations from around the world.

I am particularly proud to announce that our keynote speakers include distinguished academicians from USA, Japan and BIS, who will share their expertise and insights on cutting-edge topics. The conference program includes parallel sessions in 5 tracks, providing a platform for scholars to engage in meaningful discussions and knowledge sharing.

At Govt. College of Engineering, Nagpur, we are committed to fostering a culture of research excellence, innovation, and collaboration. ICRIPE 2025 embodies this vision, and I am confident that this conference will provide a stimulating environment for scholars to exchange ideas, explore new perspectives, and forge meaningful connections.

I extend my sincere gratitude to our keynote speakers, technical committee members, reviewers and sponsors for their invaluable contributions to the conference.

Once again, I welcome you all to ICRIPE 2025. Let us come together to explore new frontiers of knowledge, inspire innovation, and shape the future of research.

Thank you all,

Sincerely,

Prof. R. P. Borkar
General Chair ICRIPE- 2025
Principal, Govt. College of Engineering, Nagpur

From Convenor's Desk

Dear Distinguished Delegates, Speakers and Participants,

It is my immense pleasure to welcome you to the International Conference on Research and Innovative Perspectives (ICRIPE 2025), scheduled to take place on January 23-24, 2025.

I am thrilled to announce that we have received an overwhelming response, with around 128 technical papers submitted from various disciplines. This remarkable turnout is a testament to the growing importance of interdisciplinary research and innovation.

ICRIPE 2025 aims to provide a premier platform for academics, researchers, industry experts, and practitioners to share their cutting-edge research, exchange ideas, and collaborate on emerging trends and challenges. Over the course of two days, we have curated a rich program featuring keynote addresses by eminent Academicians and industry experts, technical sessions and poster presentations. Our esteemed speakers and presenters will delve into the latest advancements and innovative perspectives across various fields.

I extend my sincere gratitude to our keynote speakers, technical committee members, and reviewers for their invaluable contributions to the conference. I also appreciate the support of our sponsors, without whom this event would not have been possible. I also appreciate the tireless efforts of our organizing committee, who have worked diligently to ensure the success of this event.

I look forward to welcoming you all to ICRIPE 2025 and engaging in meaningful discussions, networking, and knowledge sharing.

Together, let us shape the future of research and innovation!

Best regards

Dr. Suraj Narendra Khante
Conference Convenor
ICRIPE 2025

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Shri. Vikas Chandra Rastogi IAS, Hon. Principal Secretary, Higher & Technical Education Deptt., Govt. of Maharashtra

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website: www.icripe2025.com

Conference Schedule

Day-1	**23/01/2025**
9.00-10.30am	Registration & Breakfast
10.30-11.30am	Inauguration of Conference
11.30-1.30pm	Keynote Speeches
1.30-2.15pm	Lunch
2.15-3.45pm	Session -1
3.45-4.00pm	Tea Break
4.00-5.30pm	Session-2
End of Day-1	
Day-2	**24/01/2025**
9.00-10.30am	Breakfast
10.30-12.30pm	Keynote speeches
12.30-2.00pm	Session -3
2.00-3.00pm	Lunch
3.00-4.00pm	Valedictory Function
End of Day-2	

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Schedule of Session

Track No. 1 Civil Engineering
Date: **Thursday, 23/01/2025**
Time: **2.15pm-3.45pm**

Session Coordinator: **Dr.S.A.Tekade**
Session Chair: **Dr. Hitendra Chandewar**
Session Co-Chair: **Dr. S. S. Pusadkar**

Paper Id	Title
21	Enhancing Municipal and Industrial Wastewater Treatment Efficiency through MBBR application: A Laboratory Study
40	Investigation of Reinforced Concrete Building for Forensic Engineering by Non-Destructive Testing Techniques
47	Prediction of concrete compressive strength using model tree
74	Bending Behaviour of a Thick Cantilever Beam Subjected to Parabolic loading Analysed through a Novel Shear Deformation Theory
173	Adsorptive Removal of Metals Using NLP Biosorbent
118	"Development of Autonomous Robotic Systems for Modular Structural Assembly in High-Rise Construction"
124	Uses Of UHPFRC Segment In Nagpur City (Wadi-RTO) Live Flyover Project
125	Rcc Design of Light Vehicular Underpass (LVUP) in Nagpur-Amravati (NH) Project
254	Microsilica: A Promising Material for High Strength Concrete
257	STUDY OF AUTOMATED SPEED BREAKERS FOR BLIND SPOTS ON THE ROAD
259	AN OVERVIEW ON DIGITIZATION AND MODERNIZATION OF LAND RECORDS IN MAHARASHTRA
260	Land use classification and planning by NMRDA -A Review
244	Reinforcing Black Cotton Soil using Banana Fiber Mat

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Schedule of Session

Track No. 1 Civil Engineering
Date: **Thursday, 23/01/2025**
Time: **4.00pm-5.30pm**

Session Coordinator: **Prof. A. A. Gawai**
Session Chair: **Dr. Ramesh Daryapurkar**
Session Co-Chair: **Dr. K. G. Asutkar**

Paper Id	Title
128	Effect of Wind Load On Low, Medium, High-Rise Buildings in Different Terrain Category
132	Dynamic Analysis of a High-Rise Structure on A Deep Pile Foundation Using Advanced Computational Tools: A Review
151	PZT Sensors in Structural Health Monitoring: Cutting-Edge Advances and Insights
153	Performance Attributes of Pervious Concrete: for Pavement Design
126	Seismic response and performance of multistorey prefabricated building structures
116	Removal of Heavy Metals in wastewater with the help of Different Macrophytes
218	A STATE OF ART REVIEW ON REMOVAL OF TOXIC GASES GENERATED FROM PYROLYSIS PROCESS
219	Sustainable Fuel Generation From Plastic Waste By Pyrolysis - A Review
223	A state of art review on solid waste management system of Nagpur city
241	RC Beam-Column Connections with Diagonal Reinforcement: Hysteretic Performance Study
243	A Short Comparative Overview of ASTM/ACI and Indian Design Codes for RC Beam-Column Joints and Strengthening Techniques
163	Sustainable Transportation Infrastructure: Design and Construction Strategies for Reduced Environmental Impact
165	The Impact of High Temperatures on Behavior of Concrete Materials: A Review

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Schedule of Session

Track No. 1 Civil Engineering
Date: **Thursday, 24/01/2025**
Time: **12.30pm-2.00pm**

Session Coordinator: **Dr. K. N. Kadam**
Session Chair: **Dr. R. S. Sonparote**
Session Co-Chair: **Dr. S. N. Khante**

Paper Id	Title
133	Analysis and Design of roof trusses of industrial shed of maple more unit using STADDPRO A review
150	Analysis On Behavior of Reinforced Concrete Structures Under Considerations of Explosive Loads
253	Tidal Flow Wetland for Copper Removal
192	Review of Groundwater Mapping and Water Quality Assessment
154	Green Porous Concrete: A Sustainable Solution for Rainwater Harvesting and Urban Pavement Applications
159	Chemical Effect on Concrete
169	"Deep Excavation – Challenges and Opportunities for Urban Space Development "
171	Analysis of Irregular Shape of Building in Earthquake prone area by Time History Analysis
186	Solid Waste Management by Pyrolysis and Composting
187	Effect of Shear Wall Placement on Torsional Behaviour of Multi-Storey Symmetric Buildings
199	REMEDIAL MEASURES ON NOISE POLLUTION ON CONVENTIONAL SPEED BREAKER
200	Impact of P-Delta Effect in Ground Shear on Building Structures Considering Linear Static

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DAY-1
Schedule of Session

Track No.2 : Mechanical Engineering
Date: **Thrusday, 23/01/2025**
Time: **2:15pm-3:45pm**
Venue **: 202(First Floor Main Building)**

Session Chair **: Dr.G.K.Awari**
Session CoChair **: Dr.S.W.Rajurkar**
Session Coordinator **: Prof.T.N.Kumbalpuri (9922424306)**

Paper Id	Title
60	Enhancing Hydraulic Cylinder Efficiency With Reconditioning Methods
67	Integrated Lean-Green Framework For Small Scale Manufacturing Industry: A Substructure Synthesis Model Approach
80	Android Controlled River Cleaning Robot
103	Automated Solar Powered Grass Cutter
155	Design & Development Of Welding Fixture For The Angle Bracket For Industrial Use
156	Design & Analysis Of Portable Injection Molding Machine
157	Design And Analysis Of Hydraulic Mini Press Machine
179	Investigation Of Thermo Acoustic Refrigeration System With Polynamide Nylon 6 Stack
180	A Review Of "Mechanical Testing And Characterization Of Paraffin Wax With Polypropylene Binder And Aluminum Additive"
190	Design And Analysis Of A Model Rocket With Environmental Monitoring Capabilities

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DAY-1
Schedule of Session

Track No.2 : Mechanical Engineering
Date: **Thursday, 23/01/2025**
Time: **4:00pm-5:30pm**
Venue **: 202(First Floor Main Building)**

Session Chair **: Dr.M.S.Kotambkar**
Session CoChair **: Dr.S.B.Ingole**
Session Coordinator**: Prof.V.P.Titarmare (9322659934)**

Paper Id	Title
196	Leveraging Industry 4.0 Tools For Parameter Identification In Performance Testing Of Mri Machines: A Maintenance Practices Perspective.
216	Advances In Wear-Resistant Coating Technologies: A Comprehensive Review
217	Rejection Analysis Of Piston In Manufacturing Process – A Case Study
225	Diesel-Milkscum Biodiesel Blends Powered Reactivity Controlled Compression Ignition (Rcci) Engine At High Compression Ratio Engine
226	Design Optimization And Rigid Body Dynamics Of A Robot Arm Using Advanced Simulation Tools
229	Survey On The Wear Characteristic Of Cladded Surface Fabricated With Overlay Method
234	Central Tyre Pressure Monitoring And Inflation System
235	Design Of Low Cost Double Acting Power Hacksaw Machine With Integrated Cooling System
252	Study Of Fabrication Techniques To Develop The Next Generation Mmcs For Industrial Applications: A Comprehensive Review
258	Design And Development Of Leg Guard For Two Wheelers

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DAY-2
Schedule of Session

Track No.2 : Mechanical Engineering
Date: **Friday, 24/01/2025**
Time**: 12:30pm-2:00pm**
Venue **: 202(First Floor Main Building)**

Session Chair **: Dr.V.M.Athawale**
Session CoChair **: Dr.U.S.Wankhede**
Session Coordinator **: Prof.R.V.Mahajan (9405979084)**

Paper Id	Title
58	Parametric Identification Of Nonlinear Joint Using Frequency Domain Analysis: A Substructure Synthesis Model Approach
167	An Overview Of Hydrodynamic Performance Under Electroosmotic/Pressure Driven Ad Streaming Potential Viscoelastic Fluid Flow
195	Effect Of Addition Of Mos2 And Sic Reinforcement To Develop The Self-Lubricating Novel Aluminium Metal Matrix Hybrid Composites For Tribological Applications: An Overview
53	Photovoltaic Panel Cooling Using Heat Pipe Technology
87	A Survey Of Indian Handcart: Issues And Design Needs
245	Parametric Optimization Of Test Variables That Influence On Ultrasonic Welding Of Plastic (Acrylic) To Hybrid Composite By Using The Taguchi Approach.
230	Industrial Case Study On Productivity Improvement Using Work Study And Lean Techniques (At V.S. Autotech, Nagpur)
115	Methods Of Plastic Waste Management And Recycling: A Review
250	A Review Paper On “Exploring The Versatility Of E-Glass Fiber Reinforced Epoxy In Advanced Engineering Applications”

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DAY -1
Schedule of Session-I

Track No. 3: Electrical Engineering Session Coordinator: Praful Nandankar (9423633372)
Date: Thursday, 23/01/2025 Session Chair: Dr. Nitin Ghawghawe
Time: 2.15 pm-3.45 pm Session Co-Chair: Dr. Rajesh Surjuse

Paper Id	Title
129	Optimizing Frequency Regulation: A Comparative Assessment of Energy Storage Technologies Based on Key Performance Parameters
208	PV-Powered BLDC Motor Drive System for EV Using an Improved KY DC-DC Converter
224	Optimal Co-ordination of Wind Farm and Electric Vehicle for Economical Operation of Grid
102	Analyzing Active and Reactive Power Sharing Techniques of Distributed Optimal Power Flow
99	Quantitative and Qualitative analysis of the Performance of State-Owned and Private Utility Companies in the Indian Electricity System
32	A comprehensive review on Linear Induction Motors in transportation systems
100	An Innovative Approach to Mitigate Outage Reduction Time on Electric Power Distribution Networks
54	Smart Farming using IoT

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DAY -1

Schedule of Session-II

Track No. 3: Electrical Engineering
Session Coordinator: Rajani Sahare (9860090083)
Date: Thursday, 23/01/2025
Session Chair: Dr. P.M. Meshram
Time: 4:00 pm-5:30 pm
Session Co-Chair: Dr. Rajesh Surjuse

Paper Id	Title
170	Design and Fabrication of Insulation Failure Detection System for Domestic Appliances with Metallic Enclosures
168	Effect of Dust Particles Deposition on Performance of Photovoltaic Solar Panels
152	Design of Half Bridge LLC Resonant Converter Using SPICE
211	Design and Analysis of a Phase-Shift Full-Bridge Converter for Wide Input Range and Constant Output Voltage
127	A Comparative Study of Different Electric Motor Types and Drives Used for Electric Vehicles
239	Solar Power Street Light with Auto Intensity Adjustment and Fault Detection
33	Understanding Hydraulic Power Packs: Essential Components, Functionality, and Industry Use Cases
232	Development of an Intelligent Smart Plant Monitoring System Using IoT and AI
88	Design of Electrical Bicycle for Sustainable Urban Mobility

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DAY -2

Schedule of Session-III

Track No. 3: Electrical Engineering

Session Coordinator: Neha Khadse (9096218277)
Session Chair: Dr. Prashant Bedekar
Session Co-Chair: Dr. Rajesh Surjuse

Date: Friday, 24/01/2025
Time: 12:30-2:00 pm

Paper Id	Title
42	Design and Analysis of a Double-Sided LIM
108	Energy Management Strategies for Hybrid Electric Vehicles
120	Enhancing Power Quality in Renewable Energy Systems: A Comprehensive Review of UPQC in PV, Wind, and Microgrids
207	Automated Hydroponic System
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233	Plant Health Monitoring System using AI and ML
237	Analyzing the Impact of Electric Vehicle Charging on Distribution Transformer Life and Performance
240	ANN-based Evaluation of Transformer Performance through Terminal Current and Voltage Monitoring

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DAY 1

Schedule of Session-I

Track No. 4 Computer Science and Engineering

Date: Thursday, 23/01/2025 **Session Coordinator: Dr. D. J. Chaudhari (8956022197)**

Time: 2.15pm-3.45pm **Session Chair: Dr. Ravindra Jogekar**
Session Co-Chair Dr. Latesh Malik

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63	Performance Evaluation of IOT Based Air Pollution Monitoring System
73	Employee Attrition Prediction
84	NAVGUIDE: Indoor Navigation for Visually Impaired
92	LegalLens: AI-powered Legal Document review system using Large Language Model
101	Review on Fraud App Detection using Machine Learning Techniques
109	Automated Pull & Drop Robot using Virtual Mapping .
112	AI-Driven Framework for Early Cancer Detection and Diagnosis
113	Artificial Intelligence based knowledge organizer for diverse data formats
117	BookAR : Augmented Reality Experience for Traditional Books

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website: www.icripe2025.com

DAY 2
Schedule of Session-II

Track No. 4 Computer Science and Engineering

Date: Thursday, 24/01/2025 **Session Coordinator: Dr.P.B.Jawade((9373494818)**
Time: 12.15pm-2.00pm **Session Chair: Dr. Vilas Mahatme**
Session Co-Chair: Dr. Latesh Malik

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139	Machine learning algorithm for High-Speed Face Recognition Based on RBF Neural Networks and Discrete Cosine Transform
146	Blockchain Technology-Based Paperless Digital Loan Processing System
149	Detecting lung cancer histopathological images with a reliable Machine learning Based approach utilizing Convolutional neural network
184	MachTracker - Machine Health Monitoring System
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website: www.icripe2025.com

DAY 1

Schedule of Session-I

Track No. 5 Electronics and Telecommunication Engineering

Date: Thursday, 23/01/2025
Time: 2pm-4pm

Session Coordinator: Shilpa Ukey
Session Chair: Dr. Harsh Goud
Session Co-Chair Dr. Rajashree Raut

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95	Smart Alert System for Road Accident Detection: A Design and Implementation Framework
96	A Study of Different Sensors for Accurate HMI System
135	Review On Real Time Monitoring System for Medical Treatment Using Smart Syringe Pump
148	Revolutionizing Air Pollution Control Automated Technology with Ink as a Byproduct
172	Review Paper on Embedded System Based Real Time Monitoring and Data Management System of Cutting Tools for Improving Efficiency of Machine Using IOT
174	Anomaly Detection in Mobile Adhoc Network to Prevent Denial of Service Attack
181	Integration of LoRa Networks and Machine Learning for Optimized Remote Healthcare Monitoring: A Comprehensive Review
188	Towards Sustainable Space Exploration: Approaches and Challenges in Space Debris Management
194	Smart Wheelchair for Semi-Disabled
198	Security Mechanisms In Wireless Sensor Network-A Survey
202	A Review on Parametric Analysis of Consensus Algorithms in Blockchain Technology
197	Security Mechanisms in Wireless Sensor Network-A Survey

Keynote Speakers of ICRIPE-2025

Dr. Sudarshan Kurwadkar
PhD in Environmental Engg
Professor of Civil and Environmental Engineering
California State University, Fullerton **(USA)**
Title of keynote: **State of the Environment: Innovative Solutions for Sustainable Water and Wastewater Management in Urban Areas**

Dr.Tarendra Lakhankar
PhD in Civil Engineering (Water Resources) from The Graduate Center of the City University of New York **(USA)**
Director, Education and Training Pillar, CUNY CREST Institute New York
Keynote Topic: **Satellite Remote Sensing Applications in Engineering and Educational Opportunities in USA**

Dr. Yasuyuki Nishida
Qualification: Dr. of Engr.
Affiliation: Technical Consultant of Headspring Inc. **(JAPAN)**
Specialization:- Power-Electronica, especially several types of utility interfaces and. PE education.
Keynote Topic: A Modern Japanese Power-Electronics Education Tool by means of RAPID.

Sandesh Sudhakar Gokanwar
Post- Scientist D/Joint Director
Organization- Bureau of Indian Standard **(INDIA)**
Keynote Topic: Bureau of Indian Standards – Importance & Opportunities

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Contributory Paper Abstracts
ICRIPE- 2025

Track-1 Civil Engineering

PAPER ID: 21

Enhancing Municipal and Industrial Wastewater Treatment Efficiency Through MBBR Application: A Laboratory Study

Abhilasha G. Deshmukh[1], Dr. Kiran M. Tajne [2]

[1] *Research Scholar PGTD of Compute & Electronics Rashtrasant Tukdoji Maharaj Nagpur University, Maharashtra, India440033 G. H. Raisoni College of Engineering and Management, Nagpur, India e-mail: deshmukhabhilasha36@gmail.com*

[2] *Associate Professor, Department of Civil Engineering Government College of Engineering, Nagpur e-mail: kgasutkar@gcoen.ac.in*

It has been estimated that most of the world's population may experience a freshwater scarcity in less than 20 years. The primary factor contributing to this unfavorable future will be the current worldwide scenario of growing water consumption and disposal. The greatest method to preserve the diminishing natural supply is to recycle wastewater effluents from industrial, agricultural, and human activity areas and reuse them to lessen the likelihood of a future fresh water catastrophe. The present study focuses one of the best low-cost sewage treatment methods called as Moving Bed Biological Reactor (MBBR). The study is conducted at existing Sewage Treatment Plant in a Hostel to increase the efficiency of plant. It also mirrors real-world urban wastewater scenarios and employs a comprehensive approach. Important design parameters like Specific Surface area (SFA), Filling ratio (Volume of media/Active Volume of Digester), Hydraulic Retention Time (HRT) are studied through a lab setup. HRT of 6 hr. was found to be giving 87% BOD reduction and 83% COD reduction. Efficiency is improved when filling ratio is increased at 60 % above this BOD and COD was found to be 85% and 79% respectively. Development of the media and the creation of a controlled aerobic environment are pivotal 1components of the research methodology. Above study can be used for improving the performance of existing Sewage treatment plant in the college campus and water can be recycle for gardening and washing purpose.

Keywords: Wastewater management, sewage treatment, MBBR method, urban wastewater, water conservation, COD, BOD.

PAPER ID: 40

Investigation of Reinforced Concrete Building for Forensic Engineering by Non-Destructive Testing Techniques

Karishma Tiwari[1], Anubhav Rai[2]

[1]*Assistant Professor Department of Civil Engineering, Gyan Ganga College of Technology, Jabalpur (M.P) email: karishmatiwari@ggct.co.in*

[2] *Head of Department, Department of Civil Engineering, Gyan Ganga College of Technology, Jabalpur (M.P) email: anubhavrai@ggits.org*

In this paper a research is done to investigate a reinforced concrete structure. The structural deficiencies were observed and examined at Namratana Building Belapur, Mumbai. The building construction was started at the year 1990 and the construction was completed at the year 1992. It has G+8 floors. The test was conducted on 51 structural elements from the ground floor and first floor. The total number of tested beams is 15 (400 mm x 300 mm), in where ground floor had 9 beams and first floor had 5 beams respectively. The total numbers of tested columns are 30 (450 x 450 mm). The presence of concrete defects is detected by using ultra-sonic pulse velocity test. There were 32 indirect tests and 19 direct tests conducted, with an average result of 4.17 km/s. The rebound hammer test is used to determine the compressive strength of concrete. The test collected 44 horizontal readings and 7 vertical readings. The average mid-point strength at the beam is 40

N/mm2, the slab is 45 N/mm², and the column is 42 N/mm2.The corrosion potential is identified by using half-cell potentiometer test. The result shows probability of active corrosion is less and uncertain in 4 columns and 4 beams. The further extension of corrosion is detected by the carbonation test. For identifying the depth of carbonation is measured by using phenolphthalein indicator as solution in ethanol. The highest observed depth of carbonation is 30 mm.

Keywords: Forensic, Non-destructive testing, Visual inspection, Rehabilitation.

PAPER ID: 47

Prediction of Concrete Compressive Strength using Model tree

Supriya.S. More[1], Ajaykumar. R. Kambekar[2]

[1]*Research Scholar, Civil Engineering Department, Sardar Patel college of Engineering, Andheri Mumbai, India, email: ssmore74@gmail.com*

[2] *Associate Professor, Civil Engineering Department, Sardar Patel college of Engineering, Andheri Mumbai, India, email: a_Kambekar@spce.ac.in*

Predicting the compressive strength of concrete is a vital aspect of construction and material science, impacting structural integrity, durability, and safety. This study explores the application of model tree algorithms, specifically using the M5 rule, to predict concrete compressive strength based on various mix properties. The M5 rule, a robust method for generating model trees, splits data into subsets and assigns linear regression models to each subset, enhancing accuracy and interpretability. By M5 rule models with the conventional compressive strength values, this research aims to develop predictive models that can accurately estimate the compressive strength of concrete. Total 330 test sample were tested using IS 516 for compressive strength. This MT-based models are trained on experimental data and tested with 50%,40%,30%,20% and 10% percentage split to forecast the compressive strength, considering various concrete mix designs. With CC value of obtained in range of 0.95 to 0.98 with testing split.MLP model is showed excellent results. The model is validated using multi linear regression. By analyzing data from different mix designs, including variables such as cement content, water- cement ratio, and aggregate properties, this approach aims to deliver high predictive accuracy while simplifying the relationships between concrete mix components and strength results.

Keywords: Coefficient of correlation, mean absolute error, root mean square error, compressive strength

PAPER ID: 74

Bending Behaviour of a Thick Cantilever Beam Subjected to Parabolic loading Analysed through a Novel Shear Deformation Theory

Rafat Ali[1], S.K. Hirde[2]

[1]*Civil Engineering Department, Government Polytechnic, Amravati, email: rafatali088@gmail.com*

[2]*Department of Applied Mechanics, Government College of Engineering, Amravati, email: suchita.hirde@gmail.com*

The current research paper seeks to investigate a thick cantilever beam under parabolic loading using a seventh-order shear deformation theory. The current theory's displacement field considers transverse shear and normal deformation effects. The beam's depth influences the formulation of proposed beam's theory. Displacement field in the thickness or depth coordinate represents the shear deformation effects. To achieve a more accurate estimation of the beam's bending behaviour including shear deformation effects, displacements, rotations and stress distributions, the thickness coordinate terms are taken up to the seventh order. Virtual work Principle is applied to get governing equation, boundary condition. By using constitutive relations, transverse shear stresses can be computed which ensure the no shear stress state on the beam's upper and lower surfaces, hence shear correction coefficient is eliminated. The homogeneous, isotropic, cantilever beam under parabolic load is regarded for illustration. The analysis is performed and the expressions are retrieved for the transverse-displacements, normal displacements, normal bending-stresses, transverse shear-stresses. The results are subsequently evaluated against those reported in literature viz Euler theory, Timoshenko theory and various higher-order SDT to demonstrate the efficiency

of seventh order theory. The novelty of present theory is its improved predictive capabilities for complex loading and boundary condition problems in automotive, aerospace and civil engineering.

Keywords: Axial stress, Deep beam, Displacement field, Equilibrium Equation, Shear deformation, Shear stress, Virtual work principle

PAPER ID: 116

Removal Of Heavy Metals in Wastewater with The Help of Different Macrophytes

Dr K. R. Harne[1], Dr R. P. Borkar[2], Anand B Prajapati[3]

[1]*Dean, NSUT, Delhi India email: harne.kailash@nsut.ac.in*

[2]*Principal GCOE, Nagpur India email: rpborkar@rediffmail.com*

[3]*Project Design Engineer Horizon Services Pune, India email: anandprajapati177@gmail.com*

Water pollution from heavy metal ions is a global environmental issue, primarily caused by wastewater from cities and industries containing organic, inorganic pollutants, and heavy metals. Exposure to heavy metals leads to toxic effects. While various treatment technologies have been developed, conventional methods are costly and less effective. This review discusses case studies and comparative analyses of different literatures on using macrophytes for heavy metal removal in wastewater. Phytoremediation, a cost-effective technique, has shown success in removing heavy metals through various macrophyte species.

Keywords: Heavy Metals, Phytoremediation, Macrophytes, Adsorption,

PAPER ID: 118

Development of Autonomous Robotic Systems for Modular Structural Assembly in High-Rise Construction

Yamini N. Deshvena[1]

[1]*Assistant Professor, Department of Civil Engineering, Shri Shivaji Institute of Engineering & Management Studies, Parbhani, Maharashtra, India, email: yaminideshvena@gmail.com*

The rapid pace of urbanization and the demand for efficient construction methods have driven the need for innovative approaches in high-rise building projects. This study presents the development of autonomous robotic systems specifically designed for modular structural assembly, aiming to revolutionize the construction industry. These systems leverage advanced robotics, artificial intelligence (AI), and real-time monitoring to independently assemble prefabricated components with exceptional precision and efficiency. Key features include adaptive control for handling environmental challenges, multi-robot coordination to streamline operations, and robust human-robot interaction for enhanced safety and oversight. Integrating IoT and machine learning, the system enables dynamic decision-making and automated error correction during assembly processes.

By minimizing manual labor, improving accuracy, and supporting sustainable construction practices, this approach accelerates project timelines while addressing critical economic, environmental, and safety concerns. This research aspires to establish a new standard in high-rise construction through the seamless integration of robotics and automation. This study explores the creation of autonomous robotic systems specifically designed for assembling modular structures in high-rise construction. Leveraging cutting-edge robotics, artificial intelligence, and Building Information Modeling (BIM), it aims to improve construction efficiency, accuracy, and safety. The envisioned system involves robots that can independently manage tasks such as handling, positioning, and securing modular units, significantly reducing the need for human involvement.

Keywords: High-rise construction, Artificial intelligence (AI), Autonomous robotic systems,IoT (Internet of

Things),Dynamic decision-making,Real-time monitoring.

PAPER ID: 124

Uses Of UHPFRC Segment in Nagpur City (Wadi-RTO) Live Flyover Project

Amit Mohansingh Bhate [1], Dr. Aasif Baig [2]

[1]Department of Civil Engineering TGPCET, RTMNU email: am.bhate15@gmail.com

[2]Assistant Professor, Structural Engineering, Department of Civil Engineering, Tulsiramji Gaikwad Patil Collage of Engineering and Technology, Nagpur, Maharashtra

Conducting a thorough investigation into the latest advancements in Ultra-High-Performance fiber reinforced Concrete (UHPFRC) is crucial to establish essential materials testing protocols and expand its practical applications. The primary goal of UHPC development is to attain high tensile strengths by leveraging fiber reinforcement, which provides tensile resistance once the cement matrix has cracked. Ongoing research and significant projects will further bolster the medium-term development of UHPC and help demonstrate its substantial structural and architectural capabilities. UHPFRC is a cement based composite material that has many positive properties including:- a) economy as compare to conventional concrete . b) Durability:- UHPFRC is resistant to corrosion and fatigue. C) strength:- UHPFRC has high strength in compression and tension .

Keywords: UHPFRC Material Properties, Procedures, Behaviour , development and principle .

PAPER ID: 125

RCC Design of Light Vehicular Underpass (LVUP) In Nagpur-Amravati (NH) Project

Varsha Yele[1], Sanjay Bhadke[2]

[1]Research Scholar, Dept. of Structural Engineering, Tulsiramji Gaikwad Patil College of Engineering & technology, Nagpur, INDIA email: varsha.yele@gmail.com

[2]Professor, Dept. of Structural Engineering,Tulsiramji Gaikwad Patil College of Engineering & technology, Nagpur, INDIA,email: sanjay.civil@tgpcet.com

A light vehicular underpass is a key infrastructure solution designed to alleviate traffic congestion and enhance mobility in urban areas. By allowing vehicles to pass beneath roadways, underpasses reduce the need for traffic signal stops and minimize the impact of intersections. This infrastructure is particularly beneficial in areas with high traffic volumes and limited space for above-ground road expansions. The design and construction of a light vehicular underpass require careful consideration of factors such as traffic flow, safety, environmental impact, and cost- effectiveness. Key components include efficient drainage systems, proper ventilation, and structural integrity to accommodate varying traffic loads. The underpass can also contribute to the aesthetic and functional enhancement of urban spaces by freeing up surface-level roads for alternative uses, such as pedestrian walkways or green spaces. This study aims to explore the benefits, challenges, and best practices involved in the planning, design, and implementation of light vehicular underpasses, with a focus on their role in improving traffic management and urban development.

Keywords: Light Vehicular Underpass, Traffic Congestion Structural Integrity etc.

PAPER ID: 126

Seismic Response and Performance of Multistorey Prefabricated Building Structures: A Review

Mr. Kalyani Meshram[1], Dr. P. L. Naktode[2], Dr. Aasif Baig[3]

[1]*Research Scholar, Structural Engineering, Department of Civil Engineering, Tulsiramji Gaikwad Patil Collage of Engineering and Technology, Nagpur, Maharashtra.email: Km7421172@gmail.com*

[2,3]*Assistant Professor, Structural Engineering, Department of Civil Engineering, Tulsiramji Gaikwad Patil Collage of Engineering and Technology, Nagpur, Maharashtra.*

This study investigates the impact of in the plane diaphragm strength and stiffness on the seismic absorbing capacity of multi-story modular buildings. Modular construction, which involves prefabricating modules offsite and assembling them on-site, has gained popularity for its efficiency, quality, and environmental benefits. However, diaphragm irregularities, resulting from the joining of modules at separate points, can affect structural stability and lead to diaphragm fractures if not addressed. The study proposes a modified approach to determine diaphragm service flexibility, considering shear deformation in isolated module diaphragms and both shear and axial deformation in diaphragm connectors. A numerical model is developed for a four-story modular RCC structure to assess seismic performance. Additionally, the study explores the thermal behavior, energy consumption, and seismic resistance of modular prefabrication, comparing it with traditional construction methods. Given the lack of guidance for modular buildings in Indian seismic codes, this research provides valuable insights into their performance under seismic loads.

Keywords: seismic resistance, energy, Prefab, modular, thermal behavior, life cycle analysis, Bracings, Shear wall, acoustic constraints etc.

PAPER ID: 128

Effect Of Wind Load on Low, Medium, High-Rise Buildings in Different Terrain Category: A Review

Mr. Shailesh V. Kapse[1], Prof. Sanjay Bhadke[2]

[1]*Research Scholar, Structural Engineering, Department of Civil Engineering, Tulsiramji Gaikwad Patil Collage of Engineering and Technology, Nagpur, Maharashtra. email: kapseshailesh6@gmail.com*

[2]*Assistant Professor, Structural Engineering, Department of Civil Engineering, Tulsiramji Gaikwad Patil Collage of Engineering and Technology, Nagpur, Maharashtra email: Sanjay.civil@tgpcet.com*

The movement of wind can cause tall structures to sway in both the "along wind" and "across wind" directions. Even buildings designed to meet lateral drift criteria may experience excessive movement during storms. As the height of a structure increases, it becomes more vulnerable to wind-induced oscillations, which can pose a risk to the building. These oscillations may also cause discomfort for the occupants, even if the building itself is not at risk of collapse. Therefore, accurately evaluating the movement of the structure is essential for ensuring serviceability. There are several methods available to determine the Wind Load Response of tall buildings. Wind currents, which are visible to the human eye, vary in their intensity depending on the terrain. In rocky areas, wind travels more slowly, whereas on flat ground, it moves faster. This study examines the impact of wind on three different building heights (G+5, G+10, and G+15) in three different types of terrain. By using wind data from these terrains, the research explores the effects of story drift, shear forces, and structural responses on buildings of varying heights. All 12 models are analyzed using ETABSv9.7.4 software. The findings of this study provide valuable insights into the variations in drift, shear forces, and the percentage change in these factors with respect to both the building height and terrain type.

Keywords: Wind Load Response, Structural Drift, Shear Forces, Tall Buildings, Terrain Variability

PAPER ID: 132

Dynamic Analysis of a High-Rise Structure on A Deep Pile Foundation Using Advanced Computational Tools: A Review

Ms. Shilpa M. Gajbhiye[1], Dr. Snehal Abhyankar[2], Dr. Amey Khedekar[3]

[1]*Research Scholar, Structural Engineering, Department of Civil Engineering, Tulsiramji Gaikwad Patil Collage of Engineering and Technology, Nagpur, Maharashtra*

[2]*Assistant Professor, Structural Engineering, Department of Civil Engineering, Tulsiramji Gaikwad Patil Collage of Engineering and Technology, Nagpur, Maharashtra*

[3]*Assistant Professor, Structural Engineering, Department of Civil Engineering, Tulsiramji Gaikwad Patil Collage of Engineering and Technology, Nagpur, Maharashtra.*

This study investigates the critical role of soil types, foundations, and building frames in resisting external loads, with a particular focus on storey displacement as an indicator of structural safety under various loading conditions. In earthquake-prone regions, foundation failures are a leading cause of structural displacement, often resulting in significant human and economic losses. The interaction between deep foundations and the surrounding soil, known as Soil-Structure Interaction (SSI), plays a pivotal role in a structure's performance. Factors such as foundation geometry, soil properties, and load conditions significantly influence the stability and design of buildings. This research highlights the importance of considering SSI effects to enhance the structural resilience and safety of buildings, especially in areas susceptible to seismic activity.

Keywords: Single under-reamed friction pile, Isolated footing, Sub-structure, Storey displacement, Building frame etc

PAPER ID: 133

Analysis and Design of Roof Trusses for Industrial Shed of Maple More Unit Using STAAD.Pro: A Review

[1]Ms. Sunayana Meshram, [2]Dr. Amey khedikar, [3]Ms. Nayana Sangode

[1]*Research Scholar, Structural Engineering, Department of Civil Engineering, Tulsiramji Gaikwad Patil Collage of Engineering and Technology, Nagpur, Maharashtra*

[2]*Assistant Professor, Structural Engineering, Department of Civil Engineering, Tulsiramji Gaikwad Patil Collage of Engineering and Technology, Nagpur, Maharashtra.*

[3]*Assistant Professor, Structural Engineering, Department of Civil Engineering, Tulsiramji Gaikwad Patil Collage of Engineering and Technology, Nagpur, Maharashtra.*

An industrial building is a structure designed for the storage of raw materials or the production of industrial goods, characterized by components such as purlins, rafters, roof trusses, wind bracing, and columns. These buildings, often used as workshops or warehouses, rely heavily on steel for construction, particularly when concrete is impractical or time-sensitive. This study focuses on the design and analysis of a multi-story industrial steel truss building, developed using manual calculations in accordance with IS codes. The structural analysis includes various load combinations, such as dead, live, and wind loads, which significantly influence the performance of critical components like the column base. Steel purlins span between rigid frames, supporting the light gauge metal cladding. The findings, based on detailed load and impact evaluations, provide insights into the structural behavior and stability of industrial buildings, ensuring they meet safety and performance requirements.

Keywords: Industrial Sheds, Roof Truss, structural analysis, Staad Pro etc.

PAPER ID: 150

Analysis On Behavior of Reinforced Concrete Structures Under Considerations of Explosive Loads: A Review

Mr. Mayur Kumbhare[1], Dr. Amey khedikar[2], Ms. Nayana Sangole[3]

[1]*Research Scholar, Structural Engineering, Department of Civil Engineering, Tulsiramji Gaikwad Patil Collage of Engineering and Technology, Nagpur, Maharashtra.*

[2]*Assistant Professor, Structural Engineering, Department of Civil Engineering, Tulsiramji Gaikwad Patil Collage of Engineering and Technology, Nagpur, Maharashtra.*

[3]*Assistant Professor, Structural Engineering, Department of Civil Engineering, Tulsiramji Gaikwad Patil Collage of Engineering and Technology, Nagpur, Maharashtra.*

Reinforced concrete structures are renowned for their strength and durability, making them integral to modern construction projects. While they are designed to withstand routine loads from occupants and environmental conditions, they face considerable vulnerabilities when subjected to explosive forces from events like terrorist attacks, industrial accidents, or military conflicts. The intense shock waves generated by explosions can lead to severe damage, including cracking, spalling, and, in extreme cases, catastrophic structural failure. This project aims to analyze the behavior of reinforced concrete structures under explosive loads to improve their resilience against such threats. Utilizing advanced computer simulations alongside a thorough review of existing research, we will explore the dynamic response of these structures to blast forces. This investigation will identify critical failure points and assess the effectiveness of current design practices. Ultimately, the study will provide recommendations for design enhancements that can bolster the strength and safety of buildings made of reinforced concrete in the midst of explosives threats. By improving our understanding of structural behavior under extreme conditions, we can contribute to the development of more resilient construction practices, ensuring better protection for occupants and assets in vulnerable settings.

Keywords: Reinforced Concrete Structure, collapse, progressive collapse, analysis, Explosive Loads, Etabs, etc.

PAPER ID: 151

PZT Sensors in Structural Health Monitoring: Cutting-Edge Advances and Insights

Avinash D. Jakate[1], Dr.Suchita. K. Hirde[2]

[1]Lecturer, Civil Engineering Department Government Polytechnic, Amravati, Maharashtra, India.
avinash.jakate@gmail.com@gmail.com

[2]Professor, Department of Applied Mechanics, Government College of Engineering, Amravati, Maharashtra, India. suchita.hirde@gmail.com

Structural health monitoring (SHM) plays a vital role in assessing infrastructure conditions, ensuring structural integrity, and refining maintenance strategies. Among the various tools for SHM, piezoelectric sensors, particularly lead zirconate titanate (PZT) sensors, stand out due to their high sensitivity, durability, and ease of integration with structural materials like steel and concrete. This review explores recent advancements in SHM techniques utilizing PZT sensors, with a focus on structural steel applications. It covers fundamental principles of PZT sensor operation. Additionally, the review examines challenges related to PZT patches. By consolidating the latest research findings, it aims to offer a comprehensive understanding of the current state-of-the-art in PZT-based SHM for structural steel, highlighting its strengths, limitations, and potential directions for future research.

Keywords: High-rise construction, Artificial intelligence (AI), Autonomous systems, loT (Internet of Things) Dynamic decision-making, Real-time monitoring

Keywords: PZT Sensors, Placement Optimization, Signal Processing.

PAPER ID: 153

Performance Attributes of Pervious Concrete: for Pavement Design

Nita J. Gedam[1], Dr. S. R. Marve[2]

[1]*Assistant Professor, Dept. of Civil Engineering, Rajiv Gandhi College of Engineering, Research & Technology, Chandrapur, MH, INDIA, e-mail: nitagedam@rcert.ac.in*

[2]*Assistant Professor , Dept. of Civil Engineering, Rajiv Gandhi College of Engineering, Research & Technology, Chandrapur, MH, INDIA , e-mail:shradheshmarve@gmail.com*

This study looks at the performance characteristics of pervious concrete for sustainable pavement construction, with an emphasis on improving strength, permeability, and durability. The major goals were to assess how different mix designs, including the addition of supplemental cementitious materials (SCMs) such as fly ash and silica fume, affected the compressive strength and hydraulic conductivity of pervious concrete.. Experimental results demonstrated that the inclusion of SCMs significantly enhanced compressive strength (up to 23 MPa) and improved freeze-thaw and abrasion resistance, making the material suitable for medium-traffic pavements. The study also highlighted the balance between porosity and permeability, with an optimal range of 15%–20% porosity providing high water infiltration without sacrificing structural integrity. The findings contribute to the advancement of sustainable construction practices by offering cost-effective, durable, and environmentally-friendly pavement solutions. The research also suggests potential avenues for future work, including real-world performance testing and the use of alternative binders.

Keywords: pervious concrete, sustainable pavement, supplementary cementitious materials, hydraulic conductivity, durability

PAPER ID: 154

Green Porous Concrete: A Sustainable Solution for Rainwater Harvesting and Urban Pavement Applications

Y. D. Parihar[1], Dr. S. R. Marve[2]

[1]*Assistant Professor , Dept. of Civil Engineering, Rajiv Gandhi College of Engineering, Research & Technology, Chandrapur, MH, INDIA, e-mail: yogiparihar02@gmail.com*

[2]*Assistant Professor, Dept. of Civil Engineering, Rajiv Gandhi College of Engineering, Research & Technology, Chandrapur, MH, INDIA, e-mail: shradheshmarve@gmail.com.*

The increasing challenges of urbanization, storm water management, and environmental sustainability have prompted the exploration of alternative construction materials, among which green porous concrete has gained significant attention. This research investigates the performance, applications, and benefits of porous concrete in comparison to conventional concrete, with a focus on its use for rainwater harvesting and urban pavements. Porous concrete, characterized by its high permeability and interconnected voids, allows water to infiltrate, promoting groundwater recharge and reducing storm water runoff. While porous concrete typically exhibits lower compressive and tensile strength compared to conventional concrete, it presents notable advantages in terms of environmental sustainability, cost efficiency, and urban heat island mitigation. The research encompasses a series of material examinations, mix formulations, and performance assessments to evaluate the appropriateness of porous concrete for diverse applications. Results demonstrate that porous concrete significantly reduces storm water runoff, enhances urban water management, and contributes to green infrastructure goals. Despite its lower strength, porous concrete is found to be an effective solution for low-traffic pavements, parking lots, and pedestrian walkways. The research concludes that porous concrete, when properly designed and maintained, offers a sustainable alternative to conventional concrete, conforming to the increasing need for sustainable construction materials in urban settings.

Keywords: Porous concrete, sustainable pavement, supplementary cementitious materials, durability

PAPER ID: 159

Chemical Effect on Concrete

Chetan T. Prajapati[1], Suchita K. Hirde[2]

[1]*Ph.D. Scholar, Dept. of Applied Mechanics, GCOEA, Amravati, Maharashtra, INDIA, email: ctprajapati@mitra.ac.in*

[2]*Head & Professor, Dept. of Applied Mechanics, GCOEA, Amravati, Maharashtra, INDIAe-mail: suchita.hirde@gmail.com*

The concrete and its life have pulled vital attention from the past many years instead of that concrete is still a research area till now. It is necessary to study various chemical aggression effect on concrete and remedial measures taken for the durability of concrete, as concrete exposed to the different chemicals developed from industrial waste, municipal waste landfill etc. As the Pollution increases day by day in surrounding atmosphere, the proportion of acid rain also increases. These chemicals like acid, sulphate, chloride, ammonium salt, landfill leachate etc. are harmful to man-made concrete structures. At the time-of-service life of the concrete structure, the opposing effects of concrete material defects as well as the insolubility in atmosphere will result in the man-made concrete structure failure before the expected life. This paper presents studies of the concretes experienced through several kinds of chemicals.

Keywords: Chemical, Concrete, Corrosion, Strength.

PAPER ID: 163

Sustainable Transportation Infrastructure: Design and Construction Strategies for Reduced Environmental Impact

S.N. Kulkarni[1], Dr. S. R. Marve[2]

[1]*Assistant Professor, Dept. of Civil Engineering, Rajiv Gandhi College of Engineering, Research, Technology, Chandrapur, MH, INDIA , e-mail: snk2011.2010@gmail.com*

[2]*Assistant Professor, Dept. of Civil Engineering, Rajiv Gandhi College of Engineering, Research & Technology, Chandrapur, MH, INDIA, e-mail:shradheshmarve@gmail.com*

This research investigates sustainable design and construction strategies for transportation infrastructure, aiming to minimize environmental impact. This research employs a mixed-methods methodology, incorporating a comprehensive literature review, detailed case studies, and in-depth expert interviews. The key findings highlight fundamental strategies, such as the utilization of environmentally-friendly materials, the implementation of innovative construction techniques like modular construction, and the integration of green infrastructure elements, including stormwater management systems and renewable energy sources.These strategies offer significant potential for reducing the environmental footprint of transportation systems, contributing to more sustainable development. The research provides a comprehensive framework for designing and constructing environmentally responsible transportation infrastructure

Keywords: Sustainable transportation, green infrastructure, lifecycle assessment, construction methods, environmental impact

PAPER ID: 165

The Impact of High Temperatures on Behavior of Concrete Materials: A Review

Nikunj Rajkumar Janbandhu[1], Divyani Harpal[2]

[1]*Department of Civil Engineering, Tulsiramji Gaikwad Patil Collage of Engineering and Technology, Nagpur, MH, India email: nikunjjanbandhu@gmail.com*

[2]*Department of Civil Engineering, Tulsiramji Gaikwad Patil Collage of Engineering and Technology, Nagpur, MH, India*

This study analyzes the effect of high temperatures in the components of concrete, focusing particularly on the usage of ground-granulated blast furnace slag, also known as or Blast Furnace Slag (BFS) in concrete formulations. It explains how certain materials react to high temperatures, especially in the setting of fire exposure. Concrete's mechanical qualities, such as strength, elasticity of flexibility, and volume security, are dramatically affected when exposed to high temperatures, resulting in structural damage. The study highlights the importance of designing buildings to withstand elevated temperatures and potential fire incidents, as these conditions can alter concrete's color, compressive strength, and elasticity, ultimately affecting its density and surface appearance. A comparative analysis of the performance of GGBS and BFS concrete against conventional concrete under high-temperature scenarios underscores the necessity for enhanced fire-resistance measures in concrete structural design. This research aims to inform better design practices and improve the resilience of concrete structures in fire-prone environments.

Keywords: High strength building materials, self-compacting building materials, quartz powder, sand made from quartz, crushed basalt, split tensile strength.

PAPER ID: 169

Deep Excavation – Challenges and Opportunities for Urban Space Development

Mr. J. D. Gawai[1],Dr. S. S. Pusadkar[2]

[1]*M. Tech. Scholar, Government College of Engineering, Nagpur, email: jaygawai804@gmail.com*

[2]*Professor, Civil Engineering, Government College of Engineering, Nagpur, email: ss_pusadkar@yahoo.co.in*

Deep excavations in urban environments, particularly in soft clay soils, pose significant challenges such as ground settlements, wall deflections, and impacts on nearby infrastructure. A review of advanced methodologies highlights effective solutions, including cross walls for minimizing deflections, the cut-and-cover technique for controlled excavation sequencing, and servo struts for precise management of wall deformations through adjustable axial forces, circular diaphragm walls, supported by considerations of lateral pressures, groundwater drawdown, and wall stiffness, have proven effective in large-scale projects. The integration of multi-strutted systems and advanced grouting techniques further reduces deformations, ensuring stability and safety. These innovations underline the importance of optimizing excavation techniques for urban sustainability and infrastructure resilience.

Keywords: Deep Excavation, Urban Environments, Soft Clay, Cross Walls, Servo Struts, Diaphragm Walls, Ground Settlements.

PAPER ID: 171

Analysis of Irregular Shape of Building in Earthquake prone area by Time History Analysis: A Review

Mr. Sandip kumbhare[1], Dr. P. Nagtode[2] , Dr. Aasif Baig[3]

[1]PG Student, Structural Engineering, Department of Civil Engineering, Tulsiramji Gaikwad Patil Collage of Engineering and Technology, Nagpur, Maharashtra. email: sandipkumbhare1998112233@gmail.com

[2]Professor, Structural Engineering, Department of Civil Engineering, Tulsiramji Gaikwad Patil Collage ofEngineering and Technology, Nagpur, Maharashtra.

[3]Professor, Structural Engineering, Department of Civil Engineering, Tulsiramji Gaikwad Patil Collage ofEngineering and Technology, Nagpur, Maharashtra. email : aasif.civil@tgpcet.com

The abrupt release enormous strain energy contained in the planet's crust causes earthquakes and seismic waves. Movement of the ground during these events may cause structural damage. Understanding ground motion characteristics is crucial for implementing measures to mitigate earthquake-induced structural harm. The three key dynamic aspects of an earthquake are its duration, frequency content, and peak ground acceleration. These factors play a vital role in predicting how structures will react to ground motion in seismic events. If non-linear behavior is removed, linear analysis of time history surpasses modal response spectrum evaluation in every way. This method requires more computing resources to calculate answers at particular time intervals. A notable benefit of this approach is that response histories maintain the relative indicators of response quantities. This feature is particularly important when designing with stress interaction effects in mind.

Keywords: Peak ground acceleration (PGA), Modal response spectrum analysis, Earth Stress interaction effects, Strain energy, Structural damage, Seismic waves.

PAPER ID: 173

Adsorptive Removal of Metals Using NLP Biosorbent

Rahul Navanitlal Jain[1] Rewatkumar Pithuji Borkar[2] Vidya Rohidas Saraf[3]

[1]Research Scholor,Dept. of Civil Engineering,Govt. College of Engineering, Jalgaon, KBCNMU, Jalgaon, email: jainrn15@gmail.com

[2]Professor & Principal, Dept. of Civil Engineering,Govt. College of Engineering,Nagpur-441108 email: rpborkar@rediffmail.com

[3]Assistant Professor, Dept. of Civil Engineering, Govt. College of Engineering, Jalgaon email: vrsaraf24@gmail.com

Different methods are evolved for treating wastewater generated from industries which contains toxic metals. Different approaches have been used for this purpose & out of that adsorption technique is more convenient & affordable. Aim of study is mainly focused on fixed bed column process for calculating the adsorbent capacity of Neem leaves for the removal of multiple metals (Cr, Cu & Zn) from synthetic wastewater. Effects of bed depth, flow rate & metal ion concentration parameters were investigated on adsorption characteristics of NLP biosorbent. Different breakthrough curves for these parameters were plotted & it shows in great agreement with the literature. Also, Thomas Model isotherm with their kinetic coefficients found best suited to experimental data. Results showed that Neem leaves powder can be effectively used as commercial biosorbent.

Keywords: Fixed bed column study, Adsorption, NLP, TM

PAPER ID: 186

Solid Waste Management by Pyrolysis and Composting

Mrs. R. N. Pantawane[1], Mr. N. S. Biswal[2], Mr. A. M. Pudke [3]Ms. B. S. Rathod[4]

[1]*Assistant Professor & HOD Dept. of Civil Engineering JDIET, Yavatmal*

[2,3,4]*Assistant Professor Dept. of Civil Engineering JDIET, Yavatmal*

This project focuses on addressing environmental challenges through the principles of Recycling, Reducing, and Reusing (3Rs) by efficiently managing domestic waste, which consists primarily of organic and inorganic materials. The goal is to treat these wastes in an environmentally sustainable way. The widespread use of plastics, which are inexpensive and durable, has led to significant environmental concerns due to improper disposal. One promising solution is the production of bio-oil through pyrolysis, a second-generation biofuel that can serve as an alternative to petroleum-based fuels in both mobile and stationary applications. Additionally, the project explores composting as an effective method for treating organic waste. Composting, an aerobic biological process, transforms organic materials into a stable, humus-like product that can be used to improve soil fertility. This approach offers environmental and economic benefits by reducing waste and enhancing agricultural productivity. In regions like the Mediterranean, where soils are typically low in organic matter, composting not only supports sustainable farming practices but also contributes to CO2 sequestration, promoting long-term environmental sustainability.

Keywords: Recycling, Pyrolysis, Composting, Bio-oil, Waste management.

PAPER ID: 187

Effect of Shear Wall Placement on Torsional Behaviour of Multi-Storey Symmetric Buildings

Mr. Devansh P. Meher[1] ,Dr. S. N. Khante[2]

[1]*Student (M. Tech. Infra.Engg. &Tech.) , Government College of Engineering, Nagpur, email: devanshmeher24@gmail.com*

[2]*Associate Professor, Applied Mechanics, Government College of Engineering, Nagpur*

Multi-Storey buildings are widely adopted in modern cities for mass housing, showcasing human innovation and urban expansion. Yet, designing these towering structures comes with its own set of challenges, especially when it comes to managing torsional effects caused by forces earthquakes. These effects are even more pronounced in asymmetric Multi-Storey, where uneven mass distribution or irregular shapes lead to increased twisting motions. This research aims to identify the torsional behaviour of such buildings with, without shear wall. By thoroughly examining the mechanics behind these torsional effects and presenting practical solutions, this research will help in advance safer and more efficient design practices in structural engineering. This research shows that position of shear walls effectively minimizes these torsional movements, greatly enhancing the building seismic behaviour. This provides practical, actionable insights for engineers, ensuring Multi-Storey buildings are both safe and resilient against such forces.

Keywords: Multi-Storey buildings, torsional effects, shear wall, Storey Displacement, Storey Drift.

PAPER ID: 192

Review of Groundwater Mapping and Water Quality Assessment

Virendrakumar Bhikajirao Patil[1], Vidya Rohidas Saraf [2]

[1]*Assistant Professor, SITRC Nashik, INDIA, email: virendra.patil@sitrc.org*

[2]*Assistant Professor, Dept. of Civil Engg, Dept. of Civil Engg, Government Engineering College, Jalgaon, email: vrsaraf24@gmail.com*

Corresponding Author: Virendrakumar Bhikajirao Patil emai id: virendra.patil@sitrc.org

Groundwater is essential for human sustenance, agriculture, and industry, making its sustainable management critical amid increasing depletion and contamination risks. Accurate mapping and quality assessment are vital for safeguarding groundwater resources. This review highlights the use of Geographic Information Systems (GIS) and the Water Quality Index (WQI) in assessing groundwater potential and quality. WQI simplifies water quality evaluation by combining multiple physico-chemical and biological parameters into a single representative score, enabling trend identification and pollution hotspot detection. GIS supports spatial analysis and visualization, offering insights into aquifer zones, contamination-prone areas, and quality distribution. Case studies across diverse regions demonstrate the effectiveness of GIS and WQI in addressing groundwater challenges such as depletion, salinity intrusion, and contamination. Integrating advanced technologies like remote sensing and machine learning with GIS and WQI enhances assessment accuracy and predictive capabilities, enabling proactive management strategies. Future research emphasizes interdisciplinary approaches, combining hydrogeology, environmental sciences, and data analytics to develop predictive models for simulating groundwater behavior under dynamic factors like climate change and human activity. In conclusion, the integration of GIS, WQI, and advanced tools provides a robust framework for sustainable groundwater management, ensuring resilience and long-term availability of this vital resource.

Keywords: Groundwater mapping, water quality assessment, GIS, WQI, hydrogeology

PAPER ID: 199

Remedial Measures on Noise Pollution on Conventional Speed Breaker

Abhijeet Harsulkar[1], Mahek Tayde[2], Aditya Rakhade[3] , Shardul Fulzele[4], Aishwarya Dongare[5], Ashwin A. Gawai[6]

[1]*B.Tech Student, Civil Engg. Department, GCOE, Nagpur, E-mail: abhijeetharsulkar18@gmail.com*

[2]*B.Tech Student, Civil Engg. Department, GCOE, Nagpur, E-mail: mahekt18@gmail.com*

[3]*B.Tech Student, Civil Engg. Department, GCOE, Nagpur, E-mail: adityarakhade816@gmail.com*

[4]*B.Tech Student, Civil Engg. Department, GCOE, Nagpur, E-mail: shardulfulzele2003@gmail.com*

[5]*B.Tech Student, Civil Engg. Department, GCOE, Nagpur, E-mail: aishwaryadongare11@gmail.com*

[6]*Assistant Professor, Civil Engg. Department, GCOE, Nagpur.*

Oobleck, a non-Newtonian fluid made of cornstarch and water, exhibits unique properties by behaving as a liquid under low stress and a solid under high stress. This makes it a suitable material for constructing speed breakers that adapt to vehicle speed - remaining soft for slow moving vehicles and hardening for overspeeding ones. Research comparing these innovative speed breakers with traditional ones highlights their effectiveness in reducing speeds, durability, and environment benefits. They require less material, lower carbon footprints, and align with sustainable urban development goals. Overall, Non-Newtonian speed breakers offer an eco-friendly, practical solution for traffic management and road safety.

Keywords : Oobleck, non-newtonian fluid, speed breaker, vehicle speed adaptation.

PAPER ID: 200

Impact of P-Delta Effect in Ground Shear on Building Structures Considering Linear Static: A Review

Mr. Amit Bhovate[1], Dr. P L. Naktode[2], Dr. Asif Baig[3]

[1]*PG Student, Structural Engineering, Department of civil Engineering, Tulasiramji Gaikwad Patil College of Engineering and Technology, Nagpur, Maharashtra*

[2] *Project Guide,Structural Engineering, Department of civil Engineering, Tulasiramji Gaikwad Patil College of Engineering And Technology, Nagpur, Maharashtra*

P-Delta effects, which have been a major contributor to damage to existing high- rise structures during previous catastrophic earthquakes, are more likely to affect high-rise buildings that are lighter and slenderer. The seismic evaluation uses the same modal analysis method to account for P-Delta effects. The analysis split, that is the first section does not take the P-Delta effect into account, and the second section does. The outcomes are then contrasted between P-Delta, dynamic, and static analysis. The structure's response is generally characterized by footing rotation due to overturning moments caused by horizontal external forces or inertia forces acting on the structure's mass, as well as the additional influence of the building's weight. Particularly significant are the elements affecting the soil-foundation-structure system's collapse. Ground movements are given to elastic and plastic material models of two benchmark structures representing the Los Angeles region, and the associated overturning moments and displacements are measured. When out-of-plane (OOP) failure mechanisms dominate the structural response, geometrical nonlinearities—which are frequently overlooked in numerical models for computational simplicity—should be taken into account. The study shows that the main failure mechanism for lighter buildings is elevating, which might result in collapse because of dynamic instability. On the other hand, soil failure mechanisms are activated for extremely heavy constructions, leading to residual rotation, settlement, and collapse.

Keywords: Seismic Effects, Linear and Non-Linear Analysis, tall buildings, P-Delta Analysis, P- delta effect.

PAPER ID: 218

A State of Art Review on Removal of Toxic Gases Generated from Pyrolysis Process

Dr. K. G Asutkar[1], Aditya Tete[2] , Saloni Kowe[3], Amin Pathan[4], Soham Wankar[5]

[1]*Associate Professor, Civil Engg. department GCOE, Nagpur. email: kgasutkar@gcoen.ac.in*

[2]*B.Tech Student, Civil Engg. department GCOE, Nagpur. email : adityatete000@gmail.com*

[3]*B.Tech Student, Civil Engg. department GCOE, Nagpur. Email: kowesaloni@gmail.com*

[4]*B.Tech Student, Civil Engg. department GCOE, Nagpur. email: aminpathan6354@gmail.com*

[5]*B.Tech Student, Civil Engg. department GCOE, Nagpur. email: vsoham62@gmail.com*

The pyrolysis process is a well-established thermochemical technique used to convert non- biodegradable materials into valuable by-products such as petroleum oil and syngas. However, it also generates harmful emissions, including volatile organic compounds (VOCs), particulate matter (PM), carbon monoxide (CO), and dioxins, which can lead to serious environmental and health risks. Addressing these challenges requires effective methods for purifying these emissions. This research investigates the application of wet scrubber systems to control these toxic pollutants. Wet scrubbers work by employing a liquid medium to capture and neutralize gaseous contaminants, achieving high levels of purification efficiency. Experimental evaluations were performed to assess the removal efficiency of these pollutants under various operating

parameters such as gas flow rate and liquid-to-gas ratio of the scrubber solution. The results demonstrate that the wet scrubber is highly effective in reducing PM, CO, and VOC concentrations, with removal efficiencies exceeding 90% when optimized with suitable scrubbing solutions. Additionally, the study emphasizes the operational and economic viability of integrating wet scrubber systems into pyrolysis operations. This method ensures compliance with environmental standards and enhances the sustainability of the pyrolysis process, offering a practical solution for industries aiming to reduce emissions and improve their environmental footprint.

Keywords: Wet scrubber, emissions, removal of toxic pollutants.

PAPER ID: 219

Sustainable Fuel Generation from Plastic Waste by Pyrolysis — A Review

Prajwal Vaidya[1], Aman Yadav[2], Isika Gedam[3], Vedant Udapure[4], K. G. Asutkar[5]

[1]B.Tech Student, Civil Engg. Department GCOE, Nagpur, email : prajwalv402@gmail.com

[2]B.Tech Student, Civil Engg. Department GCOE, Nagpur, email :aayclassic@gmail.com

[3]B.Tech Student, Civil Engg. Department GCOE, Nagpur, email : ishikagedam2@gmail.com

[4]B.Tech Student, Civil Engg. Department GCOE, Nagpur. email: vedant.udapure210104@gmail.com

[5]Associate Professor Civil Engg. Department GCOE, Nagpur, email : kgasutkar@gcoen.ac.in

The escalating environmental concerns surrounding plastic waste pollution necessitate innovative approaches to resource management. This paper focuses on the pyrolysis process as a method to address plastic waste by converting it into valuable hydrocarbons. The study specifically examines the procedure of pyrolysis, where plastic polymers undergo thermal decomposition in the absence of oxygen, and emphasizes the condensation of gases released during this process using an ice bath method. The study does not delve into scalability or life cycle assessments but rather aims to provide a comprehensive understanding of the methodology and its potential application in small-scale or experimental setups. By focusing on the technical implementation of pyrolysis and gas condensation, this paper seeks to contribute to the growing body of knowledge on waste-to-energy solutions and inspire further exploration of practical and accessible methods for plastic waste management.

Keywords: Pyrolysis process, sustainable fuel generation, Depolymerization, Plastic waste treatment, Quenching.

PAPER ID: 223

A state of art review on Solid Waste Management System of Nagpur city

Dr. K. G. Asutkar[1], Mr. P. M. Khobragade[2]

[1]Associate Professor, Civil Engg. Government College of Engineering, Nagpur, email: kgsutkar@gcoen.ac.in

[2] M. Tech. Scholar, Government Collage of Engineering, email: kgsutkar@gcoen.ac.in

Solid waste refers to discarded materials arising from human or animal activities that are deemed unwanted or no longer useful. It is typically generated by industrial, residential, and commercial sectors within a specific area. The management of solid waste involves various methods and strategies to ensure proper handling and disposal.

The process of solid waste disposal and management encompasses a range of activities, including planning, administrative coordination, financial management, engineering practices, and compliance with legal standards. Responsibility for these activities primarily lies with the waste generators, under the oversight of local, national, or even international authorities. Solid waste management involves a structured approach to the collection, treatment, and disposal of solid waste. This

process not only ensures environmental protection but also incorporates solutions for recycling materials that can be repurposed. At its core, solid waste management aims to transform discarded waste into valuable resources, fostering sustainability and resource efficiency.

Keywords: Solid waste management, Decentralize solid waste management, maximum yield technique, MYT.

PAPER ID: 241

RC Beam-Column Connections with Diagonal Reinforcement: Hysteretic Performance Study

Ashish B. Ugale[1], Suraj N. Khante[2]

[1]Assistant Professor, Dept. of Civil Egineering,Prof Ram Meghe College of Engineering & Management, Badnera-Amravati ,e-mail: abugale@rediffmail.com,

[2]Suraj N. Khante,Associate Professor,Dept. of Civil Egineering,Government College of Engineering, Nagpur e-mail: snkhante@yahoo.com

The seismic performance of reinforced concrete (RC) beam-column joints depends significantly on their behavior under cyclic loading, with improper design and detailing often leading to failure during earthquakes. This study examines the impact of innovative reinforcement detailing on the performance of exterior beam-column joints through reverse cyclic loading tests on four scaled subassemblages. Two types of reinforcement were evaluated: conventional detailing as per IS 456:2000 (Group 1) and non-conventional detailing with diagonal bars or cross-bracing reinforcements (Group 2). The results demonstrate that cross- bracing reinforcements substantially enhance seismic resilience by improving load capacity, energy dissipation, and joint ductility.

Keywords: RC Beam-column connection; reverse cyclic testing; flexibility; diagonal reinforcement

PAPER ID: 243

A Short Comparative Overview of ASTM/ACI and Indian Design Codes for RC Beam-Column Joints and Strengthening Techniques

Ashish B. Ugale[1], Suraj N. Khante[2]

[1]Assistant Professor, Dept. of Civil Egineering,Prof Ram Meghe College of Engineering & Management, Badnera-Amravati,e-mail: abugale@rediffmail.com,ashish.ugale@prmceam.ac.in
[2]Associate Professor, Dept. of Civil Egineering,, Government College of Engineering, Nagpur
e-mail: snkhante@yahoo.com

Beam-column joints are critical components of reinforced concrete (RC) structures, particularly in seismic zones, as they transfer forces between beams and columns. Their performance directly impacts the safety and stability of the structure. This paper examines the differences between ASTM/ACI standards and Indian Design Codes in the design, detailing, and strengthening of RC beam-column joints. The study explores material specifications, design methodologies, seismic performance, shear calculations, energy dissipation, stiffness, ductility, moment calculations, and strengthening techniques, drawing on experimental data from cyclic and reverse cyclic loading tests. Comparative insights are provided through detailed analysis, equations and calculations.

Keywords: RC Beam-Column Joint, ASTM, ACI, Indian Design Code, Strengthening, Seismic Design, Cyclic Loading, Shear Calculation, Energy Dissipation, Stiffness, Ductility, Moment Calculation.

PAPER ID: 244

Reinforcing Black Cotton Soil using Banana Fiber Mat

L.B.Patil[1], Dr.S.S. Pusadkar[2]

[1]*Assistant Professor, Department of Basic Sciences and Humanities, Godavari College of Engineering, Jalgaon, India, 425003, e-mail:ss_pusadkar@yahoo.co.in*

[2]*Professor, Department of Civil Engineering, Govt. College of Engineering, Nagpur, India, 441108 e-mail: lalitalalitapatil@rediffmail.com*

For understanding the influence of using banana fiber mats as reinforcement material on the bearing capacity of black cotton soils, model plate load tests were conducted. The laboratory plate load tests were conducted on a square footing on banana mat reinforced soil beds. The parameters studied in testing program were the depth of reinforcement, the plan area of reinforcement and the footing size. The banana fiber mat of selected sizewas placed at desired depth. The b/B ratio for banana mat was varied from 0.5 to 2.0 where b is width of mat and B width of test plate. The unidirectional and bidirectional banana fiber mat of different sizes 20 cm × 20 cm, 30 cm × 30 cm, 40 cm × 40 cm, 50 cm × 50 cm were used to reinforce the black cotton soil. The ratio of depth of reinforcement (u) to width of plate (B) is taken as 0.3, 0.6 and

1.0. The banana fiber mats were placed at 0.3B, 0.6B and 1.0B depth. The test results indicated that the maximum bearing capacity ratio was found at u/B = 0.6 and Br/B = 3. Also the optimum banana mat size for unidirectional and bidirectional mat was found to be 300 mm × 300 mm which is three times the width of plate

Keywords: Banana Fiber Mat, Reinforcement, Settlement, bearing capacity, Footing

PAPER ID: 253

Tidal Flow Wetland for Copper Removal

Dr R. P. Borkar[1], Dr P. S. Mahatme[2]

[1]*Principal, GCOE, Nagpur, rpborkar@rediffmail.com*

[2]*Assistant Professor, PRMCEAM, Badnera, parag.mahatme@prmceam.ac.in*

Industrial wastewater contains harmful heavy metals that affect surface water, groundwater, and soil. Constructed wetlands, particularly 4th-generation tidal flow systems, are efficient for wastewater treatment. This study examines copper removal from synthetic wastewater using a laboratory-scale tidal flow constructed wetland (35cm x 35cm x 120cm) with a 7-day detention period. The system consists of two cells layered with different media sizes and vegetated with *Typha* species. Results showed dissolved oxygen increased by 69.62%-70.64%, with BOD and COD removal at 91.41% and 85.51%, respectively. Copper removal reached 89% in the soil layer and 80% in the coarse aggregate layer.

Keywords: Tidal Flow, Constructed Wetland, Wastewater Treatment, Heavy Metal

PAPER ID: 254

Microsilica: A Promising Material for High Strength Concrete

Swajayee Ajay Dahake[1], Amruta Yogesh Raskar[2]

[1]UG Student, Dept. of Civil Engineering, VNIT, Nagpur, India, e-mail: swajayeedahake@gmail.com

[2]Assistant Professor, Dept. of Civil Engineering, G H Raisoni COEM, Pune, India, e-mail: amrutayraskar17@gmail.com

This paper deals with experimental investigation of mechanical properties of high strength concrete. The compressive and flexural strengths were carried out using microsilica and flyash. Varying volume fraction of microsilica from 6% to 10% at an interval of 1% by weight of cement and flyash of 19% constant used as replacement of cement. Cubes of 150

mm x 150 mm x 150 mm and prisms of size 150 mm✐ 150 mm✐ 700 mm were prepared for testing. The specimens were tested on compression testing machine and universal testing machine to find the compressive and flexural strength respectively at 7 and 28 days of curing. The results presented can be served as benchmark solutions for future studies.

Keywords: Microsilica, Flyash, Concrete, Compression, Flexure

PAPER ID: 257

Study of Automated Speed Breakers for Blind Spots on The Road

Dr. S A. Tekade[1], Tanisha Vasani[2], Aaliya Khan[3], Sagar Shirbhate[4], Atharva Akre[5], Vivekanand Shiwankar[6]

[1]*Assistant Professor, Civil Engg. Department, GCOE, Nagpur, Email: satekade@gcoen.ac.in*

[2]*B.Tech Student, Civil Engg. Department, GCOE, Nagpur, Email: vasanitanisha126@gmail.com*

[3]*B.Tech Student, Civil Engg. Department, GCOE, Nagpur, Email: aliyakhan62331@gmail.com*

[4] *B.Tech Student, Civil Engg. Department, GCOE, Nagpur, Email: sagar30shirbhate@gmail.com*

[5] *B.Tech Student, Civil Engg. Department, GCOE, Nagpur, Email: atharvaakre27@gmail.com*

[6] *B.Tech Student, Civil Engg. Department, GCOE, Nagpur, Email: vivekanandshiwankar233@gmail.com*

Blind spots on the road are the major traffic safety concerns in which accidents occur, usually due to less visibility for oncoming vehicles, pedestrians, or any other dangerous object. Blind spots arise generally at curvaceous spots, intersections, hilly or mountainous regions, and environmental obstructions such as buildings or trees. Traditional safety measures, such as fixed speed breakers and road signs, manage the speed but are often inefficient in addressing dynamic risks since they do not adapt to changing conditions. This research proposes an innovative, automated speed breaker system that adjusts its activation on real- time data. The system monitors the distance, speed of the vehicle, and its proximity to blind spots by using advanced sensor technologies such as LIDAR, radar, and ultrasonic sensors. It will activate the speed breaker only when necessary and use the distance monitoring system. The system aims to enhance safety by reducing the risk of accidents in high-risk areas without causing unnecessary disruptions to traffic flow. This dynamic solution ensures that the speed breaker responds to the speed and distance of the approaching vehicles, thus making it more efficient and context-specific as a traffic control method. This approach promises to make roads safer, minimize fatalities and injuries, and contribute to developing smarter, adaptive transportation infrastructure

Keywords: Blind spots, R

PAPER ID: 259

An Overview on Digitization and Modernization of Land Records In Maharashtra

Akshay Dnyaneshwar Patil[1], Sanjana Balkrushna Bawankule[2], Dr. K. G. Asutkar[3]

[1]*Student of M.Tech, Dept. of Civil Engineering, Government College of Engineering Nagpur., Nagpur, INDIA, e-mail: akshaydpatil1110@gmail.com*

[2]*Student of M.Tech, Dept. of Civil Engineering, Government College of Engineering Nagpur,Nagpur, INDIA, e-mail:sanjanabawankule5@gmail.com*

[3]*Associate Professor,Dept. of Civil Engineering ,Government College of Engineering Nagpur. Nagpur, INDIA,e-mail: Kgasutkar@gcoen.ac.in*

Through the use of cutting-edge technologies, the first component of the Modernisation and Digitisation of Land Records in Maharashtra aims to address enduring issues with fragmented data, manual processes, and restricted access. It begins with

an overview of traditional land records and the basic challenges associated with manual documentation. In order to increase transparency, accuracy, and accessibility, the study then looks into the methods and tools utilized in the digitization process, such as Geographic Information Systems (GIS). Among the major projects are the establishment of the Maha Bhulekh site for online record access, the SWAMITVA Yojana for mapping rural properties, and the use of drones for accurate surveys. The benefits of updated land records—such as improved accuracy, better transparency, fewer property conflicts, and more effective administrative processes—are also examined.

The article additionally looks at reducing disputes and improving efficient revenue collection, these steps also align with the larger goals of the Digital India Land Records Modernisation Programme (DILRMP). The benefits, challenges, and recommendations for further development in the modernisation of land records are highlighted in the report

Keywords: Modernization, GIS , SWAMITVA , Maha Bhulekh , DILRMP.

PAPER ID: 260

Land Use Classification and Planning by NMRDA- A Review

K.G.Asutkar[1], Shivangi Katre[2], Nikhat Fatema[3]

[1]*Associate Professor,Department of Civil Engineering,GCOEN,Nagpur,Maharashtra,India,email:- kgasutar@gcoen.ac.in*
[2]*M.T ech Student,Department of Civil Engineering ,GCOEN,Nagpur,Maharashtra,India,email:-katreshiwangi@gmail.com*

[3]*M.TECH student,Department of Civil Engineering,GCOEN,Nagpur,Magarashtra,India,email:-nikhatfatema039@gmail.com*

The Nagpur Metropolitan Region Development Authority (NMRDA) has devised a structured land use classification framework aimed at sustainable urban development. This paper examines the classification's objectives, methodologies, and findings, focusing on its role in balancing urbanization, economic development, and environmental preservation. Emphasizing smart city principles and Geographic Information Systems (GIS), the research highlights the strengths and challenges of NMRDA's land use policies while proposing pathways for enhanced implementation. Land use classification organizes land into specific categories such as residential, commercial, industrial, agricultural, recreational, mixed-use, and special uses, ensuring efficient resource allocation and mitigating land-use conflicts. Permissible uses, defined by zoning laws, dictate the activities allowed within these categories, balancing development needs with environmental and social considerations. The study delves into regulatory frameworks, examples of uses across land types, and the adaptability of modern zoning practices, such as mixed-use developments and conditional uses. Emerging trends like smart city integration and climate-responsive planning underscore the evolving nature of these concepts. By analyzing case studies, this paper emphasizes the importance of innovative and flexible land-use strategies in creating sustainable and resilient urban spaces

Keywords: Nagpur Metropolitan Region Development Authority (NMRDA), Land Use Classification, Urban Planning, Zoning Regulations

Track-2 Mechanical Engineering

PAPER ID: 53

Photovoltaic panel cooling using heat pipe technology

Pawan Chilbule[1] ,Lalit Dhole[2],Ganesh Chavhan[3] ,Sudarshan Butley[4]

1 Research Scholar, Deptt. Of Mechanical Engineering Government College of Engineering Chandrapur Maharashtra India. e-mail:- pawan.chilbule@gmail.com

2Associate Professor,Deptt. Of Mechanical Engineering Government College of Engineering Chandrapur Maharashtra India ,e-mail:- lalitdhole@gmail.com

3Assistant Professor, Deptt. Of Mechanical Engineering Government College of Engineering Chandrapur Maharashtra India, e-mail:- ganeshchavhan007@gmail.com

4 Research ScholarDeptt.Of Mechanical Engineering Government College of Engineering Chandrapur Maharashtra India e-mail:- sudarshanbutley@yahoo.com

Removing excess heat from PV panel using appropriate cooling method leads to improvement in electrical performance and heat removed can be used for water, space heating and crop drying. Heat pipe (HP) with air cooled finned condenser section was utilized for PV cooling and parametric analysis of heat pipe PV system considering the parameters i.e HP filling ratio, air velocity and vacuum inside the HP was worked out at tilt of 20 °.Results indicate that pressure variations exerted a minimal influence with 0.39% impact on photovoltaic efficiency and influence of filling ratio and air velocity is more i.e. 50.87% and 48.72 % respectively. From main effect plots for signal to noise ratio and means the optimum values of parameters are 50% filling ratio, 2.5 m/s air velocity and 0.6 bar pressure in the heat pipe.

Keywords: Heat Pipe; Photovoltaic; filling ratio; electrical efficiency.

PAPER ID: 58

Parametric identification of nonlinear joint using frequency domain analysis: A substructure synthesis model approach

Faisal Hussain[1], Sanjay Ingole[2]

1 Research Scholar Dept. of Mechanical Engineering Government College of Engineering, Chandrapur Gondwana University,Maharashtra, INDIA email : fshppn@gmail.com

2Associate Professor Dept. of Mechanical Engineering Government College of Engineering, Nagpur RTM Nagpur University,Maharashtra, INDIA email: ingolesb67@gmail.com

Non-linear structural behavior is a common feature of engineering structures subjected to varying stresses. In broad terms, nonlinear systems can be largely analyzed using linear concepts; however, nonlinearity in bolted joint constructions to define the joints performance. A scientific framework for the parametric recognition of non-linear structure components is provided by the current study work. The principle of sub-structure synthesis, incorporating both non-linear and linear stiffness characteristics, is employed to get the frequency equation. In inverse analysis, the resulting solution is also applied to determine a non-linear variable. A chaotic limit condition on a cantilever beam is used to quantitatively examine the current work. The technique offers accurate estimates for a extensive variety of values of non-linear stiffness. Less than 10% of inaccuracy is found between the mathematical framework developed and experimental in this work.

Keywords: Sub-Structure Synthesis, Nonlinear Rotational Stiffness, Linear Translational Stiffness, Frequency Domain Analysis.

PAPER ID:60

Enhancing Hydraulic Cylinder Efficiency with Reconditioning Methods

Faisal Hussain[1], Rishabh Meshram[2] ,Tanmay Fulzele[3] ,Shakya Gharde[4],Pushpak Raut[5] ,Kartik Borkar[6]

[1]Assistant Professor, Department of Mechanical Engineering, S.B. Jain Institute of Technology, Management & Research Nagpur, 441501 (MH), India

[2] Student, Department of Mechanical Engineering , SB Jain Institute of Technology , Management & Research, Nagpur,441501 (MH), India

[3]Student, Department of Mechanical Engineering , SB Jain Institute of Technology , Management & Research, Nagpur,441501 (MH), India

[4]Student, Department of Mechanical Engineering , SB Jain Institute of Technology , Management & Research, Nagpur,441501 (MH), India

[5]Student, Department of Mechanical Engineering , SB Jain Institute of Technology , Management & Research, Nagpur,441501 (MH), India

[6]Student, Department of Mechanical Engineering , SB Jain Institute of Technology , Management & Research, Nagpur,441501 (MH), India 4

This research paper presents a comprehensive study on the Complete Reconditioning, Repairing, and Modification of Quick-Acting Hydraulic Cylinders for the 110 Ton Larox Filter Press, aiming to restore operational functionality, enhance performance, and extend service life. The methodology follows a structured reconditioning process, beginning with disassembly and detailed inspection of critical components to identify failures, including piston rods, cylinder bores, and seals. Advanced repair techniques such as precision honing, surface hardening, and seal replacement were implemented to address wear and restore tolerance to H8/h8 standards. Modifications include the integration of upgraded materials and design enhancements to withstand a working pressure of 400 bar, a temperature of 56°C, and demanding operational cycles, ensuring compliance
with industry standards.

Keywords: Hydraulic cylinders, Larox filter press, sealing technology, hydraulic jack

PAPER ID: 67

Integrated Lean-Green Framework for Small Scale Manufacturing Industry: A substructure synthesis model approach

Ajay Anantrao Joshi[1], Dr. Pravin S. Nerkar[2],

[1]Research Scholar, Deptt. of Mechanical Engg, RTMNU, Nagpur, Maharashtra, India., e-mail: ajayjoshideoli@gmail.com

[2]Assistant Professor, Deptt. of Mechanical Engg, SVPCET ,Nagpur,Maharashtra, India, e-mail: psnerkar3@gmail.com

Small-scale industries (SSIs) are vital to India's economy, contributing significantly to employment. Lean manufacturing enhances operational efficiency by minimizing waste, while green manufacturing promotes sustainability by reducing environmental impacts. Integrating Lean and Green practices can help SSIs achieve both economic and environmental goals. This research presents a four-phase framework—Assessment, Planning, Implementation, and Evaluation—designed for easy adoption by SSIs, fostering long-term sustainability and efficiency.

Keywords: Lean manufacturing, green manufacturing, integrated framework, small-scale industry.

PAPER ID: 80

Android Controlled River Cleaning Robot

Mr. Dhotre Yash Prafulla[1], Mr. Misal Prathamesh Naresh[2], Dr.Manisha Sudhir Lande[3] , Mr. Masal Rohan Pandurang[4], Mr. Pakhale Rutik Subhash[5]

[1]*Student Dept. of Mechanical Engineering VPKBIET Baramati, India email:yash.dhotre.mech.2022@vpkbiet.org*

[2]*StudentDept. of Mechanical Engineering VPKBIET Baramati. India e-mail:prathamesh.misal.mech.2021@vpkbiet.org*

[3]*Associate Professor Dept of Mechanical Engineering VPKBIET Baramati.India e-mail:manisha.lande@vpkbiet.org*

[4]*Student Dept. of Mechanical Engineering VPKBIET Baramati. India e-mail:rohan.masal.mech.2022@vpkbiet.org*

[5]*StudentDept. of Mechanical EngineeringVPKBIET Baramati. India e-mail:rutik.pakhale.mech.2021@vpkbiet.org*

This paper presents the development and implementation of an "Android-Based River Cleaning Robot"—a device specifically designed to collect and remove waste materials from the surface of water bodies. The project aims to address the critical problem of pollution in rivers, where excessive waste, toxic substances, and floating debris have significantly harmed aquatic ecosystems. Such conditions threaten the survival of marine organisms and contribute to the overall degradation of water quality.The robot functions by removing surface debris from water bodies, which helps in minimizing water contamination and mitigating the risks posed to aquatic life. A primary goal of this system is to reduce reliance on manual labor and decrease the time required for river cleaning activities.This cleaning system operates using power stored in rechargeable batteries, which supply energy to an engine and a chain-drive mechanism. The energy-efficient design ensures smooth operation and effective waste collection, offering a sustainable method for maintaining cleaner water bodies.Water plays a crucial role in sustaining life on Earth. It is widely acknowledged that around 71% of the Earth's surface is covered with water, of which nearly 97% exists in oceans. The remaining 3% is found in frozen glaciers, rivers, and lakes. With water being such a limited and essential resource, the proposed system aims to contribute to pollution control and the preservation of aquatic environments.

Keywords: Android, River cleaning, Robot, Machine

PAPER ID: 87

A Survey of Indian Handcart: Issues and Design Needs

Yogesh L Yenarak[1], S W Rajurkar[2]

[1]*Research Scholar Dept. of Mechanical Engineering Govt. College of Engineering Chandrapur, INDIA e-mail: yogesh.yenarkar@gmail.com*

[2]*Associate Professor Dept. of Mechanical Engineering, Govt. College of Engineering, Nagpur, INDIA e-mail: swrajurkar@gmail.com*

Street vending has now been recognized as an important economic activity and the size of this economy is substantial. It has been made legal in many of the south east Asian countries including India. The legal rights of street vendors have been established The street vendor's act defines mobile vendors and give them protection. The desirable features of vending cart, issues in currently used carts are not addressed anywhere. This paper is based on survey conducted to identify the issues and need of street vendor's handcart. This is an attempt to identify the requirements of cart users, design changes required for better and a convenient use. There is a need for ergonomic and safe design of cart. The

conclusions are based on survey conducted and other reported literature. It endorses the need for redesign of a typical vendor's cart on Indian road for ergonomic and safety aspects.

Keywords: Vendor's Cart, Street Vendor's act, Handcart

PAPER ID: 103

Automated Solar-Powered Grass Cutter

Atharva Sangar[1], Varad Borawake[2] , Dr. Parashuram Chitragar[3], Aditya Shinde[4], Atharva More[5]

[1]*Student, Dept. of Mechanical Engineering VPKBIET Baramati Savitribai Phule Pune University Pune, Maharashtra, INDIA e-mail: atharva.sangar.mech.2021@vpkbiet.org*

[2]*Student, Dept. of Mechanical Engineering VPKBIET Baramati Savitribai Phule Pune University Pune, Maharashtra, INDIA e-mail: varad.borawake.mech.2021@vpkbiet.org*

[3]*Professor, Dept. of Mechanical Engineering VPKBIET Baramati Savitribai Phile Pune University Pune, Maharashtra, INDIA e-mail: parashuram.chitragar@vpkbiet.org*

[4]*Student, Dept. of Mechanical Engineering VPKBIET Baramati Savitribai Phule Pune University Pune, Maharashtra, INDIA e-mail: aditya.shinde.mech.2021@vpkbiet.org*

[5]*Student, Dept. of Mechanical Engineering VPKBIET Baramati Savitribai Phule Pune University Pune, Maharashtra, INDIA e-mail: atharva.more.mech.2022@vpkbiet.org*

The Automated Solar-Powered Grass Cutter is an innovative solution designed to simplify lawn maintenance while promoting environmental sustainability. This project integrates solar energy with automation technology to create a self-operating grass-cutting system. The device harnesses solar power through photovoltaic panels,which charge a built-in battery, eliminating the need for external power sources and reducing carbon emissions. Grass cutter is equipped with sensors which detects obstacles in its path, ensuring safe and efficient operation.The automation system enables the device to operate autonomously, following a predefined area or random pattern to cut grass uniformly. A height-adjustable blade mechanism allows customization to meet different lawn and height requirements. The use of renewable energy not only reduces operational costs but also makes the system eco-friendly. This project addresses the need for sustainable and low-maintenance lawn care solutions, particularly in areas. where electricity access is limited. By combining solar power with intelligent automation, this grass cutter offers a practical and cost-effective alternative to traditional lawn mowers, reducing both labour and environmental impact. This innovative approach has the potential to revolutionize lawn maintenance, making it more accessible and sustainable. The development and deployment of this technology aim to contribute to
a greener and smarter future.

Keywords: Renewable energy, Solar-power, Automation, Grass cutter, Obstacle detection, Lawn maintenance

PAPER ID: 115

Methods of plastic waste management and recycling: A Review

Rohit Tamshettiwar[1] ,Ganesh Chavhan[2], Prashant Nagpure[3], Ishan Khanke[4] ,Kunal Rathod[4] ,Kaushika Lanjewar[5]
[1]Mechanical Engineering Department, GEC, Chandrapur, M.S., India Email: rohittamshettiwar@gmail.com

[2]Mechanical Engineering Department, GEC, Chandrapur, M.S., India

[3]Mechanical Engineering Department, GEC, Chandrapur, M.S., India

[4]Mechanical Engineering Department, GEC, Chandrapur, M.S., India

[5]Mechanical Engineering Department, GEC, Chandrapur, M.S., India

Plastics are inexpensive and durable materials with large amount of applications. Resulting increased production of plastic over the past years but being most effective innovation of all time it has a huge negative impact on environment and living habitats as its polymer is durable and long lasting it is being left to degrade as plastic waste. It is a major concern to overlook for sustainable life on earth. Two possible ways of avoiding the circumstances
rising by plastic waste is degradation and recycling. Recycling being the effective way of preventing effect of plastic waste, it has many types to recycle plastic waste. While most technology advancements are working on recycling of plastic waste on large scale, it is possible to do it economically in small scale.

Keywords: Polyfiber Pyrolysis Landfills Chemical recycling Extrusion Disposal

PAPER ID: 155

Design & Development Of Welding Fixture For The Angle Bracket For Industrial Use

Nilesh Raut [1],Gaurav Nagdeve[2]

[1] Student , Dept. of Mechanical EngineerinG, TGPCET Nagpur, INDIA , e-mail: rautn7293@gmail.com

[2] Professor, Dept. of Mechanical Engineering, TGPCET Nagpur, INDIA, e-mail: gaurav.mechanical@tgpcet.com

Angle plate is the most widely used product in the industry and can be utilized for structural support in practically every industry. The welding process uses a welding fixture design. The welding fixture's design helps the operator or worker weld the component more precisely and with less fatigue. Due to its ability to improve product quality and reduce welding cycle time, the equipment boosts industry manufacturing productivity. Additionally, analysis is done to verify the fixture tool's structural strength.

Keywords: Fixture design, Solid works, drafting of fixture, manufacturing tool, CAD, Tool Design, CAE.

PAPER ID: 156

Design & Analysis Of Portable Injection Molding Machine

Rishuja Khobragade[1], Praful Randive[2]

[1]Student, Dept. of Mechanical Engineering TGPCET Nagpur, INDIA, e-mail: rishujak1993@gmail.com

[2]Professor, Dept. of Mechanical Engineering, TGPCET, Nagpur, INDIA e-mail: nss@tgpcet.com

This review paper focuses on the design and analysis of a portable injection molding machine. A small and easy-touse injection molding technique is required due to the growing need for adaptable and effective manufacturing solutions. In order to improve portability without sacrificing performance. By studying various research paper, important design components like heating and cooling system, a robust yet lightweight construction, and an intuitive control interface can be carried out. Finite Element Analysis (FEA) is used to evaluate the machine's structural integrity and thermal efficiency in order to guarantee optimal performance under a range of conditions. The study of research paper also help in making the machine less expensive than its traditional counterparts, making it accessible to start-ups and educational projects.

Keywords: Plastic injection molding, molding machine, CAD, CAE, Structural analysis, machine design, Solid works.

PAPER ID: 157

Design And Analysis of Hydraulic Mini Press Machine

Gajanan Chavan[1], Dipali Bhoya[r2]

[1]Student Dept. ofMechanical Engineering TGPCET Nagpur,INDIA, e-mail: g2001chavan@gmail.com

[2]Professor Dept. of Mechanical Engineering, TGPCET Nagpur, INDIA, e-mail: bhoyar.dipali@tpgcet.in

This review paper gives us the detail study of the project presenting the design analysis of a hydraulic small press machine. The primary objective of the project is to develop a compact, useful, and cost-effective hydraulic press that can be utilized for a number of applications, such as pressing, shaping, and assembling small work components. Pascal's Law and hydraulic power enable the machine to generate significant forces with minimal input. The design process includes selecting the appropriate components, materials, and sizes for hydraulic systems, including pumps, cylinders, and valves. To ensure safety and efficiency, a number of essential parts are chosen and examined for best performance, including the frame, hydraulic cylinder, piston, pump, and control valves. Because of its modest size, the machine is designed for research, educational displays, and small-scale industrial applications.

Keywords: Hydraulic Press Machine, Press tool, Solid works, drafting of machine, manufacturing tool, CAD, Design of Machine, CAE.

PAPER ID: 167

An Overview of Hydrodynamic Performance under Electroosmotic/Pressure Driven and Streaming Potential Viscoelastic Fluid Flow

Tripti Kumbalpuri[1], Aditya Kyawal[2]

[1]Assistant Professor, Dept. of Mechanical Engineering, Government College of Engineering Nagpur - 441108, Maharashtra E-mail: tripti.kyawal@gmail.com

[2]Student Dept. of Mechanical Engineering, Government College of Engineering Nagpur-441108 Maharashtra E -mail: kyawal.12.aditya@gmail.com

In our present work, we conducted a semi-analytical analysis of the electroosmotic / pressure-driven (EOF/PD flow of a hydrodynamically fully developed and streaming potential viscoelastic fluid in a parallel plate microchannel. To explain the viscoelastic fluid's rheology, we used a simplified Phan-Thien-Tanner (sPTT) model. Our method used the full Poisson-Boltzmann equation to provide precise analytical solutions for the electrostatic potential distribution and velocity profile. We observed that in case of EOF/PD flow , Pressure-assisted electroosmotic flow improves flow velocity and volumetric flow rate. Additionally, we established that an increase in the degree of surface charge initiates the streaming potential field, and the volumetric flow rate increases with the viscoelastic parameter. The impacts of fluid rheology and wall zeta potential on volumetric flow rate, velocity distribution, is the study's primary conclusions. We show that the combination of the fluid's viscoelasticity and a greater wall zeta potential result in a significant increase in volumetric flow rate for a given favourable pressure situation. In order to create microfluidic systems and devices, a comprehensive theoretical knowledge of the electrokinetic transport process is what we hope our research will provide.

Keywords: Electrokinetic, sPTT, Streaming potential, Zeta potential and Viscoelastic.

PAPER ID: 179

Investigation of Thermo acoustic refrigeration system with polynamide nylon 6 stack

Kamlesh Shelke[1] ,Uday Wankhede[2]

[1] Research Scholar , Dept. of Mechanical Engineering Gondwana University Gadchiroli, INDIA ,e-mail: ksshelke1976@gmail.com

[2] Associate Professor, Dept. of Mechanical Engineering ,Government College of Engineering RTMNU, Nagpur University ,Nagpur, INDIA ,e-mail: udaywankhede74@gmail.com

Recent advances in thermal acoustics potentially revolutionize several electronics. Manage longitudinal wave temperature changes to build a machine that can replace refrigeration and air conditioning. Space heaters, hot water heaters, refrigerators, and coolers can have these devices. Thermal acoustic devices don't include dangerous chemicals or environmentally hazardous materials like modern refrigeration systems. In thermo acoustics, heat is converted to sound and vice versa. Thermo acoustic equipment includes prime mover and refrigerators. A thermo acoustic engine converts heat into sounds that can be used for production. Instead, a thermo acoustic refrigerator absorbs heat from a low-temperature medium and rejects it to a high-temperature medium using acoustic power. This study examines the performance coefficient of a thermo acoustic refrigeration system with helium gas as working fluid, parallel plate stack geometry, and polyamide nylon 6 stack material. The performance of thermo acoustic refrigeration systems depends on stack geometry: spiral, parallel, or honeycomb. Different stack shape, stack material, and working fluid are needed to increase thermo acoustic refrigeration system performance.

Keywords: Helium, parallel plate, polyamide nylon, stack, thermo acoustic.

PAPER ID: 180

A Review of "Mechanical Testing and Characterization of Paraffin Wax with Polypropylene Binder and Aluminum Additive"

Himani Harpal[1], Dr. Kalpit P.Kaurase[2], Vishwajeet Ambade[3]

[1] Student ,Dept. of Aeronautical Engineering ,Tulsiramji Gaikwad –Patil College of Engineering & Technology, Nagpur INDIA ,e-mail: harpalhimani9@gmail.com
[2]Assistant Professor Tulsiramji Gaikwad –Patil College of Engineering & Technology, Nagpur INDIA
[3]Assistant Professor Tulsiramji Gaikwad –Patil College of Engineering & Technology, Nagpur INDIA

Recent studies on hybrid propellants suggest that paraffin wax is a promising substitute for traditional solid fuels in hybrid rocket engines, offering safety, reliability, and the advantages of both solid and liquid fuels. Paraffin wax provides several benefits, including a high calorific value, high regression rate, improved performance, affordability, ease of processing, non-toxicity, chemical stability, non-corrosiveness, and clean exhaust. Researchers are enhancing its mechanical and thermal properties by adding binders, energetic elements, and other additives. This project focuses on preparing propellant grains by mixing paraffin wax with high-energy aluminum and a strengthening additive, polypropylene (PP). The resulting blends will be compared to pure paraffin and HTPB grains in terms of mechanical and thermal characteristics. Polypropylene (PP) is preferred over polyethylene (PE) as a binder due to its higher stiffness, melting point, lower density, and better resistance to cracking. Studies show that paraffin wax grains with PP and aluminum demonstrate improved mechanical, thermal, and micro structural properties, making them suitable for hybrid rocket fuel applications.

Keywords: Paraffin Wax, Hybrid Rocket Fuel, Polypropylene (PP), High-Energy Additive (Aluminum), Mechanical and Thermal Properties..

APER ID: 190

Design and Analysis of a Model Rocket with Environmental Monitoring Capabilities

Vikram Titarmare[1] ,Shiwang pandey[2],Sanket Tupkar[3] ,Utpal Wanve[4] ,Sameer Sabnis[5] ,Atharva Kamde[6], Dhirajkumar Bombate[7]

[1]Project Member Dept. of Mechanical Engineering, Email: shiwangpande1@gmail.com

[2]Project Guide Dept. of Mechanical Engineering, Government College of Engineering Nagpur, INDIA Email: vptitarmare@gcoen.ac.in

[3]Project Member Dept. of Mechanical Engineering, Email: sankettupkar36@gmail.com

[4]Project Member ,Dept. of Mechanical Engineering, Email: utpalwanve9@gmail.com

[5]Project Member, Dept. of Mechanical Engineering, Email: sameersabnis7@gmail.com

[6]Project Member Dept. of Mechanical Engineering, Email:atharvakamde258258@gmail.com

[7]Project Member, Dept. of Mechanical Engineering, Email: bombatedhiraj@gmail.com

A system in the form of an advanced model rocket capable of launching and soaring to a sufficient altitude while also being able to capture images in real-time for Artificial Intelligence assistance is developed and the design & analysis is presented in detail. Within the scope of the project, numerous sensors such as gas, PM2.5 dust, ADXL345, BMP280, DHT-11, and a Raspberry Pi 5 module with a Camera Module 3 were integrated into the system. The integrated system has the ability to monitor the atmosphere, and reach and maintain altitudes between 1000 to 1500 meters. All this is achieved while ensuring the collection of important environmental information that can potentially be useful in the context of natural catastrophes monitoring.

Keywords: Model rocket, Environmental monitoring, Telemetry, AI surveillance, Atmospheric sensing, Disaster management.

PAPER ID: 195

Effect Of Addition Of Mos2 And Sic Reinforcement To Develop The Self-Lubricating Novel Aluminium Metal Matrix Hybrid Composites For Tribological Applications: An Overview

Alokkumar Uplap[1], Dr. Ganesh Chavhan[2], Pallavi Pudke[3], Vrittika Pachghare [4]

[1]Research Scholar, Dept. of Mechanical Engineering Gondwana University Govt..Engg. College, Chandrapur e-mail: auplapa@gmail.com

[2]Guide & Assistant Professor Dept. of Mechanical Engineering Gondwana University Govt..Engg. College, Chandrapur e-mail: ganeshchavhan007@gmail.com

[3]Research Scholar Dept. of Mechanical Engg. Gondwana University Govt. Engg. College Chandrapur e-mail: pallj8239@gmail.com

[4]Research Scholar Dept. of Mechanical Engg. Nagpur University Govt. Engg. College Nagpur e-mail: pachghare.vrittika@gmail.com

Now a day, the demand of newer light weight and high strength material has been shifted towards composites. Day by day, novel hybrid Composites are gradually and rapidly replacing the costly super alloy and plain composites and gaining prominence in the manufacturing industry. Present review comprises the investigation of the reinforcing agent like carbide of silicon and solid lubricant like sulphides of molybdenum on the overall performance of novel AMM composites. Similarly, Al hybrid composites shows excellent tribological applications because of its improved properties such as high strength, antifriction and anti-wear behaviour. Development or fabrication of novel hybrid AMMC with suitable characterisation is of utmost importance to ensure the desired tribological and mechanical properties. Therefore, centrifugal casting, powder metallurgy and Stir casting method is studied in the present review. Out of this Stir casting method is simple, economical and equally effective for Hybrid AMMCs. The effect of SiC and MoS2 particulate reinforcement in the aluminium metal matrix composite is also briefly studied in order to justify its use in Automotive industry. It also discusses the improved tribological aspects such as wear resistance and enhanced mechanical properties like hardness. Thus, the review is carried out to study the effectiveness of novel hybrid composites with improved mechanical properties to justify its suitability for the tribological uses in automotive, aerospace and military benefits.

Keywords: Tribological applications, Novel Hybrid AMMCs, Characterization, Stir Casting, Pin on disc wear tester, Hardness tester, SEM, ANOVA for DOE

PAPER ID: 196

Leveraging Industry 4.0 Tools for Parameter Identification in Performance Testing of MRI Machines: A Maintenance Practices Perspective.

Shirish Gandhare[1],Supriya Narad[2], Rahul Pistulkar[3], Vrittika Pachghare[4]

[1]Assistant Professor, Dept. of Mechanical Engineering SGGSIE&T, Vishnupuri, Nanded, INDIA e-mail: gandhareshirish@sggs.ac.in

[2]Head of the Department, School of allied Sciences DMIHER, Sawangi (M)Wardha, INDIA e-mail: supriya.narad@dmiher.edu.in

[3]Assistant Professor, Dept. of Mechanical Engineering GCOE, Nagpur, INDIA e-mail: pistulkarrahul@gmail.com

[4]Assistant Professor,Dept. of Mechanical Engineering GCOE, Nagpur, INDIA e-mail: pachghare.vrittika@gmail.com

Magnetic Resonance Imaging (MRI) machines are critical for accurate diagnosis and effective treatment planning in medical practice. Failures or inaccuracies in these devices can pose significant risks to patient health. This research aims to identify key performance parameters of MRI machines from a maintenance perspective and explore the integration of Industry 4.0 technologies to enhance their performance testing and reliability. By leveraging IoT-based sensors and actuators, this study proposes a condition-based monitoring framework that captures failure events, visualizes performance metrics in real time, and ensures seamless data transmission for diagnostic reporting. The methodology involves categorizing MRI machine components into diagnostic and non-diagnostic elements, analyzing their modes of failure, and identifying parameters affecting their performance. Data from IoT sensors will be transmitted to a central database for analysis, enabling predictive maintenance and regular performance evaluations. The findings demonstrate that condition-based monitoring improves fault detection, reduces downtime, and ensures consistent diagnostic accuracy. This study highlights the challenges of maintaining advanced MRI systems in medical device industries and underscores the importance of Industry 4.0 tools in addressing these challenges. By prioritizing maintenance with cutting-edge technologies, this research contributes to the development of high-performance MRI systems, ensuring reliable and high-quality healthcare services.

Keywords: Industry 4.0, MRI machine, parameter identification, performance testing, predictive maintenance, IoT, digital twin.

PAPER ID: 216

Advances in Wear-Resistant Coating Technologies: A Comprehensive Review

Pallavi Pudke[1] ,Ganesh Chavhan[2] ,Rohini Zade[3] ,Alok Uplap[4]

[1]Research Scholar, Mechanical Engineering Department, Government Engineering College Chandrapur, Maharashtra, India 442001, Email: pallj8239@gmail.com.

[2]Asst.Professor Mechanical Engineering Department Government Engineering College Chandrapur ,Maharashtra India 442001,Email: ganeshchavhan007@gmail.com.

[3] Research Scholar Mechanical Engineering Department Government Engineering College Chandrapur ,Maharashtra India 442001,Email: rohinizade210@gmail.com.

4 Associate professor Mechanical Engineering Department Government Engineering College Nagpur ,Maharashtra India 442001auplapa@gmail.com

Wear-resistant coatings play a pivotal role in enhancing material performance under extreme conditions by improving properties such as hardness, corrosion resistance, and thermal stability. This review explores advancements in coating technologies, including innovative materials like ceramics, composites, and polymers, as well as deposition techniques such as Physical Vapor Deposition (PVD), Chemical Vapor Deposition (CVD), and thermal spraying. Applications span industries like aerospace, automotive, biomedical, and energy, tackling challenges like material compatibility and environmental impact. The paper also examines emerging technologies, such as hardfacing methods, nanostructured coatings, and self-lubricating systems, while emphasizing future directions in eco-friendly processes and AI-driven optimization. By referencing over 50 scholarly works, this comprehensive study provides a foundation for continued research and development in wear-resistant coatings, underscoring their role in improving industrial efficiency and sustainability.

Keywords: Wear-resistant coatings, Surface engineering, Physical Vapor Deposition (PVD),Chemical Vapor Deposition (CVD), Thermal spray coatings, Electrochemical coatings, Hardfacing techniques, Nanostructured coatings

PAPER ID: 217

Rejection Analysis of Piston in Manufacturing Process – A Case Study

Poonam Shukla[1], Himanshu Lokhande[2], Abhas Kamble[3], Dr. Sanjay Ingole[4]

[1]*Assistant Professor Department of Mechanical Engineering, Government College of engineering Nagpur ,India*

[2] *Final year B-Tech student ,Department of Mechanical Engineering, Government College of engineering Nagpur ,India*

[3] *Final year B-Tech student ,Department of Mechanical Engineering, Government College of engineering Nagpur ,India*

[4]*Associate Professor Department of Mechanical Engineering, Government College of engineering Nagpur ,India*

Rejection analysis is a crucial aspect of quality management in the manufacturing industry, aimed at identifying and rectifying the root causes of rejected or defective products. This paper provides an overview of the concept, objectives, and methodologies involved in rejection analysis. The primary objective is to improve product quality by systematically analyzing rejected items and implementing corrective actions to prevent recurrence. Key steps in rejection analysis include identifying rejected products, conducting root cause analysis, collecting and analyzing data, implementing corrective actions, and monitoring for continuous improvement. Additionally, rejection analysis enables manufacturers to meet regulatory standards, mitigate risks, and foster culture of continuous improvement. By emphasizing the importance of rejection analysis in driving quality, efficiency, and competitiveness, underscores its critical role in ensuring the success and sustainability of manufacturing operations.

Keywords: Product Quality, Quality Management, Rejection Analysis, Sustainability Of Manufacturing Operations.

PAPER ID: 225

Diesel-Milkscum Biodiesel Blends Powered Reactivity Controlled Compression Ignition (RCCI) Engine at High Compression Ratio

Shrikrishna Wagh1 ,Prashant Washimkar2, Nikhil Bhave3 , R V Mahajan4, Alokkumar Uplap5

[1]*Research Schola Dept. of Mechanical Engineering Gondwana University Govt College of Engg,Chandrapur, E-mail: srwagh76@gmail.com*

[2]*Guide & Associate Professor, Dept. of Mechanical Engineering ,Gondwana University,Govt College of Engg,Chandrapur , E -mail: prashnatwashimkar24@gmail.com*

[3]*Assistant Professor ,School of Energy and Enviornment Systems Defence Institute of Advanced Technology, Giri Nagar Pune Maharashtra-411025, E-mail:bhave.nikhil123@gmail.com*

[4] *Assistant Professor, Dept. of Mechanical Engineering, Government College of Engineering, Nagpur -441108 Maharashtra E-mail: rvmahajan@gcoen.ac.in*

[5]*Research Scholar Dept. of Mechanical Engineering Gondwana University ,Govt College of Engg. Chandrapur ,E-mail: auplapa@gmail.com*

RCCI combustion is gaining recognition as a cutting-edge approach for enhancing fuel efficiency and minimizing emissions in internal combustion engines. This research examines the environmental advantages of RCCI combustion by utilizing an innovative blend of Indian fuel and Milkscum biodiesel. Through comprehensive experimentation and analysis, the study

investigates combustion characteristics, emission performance, and the by and large natural implications of this advanced fuel combination. The findings demonstrate that RCCI combustion powered by the Milkscum biodiesel mix achieves significant decreases in greenhouse gas emissions, particulate matter, and other pollutants when contrasted with regular diesel ignition combustion. Derived from renewable and sustainable resources, Milkscum biodiesel further enhances the eco-friendly attributes of the blend, presenting a sustainable alternative non-renewable energy sources. This not just adds to ecological preservation yet additionally lines up with the developing need for renewable energy solutions.The research emphasizes the potential of combining RCCI combustion with sustainable biodiesel blends to promote a greener and more energy-efficient transportation area. By decreasing dependence on non-renewable energy sources and relieving destructive discharges,, this approach supports global efforts toward environmental conservation. The study highlights the significant role RCCI technology and innovative biofuel blends can play in advancing sustainable practices within the automotive industry.

Keywords: RCCI Engine, VCR, BTE, BSFC, EGT

PAPER ID: 226

Design Optimization And Rigid Body Dynamics Of A Robot Arm Using Advanced Simulation Tools

Rehan Khan[1], Anuj Muley[2]

[1] Mohammed Rehan Khan, Student ,Dept. of Mechanical Engineering TGPCET Nagpur, INDIA, e-mail: rk976654@gmail.com

[2]Professor, Dept. of Mechanical Engineering,TGPCET, Nagpur, INDIA, e-mail: anuj.mechanical@tgpcet.com

The design and optimization of robotic arms are essential for enhancing performance, precision, and dependability in a variety of applications, including automation, medical robotics, and manufacturing, according to this review paper. The objective of this work is to use sophisticated simulation tools, namely SolidWorks and ANSYS, to optimize the design and investigate the rigid body dynamics of a robotic arm. The focus is on increasing the mechanical design by optimizing critical parameters, including joint configurations, link lengths, and material qualities, to provide optimal performance while minimizing energy consumption, wear, and the danger of mechanical failures. The robotic arm is 3D modelled using SolidWorks, and comprehensive structural and dynamic simulations are performed using ANSYS. These simulations analyze the arm's behavior under various loading circumstances, quantifying stress, strain, and deformation. To determine crucial design elements, the dynamic performance—which includes the arm's mobility, stability,and reaction to outside forces—is examined. The study's conclusions provide important information for enhancing the robotic arm's design, guaranteeing increased effectiveness, durability, and accuracy. The results contribute to the development of more dependable and efficient robotic systems, supporting their greater application across industries and advancing the state of robotics.

Keywords: Robot arm, FEA, CAD, Optimization, Solid works, Ansys Workbench, Structural Analysis.

PAPER ID: 229

Survey On The Wear Characteristic Of Cladded Surface Fabricated With Overlay Method

Rohini Zade[1] ,Pallavi Pudke[2] ,Ganesh Chavhan[3] ,Pawan Chilbule[4]

[1] Research Scholar, Mechanical Engineering Department, Govt. Engg. College Chandrapur ,Maharashtra India 442001email: rohinizade210@gmail.com

[2] Research Scholar, Mechanical Engineering Department, Govt. Engg. College Chandrapur ,Maharashtra India 442001 email: pallj8239@gmail.com

[3]Assistant Professor, Mechanical Engineering Department, Govt. Engg. College Chandrapur ,Maharashtra India 442001email: ganeshchavhan007@gmail.com

[4]Research Scholar, Mechanical Engineering Department, Govt. Engg. College Chandrapur ,Maharashtra India 442001

The wear characteristics of cladded surfaces fabricated using overlay methods play a crucial role in extending the lifespan and performance of industrial components. This review focuses on advancements in overlay cladding techniques, including direct energy deposition, electron beam cladding, and plasma-transferred arc welding. These methods are explored for their ability to enhance wear resistance through the use of advanced materials such as tungsten carbide, silicon carbide, and solid lubricants. Hybrid processes, such as combining ultrasonic nanocrystal surface modification with cladding, show significant improvements, boosting wear resistance by up to 25%. Incorporating ceramic and metallic reinforcements has been found to reduce friction, lower wear rates, and improve surface hardness. These advancements demonstrate the effectiveness of overlay methods in creating durable, wear-resistant surfaces suitable for extreme environments, offering a pathway for industries to achieve longer-lasting and more reliable components. Future research is encouraged to focus on fine-tuning cladding processes and exploring novel reinforcement materials for even greater performance gains.

Keywords: wear resistance; coating; overlay technique; cladded surfaces

PAPER ID: 230

Industrial Case Study On Productivity Improvement Using Work Study And Lean Techniques (At V.S. Autotech, Nagpur)

Dr. R.B. Yarasu[1], Vishal Sapkal [2], Ganesh Gunjale[3], Vrittika Pachghare[4], Poonam Shukla[5]

[1]Associate Professor Department of Mechanical Engineering, Government College of engineering Nagpur ,India

[2] B-Tech student ,Department of Mechanical Engineering, Government College of engineering Nagpur ,India

[3] B-Tech student ,Department of Mechanical Engineering, Government College of engineering Nagpur ,India

[4]Assistant Professor Department of Mechanical Engineering, Government College of engineering Nagpur ,India

[5]Assistant Professor Department of Mechanical Engineering, Government College of engineering Nagpur ,India

The objective of this industrial project is to present an overview on a new combined methodology for the enhancement in productivity with the help of various Work Study Methods associated with Lean Manufacturing Principles & Tools. Lean manufacturing tools are one of the most influential & most effective methodologies for eliminating wastes (MUDA), controlling quality, and improving overall performance of any machine, system or process in any industry with the complete assurance of large annual profit margins. Problem faced in the company was the daily target of manufacturing was not achieved and hence covered in monthly target. So, the company needed to calculate time cycle for various process and reduce time cycle by identifying time losses, need to implement lean methodology and 5 S technique. This prescriptive report proposes genuine solutions & concepts for implementing Work Study Methods and deploying associated lean manufacturing tools in any enterprise or industry, covering the technical, engineering, and manufacturing aspects as well as the business etiquette affairs. Lean Manufacturing together with Work Study Methods, being the most sophisticated & vast area of studies has a huge scope for implementation & deployment of their very own concepts.

Keywords: 5S, Wastes (Muda), Time & Method Study, Setup Time Reduction (SUR), Standardized Work (SDW)

PAPER ID: 234

Central Tyre pressure monitoring and inflation system

Kunal Mohare[1], Karan Gaikwad[2], 0m Gumgaonkar[3], Raj Sharma[4] , Arpit Panchabhai [5], Dr R. B. Yarasu[6]

[1,2,3,4,5]B-Tech student Department of Mechanical Engineering, Government College of engineering Nagpur, India

[6]Assistant Professor Department of Mechanical Engineering, Government College of engineering Nagpur, India

Our study shows that lowering tyre pressure by a few PSI can result in decreased fuel economy, tyre life, safety, and vehicle performance. We have developed an automatic tire inflation and deflation system that ensures that tires are properly inflated at all times. Our design proposes and successfully implements the use of a centralized compressor that supplies air to all four tires via hoses and a swivel joint attached to the rim of each wheel. The swivel joints help to efficiently channel air to the tyres without kinking the hoses. With the recent increase in oil prices and growing concern about environmental issues, this system addresses the potential for improved fuel economy, reduced tire wear, and increased tire handling and performance in a variety of conditions.

Keywords: Tires, Inflation, Deflation, Pneumatics, etc

PAPER ID: 235

Design of low cost double acting power hacksaw machine with integrated cooling system

Lawrhense More[1], Alokkumar Uplap[2] ,Tejas Dharme[3] ,Kanchan Katre[4]

[1] B-Tech student Department of Mechanical Engineering, Government College of engineering Nagpur ,India email: lawrhensemore@gmail.com

[2]Assistant Proffesor ,Department of Mechanical Engineering, Government College of engineering Nagpur ,India email: auplapa@gmail.com

[3]B-Tech student,Department of Mechanical Engineering, Government College of engineering Nagpur ,India email: tejasdharme21@gmail.com

[4] B-Tech student Department of Mechanical Engineering, Government College of engineering Nagpur ,India email: kanchankatra02@gmail.com

We have done research on design of low cost Double Acting Power Hacksaw Machine with integrated cooling system that operates on the principle of the slider-crank mechanism. This machine is specifically engineered to improve the efficiency of cutting metals, using high-speed steel blades for increasing performance. One of the key innovations in our design is the inclusion of a custom cooling system, which significantly reduces the heat generated during the cutting process, thus extending the life of the blade and improving operational safety. The main aim of this research is to find best optimised metal cutting machine that can work on various metals with improved performance, while maintaining affordability and ease of use. The double-acting nature of the hacksaw machine allows it to cut during both the forward and return strokes, doubling the cutting efficiency compared to single-acting hacksaws. We chose this project because traditional single-acting hacksaws are slower and more chances to overheating, leading to inefficiencies and wear and tear. By using a slider-crank mechanism and a cooling system, we aim to deliver a solution that not only increases productivity but also maintains optimal working conditions for the blade, reducing downtime caused by excessive heat. Our innovative cooling system is designed to add submerged type coolant pump with external power, relying on the electricity of the battery to activate coolant sprays during both cutting strokes, making the machine more energy-efficient. This research forms the base for the working model for future adaptations in industrial and workshop settings where precision and durability are critical but require improvement. This system takes a advantage of slider Crank mechanisms for both cutting stroke and water supply as cooling.

Keywords: Affordable, Innovative, Adaptation, Durability

PAPER ID:245

Parametric optimization of Test variables that Influence on ultrasonic welding of plastic (acrylic) to hybrid composite by using the Taguchi Approach.

Ganesh Chavhan[1]

[1]*Mechanical Engineering Department, Government College of Engineering, Chandrapur (Affiliated to Gondwana University, Gadchiroli) (M.S.), 442403, India ,Corresponding author, email: ganeshchavhan007@gmail.com.*

A solid-state joining technique called ultrasonic welding creates joins by applying high-frequency vibratory energy to work components that are kept together under pressure without melting. Plastic (acrylic) to hybrid composite are joined to the apparatus in automotive and electronic applications using a solid state joining technique. This work produces ultrasonically welding of Plastic (acrylic) to hybrid composite with a thickness of 1 mm while taking into account welding factors such as % of Eichhornia Fiber, Welding time, and Amplitude. To perform trials, an appropriate experimental design was created and carried out using Taguchi's robust design process. The ANOVA and S/N ratio studies are in use to study the impact of different welding parameters on the weld strength and to get the best parameters. The welding time of 5 (S), the % of Eichhornia Fiber 10 (%) and amplitude at 50 (μm), are the parameter values that yield the greatest weld strength.

keywords: Hybrid Composite; Ultrasonic plastic welding; Taguchi design of Experiments; ANOVA; Weld strength.

PAPER ID: 250

A Review Paper on "Exploring the Versatility of E-Glass Fiber Reinforced Epoxy in Advanced Engineering Applications"

Pramod H Sahare[1], Dr.Lalit Dhole[2] ,Dr.S.W.Burande[3], Dr. Ganesh Chavhan[4]

[1]*Research Scholar, Dept. of Mechanical Engineering ,Government College of Engineering Chandrapur, e-mail: rcert.phsahare@gmail.com*

[2]*Associate Professor, Dept. of Mechanical Engineering, Government College of Engineering Chandrapur, e-mail: lalitdhole@gmail.com*

[3] *Assistant Professor, Dept. of Mechanical Engineering, Government College of Engineering Chandrapur, e-mail: wbsudhir@gmail.com*

[4] *Assistant Professor, Dept. of Mechanical Engineering, Government College of Engineering Chandrapur, e-mail: ganeshchavan007@gmail.com*

E-glass fiber reinforced epoxy composites have gained widespread popularity in advanced engineering applications due to their superior mechanical, thermal, and environmental properties. These composites offer a combination of lightweight, high strength, and resistance to corrosion, making them suitable for industries such as aerospace, automotive, construction, and renewable energy. This review paper aims to explore the versatility of E-glass fiber reinforced epoxy composites by synthesizing findings from over 25 research studies. The paper highlights the mechanical properties, thermal stability, and environmental durability of these composites and discusses the innovative fabrication techniques and diverse engineering applications. Finally, the challenges and future directions for the development of these materials are discussed.

Keywords: E-glass fiber, Epoxy composites, Mechanical properties, Tribological behavior, Fabrication techniques.

PAPER ID:252

Study of Fabrication Techniques to Develop the Next Generation MMCs for Industrial Applications: A Comprehensive Review

Alokkumar Uplap[1], Dr. Ganesh Chavhan[2], Aditya Damle[3], Ketaki Mahalle[4], Shrikrishna R Wagh [5],Gajendra Tekade[6]

[1]*Research Scholar& Asstt.Professo Dept. of Mechanical Engineering Gondwana University Govt.Engg. College, Chandraur, e-mail: auplapa@gmail.com*

[2]*Guide & Assistant Professor Dept. of Mechanical Engineering, Gondwana University Govt.Engg. College, Chandrapur, e-mail:* ganeshchavhan007@gmail.com

[3]*B-Tech student, Department of Mechanical Engineering, Government College of engineering Nagpur ,India email: aditya.damle@gmail.com*

[4] *B-Tech student Department of Mechanical Engineering, Government College of engineering Nagpur ,India email: ketakimahalle14 @gmail.com*

[5]*Research Scholar& Asstt.Professo Dept. of Mechanical Engineering Gondwana University Govt.Engg. College, Chandrapur ,India email: srwagh76 @gmail.com*

[6] *B-Tech student Department of Mechanical Engineering, Government College of engineering Nagpur ,India email: gajendratekade2004@gmail.com*

This research investigates the development and optimization of aluminum matrix composites (AMMCs) with a specific focus on enhancing mechanical and tribological properties through innovative processing techniques. The study addresses the fundamental limitations of traditional aluminum alloys by exploring novel approaches to reinforcement design and matrix modification. Through systematic analysis of processing variables, including temperature control, pressure parameters, and mixing dynamics, this investigation establishes critical relationships between manufacturing methods and resultant material properties. Particular attention is given to the development of hybrid self-lubricating AMMCs, examining how various reinforcement combinations and their spatial distribution influence overall performance characteristics. The research methodology encompasses comprehensive microstructural analysis, standardized property measurements, and application-specific testing protocols. Findings from this study contribute to advanced material design strategies and process optimization techniques, providing valuable insights for engineering applications requiring high-performance, lightweight materials. This investigation also identifies promising directions for future research in reinforcement materials and processing technologies.

Keywords: Hybrid self lubricating AMMCs, Industrial applications, spatial distribution.

PAPER ID: 258

Design and Development of Leg Guard for Two Wheelers

Pushpak Khotele[1] ,Sanjay Rajurkar[2] ,Sahil Brahme[3] ,Sumedh kukudkar[4],Ayush khobragade[5] ,Nikita Rahangdale[6]

[1] *B-Tech student, Department of Mechanical Engineering, Government College of engineering Nagpur ,India, email: khotelepushpak@gmail.com*

[2]*Associate Professor,Department of Mechanical Engineering, Government College of engineering Nagpur ,India, email: swrajurkar@gcoen.ac.in*

[3]*B-Tech student,Department of Mechanical Engineering, Government College of engineering Nagpur ,India, email:sahilbrahme@gmail.com*

[4] *B-Tech student, Department of Mechanical Engineering, Government College of engineering Nagpur ,India, email:sumedhkukudkar0@gmail.com*

[5] *B-Tech student ,Department of Mechanical Engineering, Government College of engineering Nagpur ,India email: ayushkhobragade957@gmail.com*

[6]*B-Tech student,Department of Mechanical Engineering, Government College of engineering Nagpur ,India email: rahangdalenikita07@gmail.com*

The document discusses the design and development of an innovative leg guard for scooters aimed at enhancing rider and pillion safety, particularly against leg injuries during skidding or side impacts. Conventional crash guards, while effective for motorcycles, are less adaptable to scooters where pillion riders' legs are highly exposed to risk. This research presents an

active safety mechanism utilizing lean angle sensors and actuators to deploy the leg guard only when a scooter tilts beyond a safe angle (45°), indicating the possibility of a fall. Key components include the MPU-6050 gyroscope and accelerometer for tilt detection, an Arduino Uno for signal processing, and a stepper motor for precise guard actuation. The design prioritizes minimal intrusion during normal use by housing the leg guard compactly within the chassis. When triggered, the guard extends swiftly to absorb impact, providing critical protection. The study emphasizes compliance with homologation standards for safety and material durability, ensuring practical integration across various scooter models. This solution combines technological innovation and compact design to create a universal safety enhancement for two-wheelers.

Track-3 Electrical Engineering

PAPER ID: 32

A comprehensive review on Linear Induction Motors in transportation systems

Sasmeet Dharmik[1],Sarim Syed[2],Pranay Nandagawali[3],Shreyash Kadu[4]

[1]Fourth-year Student,Dept. of Electrical Engg.,Government College of Engg., Nagpur , INDIAEmail: Sasmeet.Dharmik1@gmail.com

[2]Fourth-year StudentDept. of Electrical Engg.,Government College of Engg.,Nagpur , INDIAEmail: ssarim432@gmail.com

[3]Fourth-year Student,Dept. of Electrical Engineering Government College of Engg,Nagpur INDIAemail: pranaynandagawali2004@gmail.com

[4]Fourth-year Student,Dept. of Electrical EngineeringGovernment College of Engg.,Nagpur, INDIAemail: shreyashkadu678@gmail.com

This study provides a thorough analysis of linear induction motors (LIMs) and how they are used in transportation systems, emphasizing high-speed rail, urban transit, and new mobility technologies. Because of their unique benefits—like direct linear thrust, minimal maintenance, and environmental adaptability—LIMs are a popular option for contemporary transportation. But they also have special problems, like end effects, edge effects, problems with heat management, and efficiency losses because of wide air gaps. This review highlights the relative advantages and disadvantages of LIMs by analyzing their technical features and comparing them to other motor types such as Permanent Magnet Linear Motors (PMLMs) and Linear Synchronous Motors (LSMs). The study also examines sophisticated performance optimization methods for LIMs, including as adaptive control algorithms, heat management strategies, Finite Element Analysis (FEA), and material advancements. Through increased efficiency and dependability in demanding transportation applications, these strategies seek to address LIM-specific difficulties. To attain greater durability, lower energy losses, and improved thrust efficiency, future research objectives are described, with an emphasis on innovative materials, intelligent control systems, and holistic multi-physics modeling. LIMs can play a bigger part in efficient and sustainable transportation systems by overcoming these constraints, which will let them adapt to the changing requirements of intercity and urban transit networks.

Keywords- Linear Induction Motor (LIM), Transportation systems, End effects, Edge effects, Finite Element Analysis, Adaptive control algorithms, Electromagnetic modeling

PAPER ID: 33

Understanding Hydraulic Power Packs: Essential Components, Functionality, and Industry Use Cases

Mr. Yogesh K[1],Mr. Athrav B[2],Ms. Riya B[3],Mr. Tejas D[4]

[1]studentDept. of electrical Engg.government college ofengineering, Nagpur Email: yskhandere@gcoen.ac.in

[2]StudentDept. of electrical Engg.government college ofengineering, Nagpur Email: akbelkhode@gcoen.ac.in

[3]StudentDept. of electrical Engg.government college ofengineering, NagpurEmail: rrbadhe@gcoen.ac.in

[4]StudentDept. of electrical Engg.government college ofengineering, Nagpur Email: tpdhakne@gcoen.ac.in

Hydraulic power packs have a very vital function in virtually all fields whereby motion and force and/or precise control is required in many of the apparatus and devices in use. When it comes to hydraulic power pack, as this paper will reveal, the pump, reservoir, valve and filter can significantly influence the capability and reliability of hydraulic systems. In confined space it addresses some elementary ideas of the behaviour of fluids when they are employed to generate, manage and maintain pressure and velocities in such systems. In addition, it considers various types of hydraulic power packs, new generation hydraulic power packs, fresh trends and scope in smart hydraulic power packs and hydraulics friendly power packs.

Keywords— Hydraulic Power Pack, Pressure, Hydraulic System, Major Components, Motor, Pump, Oil Tank, Manifold, Relief Valve, Fluid, Hydraulic Operation, Flow Control.

PAPER ID: 42

Design and Analysis of a Double-Sided LIM

Sasmeet Dharmik[1],Sarim Syed[2],Pranay Nandagawali[3] ,Shreyash Kadu[4]

[1]Fourth-year Student, Dept. of Electrical Engineering,Government College of Engg.,Nagpur, INDIA, e-mail: Sasmeet.Dharmik1@gmail.com

[2]Fourth-year Student,Dept. of Electrical Engineering, Government College of Engg, Nagpur, INDIA e-mail: ssarim432@gmail.com

[3]Fourth-year Student,Dept. of Electrical Engineering, Government College of Engg,Nagpur, INDIA e-mail: pranaynandagawali2004@gmail.com

[4]Fourth-year Student, Dept. of Electrical Engineering, Government College of Engg. Nagpur, INDIAe-mail: shreyashkadu678@gmail.com

A double-sided linear induction motor (DSLIM) optimized for high-thrust and high-efficiency applications in automation and transportation is designed, analysed, and simulated in this work. With its symmetrical double-sided design, the DSLIM offers balanced magnetic flux and increased thrust density, which makes it appropriate for automated material handling and high-speed urban transit systems like Maglev trains. Finite Element Analysis (FEA) is used to analyse performance and calculate important parameters such as thrust force, synchronous speed, and slip. According to simulation results, the DSLIM design is effective. It produces a lot of thrust, is around 70% efficient at the ideal slip levels, and significantly reduces end effects, which are major problems in LIM applications. The design's precision and dependability are confirmed by the high degree of agreement between theoretical calculations and simulation results.

Keywords: Double-Sided LIM (DSLIM), Finite Element Analysis (FEA), Thrust Force, End Effects, Magnetic Flux Distribution, Urban Transit Systems.

PAPER ID:54

Smart Farming using IoT

Rahul Sharma[1],Atharva Sable[2] ,Vaishnavi Gore[3],Rudra Yadav[4]

[1]Fourth-year Student,Dept. of Electrical Engineering,Government College of Engg.,Nagpur, INDIA e-mail: rdsharma@gcoen.ac.in

[2]First-year Student,Dept. of Electrical Engineering, Government College of Engg, Nagpur, INDIA e-mail: adsable@gcoen.ac.in

[3]First-year Student,Dept. of Electrical Engineering Government College of Engg,Nagpur, INDIA e-mail: vsgore@gcoen.ac.in

[4]*First-year Student, Dept. of Electrical EngineeringGovernment College of Engg.,Nagpur, INDIA e-mail: rsyadav@gcoen.ac.in*

Smart farming, powered by the Internet of Things (IoT), is transforming conventional agricultural techniques through the integration of real-time monitoring and automation. The following discourse outlines a comprehensive blueprint of an IoT-centric farming framework employing key components like Arduino Uno, Raspberry Pi, soil moisture, and temperature sensors to optimize resource utilization and bolster agricultural output. This system acquires environmental data, processes it utilizing a microcontroller, and disseminates actionable insights to farmers via cloud platforms and mobile apps. By scrutinizing temperature and moisture patterns, the document underscores the significance of immediate data for regulating irrigation, enhancing crop vitality, and ensuring ecological viability. This pioneering solution underscores how IoT technologies can rectify inefficiencies in traditional farming methods and herald the era of precise agriculture.

Keywords: Smart farming, precision agriculture, real-time monitoring, irrigation management, data-driven farming, resource optimization.

PAPER ID: 88

Design of Electrical Bicycle for Sustainable Urban Mobility

Raghav Nimkar[1],Shriya Mamidpelliar[2] ,Akshit Ramteke[3] ,Anushka Jadhao[4]

[1]*First-year Student, Dept. of Electrical Engineering, Government College of Engg., Nagpur, INDIA e-mail: raghavnimkar12@gmail.com*

[2]*First-year Student, Dept. of Electrical Engineering, Government College of Engg, Nagpur, INDIA e-mail: shriyamamidpelliwar@gmail.com*

[3]*First-year Student, Dept. of Electrical Engineering Government College of Engg, Nagpur, INDIA e-mail: akshit169.bcr@gmail.com*

[4]*First-year Student, Dept. of Electrical Engineering Government College of Engg., Nagpur, INDIA e-mail: anushkajadhao70@gmail.com*

Electric bicycles (e-bikes) represent a blend of traditional cycling and modern electric mobility, offering an efficient and eco-friendly transportation solution. This paper discusses the design and functionality of an electric bicycle optimized for urban commuting and leisure use. It delves into the integration of key components such as hub motors, controllers, and rechargeable batteries, emphasizing their role in enhancing performance and user experience. Key calculations for power requirements are provided, ensuring compatibility with diverse terrains and user needs. The proposed system demonstrates potential as a sustainable transport alternative, reducing emissions, operational costs, and traffic congestion while improving accessibility and ease of use. The power rating of an electric bicycle is designed using a structured approach by using all the formulas and the same designed electrical bicycle has been tested in a simulation environment which provides the validity of the proposed design.

Keywords: Electric bicycle, sustainable transport, hub motor, power calculation, energy efficiency, urban mobility, electric vehicles, eco-friendly transportation.

PAPER ID: 99

Quantitative and Qualitative analysis of the Performance of State-Owned and Private Utility Companies in the Indian Electricity System

Khond Sarang V[1]

[1]*Associate ProfessorDept. of Applied Science and Allied EnggHVP Mandal's College of Engg.&Tech. Amravatie-mail: sarangkhond@yahoo.com*

The power sector is one of the most important sectors in the development of any country.The Electricity system in India is undergoing rapid changes with most of the utilities being state-owned, private utilities are also encouraged to participate to boost the growth opportunities in this sector. In this paper, quantitative and qualitative analysis is based on the comparative study of the performance of India's largest State-owned power supply utility, MSEDCL, and India's two largest private power supply utilities, Tata Power, and Adani Power. The quantitative analysis is based on 09 factors and the qualitative analysis is based on 05 factors which are influential in deciding the financial performance and sustainable operation of the utilities.

Keywords: India, Electricity, Power Distribution utilities, Operations Analysis
PAPER ID: 100

An Innovative Approach to Mitigate Outage Reduction Time on Electric Power Distribution Networks

Khond Sarang V.[1]

[1]*Associate Professor, Dept. of Applied Science & Allied Engg, HVP Mandal's College Of Engg &Tech, Amravati,INDIA., e-mail- sarangkhond@yahoo.com, e-mail: buzz@exceluniversity.ac.in*

The power sector is one of the most important sectors in developing any country as it helps enhance the nation's business and simplify life. India has seen rapid development in all three sectors of the power industry i.e. generation, transmission, and distribution since 2014. According to the latest data available on the website of the Ministry of Power (MoP), Government of India, the overall generation capacity has increased by 9.88%, the transmission network has increased by 1, 14,599 km and the government is focusing on revamping the distribution sector to improve the reliability, quality, and affordability of electric power supply. The power distribution sector is the most challenging one due to large geographical areas, environmental challenges, and system breakdowns due to faults, component failures, and aging of conductors. Almost 80% of breakdowns in the power system are due to faults in the distribution system. Considerable time is lost in locating the faults resulting in loss of revenue and consumer dissatisfaction. This paper focuses on distribution system innovations and infrastructure. It presents a model for automatic fault detection and its location, which will directly inform the maintenance personal about the nature and location of the fault occurred in the form of SMS resulting in reduced manual efforts and the time needed to locate the fault.

Keywords: India, Electricity, Sustainable development, Power system planning, Demand growth, Grid management

PAPER ID: 102

Analyzing Active and Reactive Power Sharing Techniques of Distributed Optimal Power Flow

Manoj Bhaurao Deokate[1] Dr. Rajesh S. Surjuse[2]

[1]*Research Scholar Dept. of Electrical Engineering Government College of Engineering Chandrapur (M.S.), INDIA*

[2]*Associate Professor & Head Dept. of Electrical Engineering Government College of Engineering Nagpur (M.S.), INDIA*

Active & reactive power-sharing strategies are analyzed for distributed optimal power flow in specific load scenarios. Optimal power flow finds steady-state operation points that lower generation costs, losses, etc. In the last five decades, Distributed Optimal Power Flow (DOPF) has emerged to be among the most significant and broadly examined nonlinear optimization issues while preserving a system performance that is acceptable in terms of limitations on the line flow, active along with reactive powers of the generators, the output of different compensating devices, etc. OPF has become complex due to the addition of various devices and the power industry deregulation. Economic market management has been placed on top of the conventional power system concept practices. This paper provides an in-depth exploration of optimizing power flow using distributed techniques, specifically focusing on the**IEEE-14 Bus system.** Here's a detailed analysis and summary based on the content presented.

Keywords: OPF, DOPF, Active Power, Reactive Power, Equality and Inequality Constraints.

PAPER ID: 108

Energy Management Strategies for Hybrid Electric Vehicles

Mahendra Annaji Bagde[1], Anjali U. Jawadekar[2], Priti Mahendra Bagde[3]

[1]*Research ScholarShri Sant Gajanan Maharaj College of Engineering, Khamgaon Road, Shegaon, Indiamabagde@gmail.com*

[2]*Associate ProfessorShri Sant Gajanan Maharaj College of Engineering, Khamgaon Road, Shegaon, India anjali.jawadekar@gmail.com*

[3]*MTech CSERGPV University Bhopal pmbagde020785@gmail.com*

Electric motors having high traction power are engaged in the electric vehicles in order to deliver required high torque to the vehicle to maintain the essential torque, which require high amount of current to be delivered at the traction motors. In the existing system power pack in the form of lithium-ion battery is engaged to provide the required power to the traction power. Hybrid energy storage system is the way to address this issue in an effective way. In the research work multiple energy sources like lithium-ion battery source, fuel cell and ultra capacitor are used for development of the hybrid energy source. These energy sources are intelligently engaged through different control strategies in order to ensure confirmed required power delivery at the traction motors. Different modules from the Simulink are used for the development and analysis of the targeted system.

Keywords*:* Classic PI Control, Simulink, Hybrid Energy Storage, Li-ion Battery, Fuel Cell, Ultra Capacitor.

PAPER ID: 120

Enhancing Power Quality in Renewable Energy Systems: A Comprehensive Review of UPQC in PV, Wind, and Microgrids

Pooja Chaudhari[1],Kunal Sawalakhe[2], Mr.Ganesh Wakte[3], PratikGhutke[4],MukeshKumar[5]

[1]*Department of Electrical EngineeringTulsiramji Gaikwad Patil College of Engg and Tech NagpurMH, India*

[2]*Department of Electrical EngineeringTulsiramji Gaikwad Patil College of Engg and Tech NagpurMH, India*

[3]*Department of Electrical EngineeringTulsiramji Gaikwad Patil College of Engg and Tech NagpurMH, India*

[4]*Department of Electrical EngineeringTulsiramji Gaikwad Patil College of Engg and Tech NagpurMH, India*

[5]*Department of Electrical EngineeringG.H.Raisoni University, AmravatiMH, India*

The Unified Power Quality Conditioner (UPQC) is a versatile power electronic device designed to address a wide range of power quality issues in electrical systems, particularly in renewable energy applications like photovoltaic (PV), wind, and microgrid systems. UPQC combines the functions of both series and shunt compensators, enabling it to simultaneously mitigate voltage disturbances (such as sags, swells, and flicker) and current-related issues (including harmonics and reactive power imbalances). The series compensator regulates the voltage supplied to the load, while the shunt compensator manages current harmonics and provides reactive power support. The integration of these two functions allows UPQC to provide comprehensive compensation, improving the overall stability, reliability, and efficiency of the power system. This paper explores the working principles, configurations, and applications of UPQC in renewable energy systems, highlighting its advantages such as enhanced system performance and reduced equipment damage. However, the paper also discusses the limitations of UPQC, including high initial costs, complex control strategies, and potential harmonic generation if not properly designed. Overall, UPQC emerges as a promising solution for addressing the growing power

quality challenges in modern, distributed energy systems, making it essential for the smooth integration of renewable energy sources into the grid.

Keywords—Harmonics, Microgrid, Power Quality, Renewable Energy, UPQC, Voltage Regulation

PAPER ID: 127

A Comparative Study of Different Electric Motor Types and Drives Used for Electric Vehicles

J. R.Sawant[1] D. A. Shahakar[2],A. S. Telang[3]

[1]*Assistant Professor Dept. of Electrical Engineering JDIET,Yawatmal , Maharashtra, INDIA, e-mail: jitusawant134@gmail.com*

[2]*Associate Professor,Dept. of Electrical Engineering, PRCOEAM,Amarawati Maharashtra, INDIA e-mail: deepakshahakar@gmail.com*

[3]Associate Professor Dept. of Electrical Engineering, PRCOEAM,Amarawati, Maharashtra, INDIA e-mail: astelang@prpotepatilengg.ac.in

The transition to electric vehicles has increased the need to optimize electric motor and drive systems for better performance, efficiency, and cost-effectiveness. This paper provides a comparative study of four major electric motor types used in EVs: Induction Motors, Switched Reluctance Motors, Brushless DC motors, and Permanent Magnet Synchronous Motors. Each motor type is evaluated against key parameters, including efficiency, torque ripple, power density, torque density, cost, and reliability and maintenance, alongside their integration with modern drive systems. PMSMs are recognized for high efficiency and torque density but face challenges in cost and material sustainability. BLDC motors strike a balance between performance and affordability but exhibit moderate torque ripple. IMs, valued for their durability and cost advantages, show comparatively lower efficiency. SRMs offer simplicity and robustness, though advanced control strategies are essential to address torque ripple and acoustic noise. The paper explores how motor characteristics align with EV applications, providing insights into their suitability for EVs. Most appropriate motor for EV is SRM.

Keywords: Electric vehicle, SRM, BLDC, IM, PMSM

PAPER ID: 129

Optimizing Frequency Regulation: A Comparative Assessment of Energy Storage Technologies Based on Key Performance Parameters

Prof. A. D. Borkhade[1], Dr. R. S. Surjuse[2]

[1]*Assistant Professor Dept. of Electrical Engineering& Technology, Yavatmal (Maharashtra) e-mail: borkhadeanurag26@gmail.com*

[2]*Associate Professor & Head Dept. of Electrical Engineering Govt. College of Engineering, Nagpur (Maharashtra) e-mail: surjusemnit@rediffmail.com*

Frequency regulation is critical for ensuring the stability and reliability of power systems, particularly with the growing integration of renewable energy sources. This study provides a comparative assessment of energy storage technologies namely Lithium-ion batteries, flywheels, supercapacitors, and pumped hydro storage based on key performance parameters such as response time, efficiency, power handling capacity, cycle life, and cost. The analysis, grounded in a review of existing literature and real-world case studies, identifies the strengths and limitations of each technology for frequency regulation. Lithium-ion batteries stand out for their high efficiency

and cost-effectiveness, while flywheels and supercapacitors excel in rapid response and durability. In contrast, pumped hydro storage demonstrates limited suitability for instantaneous frequency regulation but remains effective for long-duration applications. The paper concludes by recommending tailored energy storage solutions to meet specific operational and economic needs and advocates for lithium-ion battery types that combine multiple technologies as a promising strategy to enhance frequency regulation and optimize grid performance in the evolving energy landscape.

Keywords: Frequency regulation, Energy storage systems, Key performance parameters, Lithium-ion battery types.

PAPER ID: 152

Design of Half Bridge LLC Resonant Converter Using SPICE

Atharva Rajendra Patil[1],Anoop Dilip Pawar[2], Yash Yogeshwar Raut[3],Dr. Rajesh . S . Surjuse[4],Harshada Sunilrao Watkar[5]

[1]*e-mail: arpatil264@gmail.com*

[2]*e-mail:anooppawar11@gmail.com*

[3]*e-mail: yashraut016@gmail.com*

[4]*e-mail: surjusemnit@rediffmail.com*

[5]*e-mail:harshadawatkar16@gmail.co*

The design of half-bridge LLC resonant converters is gaining attention for their high efficiency, power density, and low switching losses. Unlike traditional PWM-based converters, these operate through frequency modulation, posing unique challenges in resonant tank modeling and component selection. This paper outlines a systematic approach to designing an LLC resonant converter using the First Harmonic Approximation (FHA) method and LTspice simulations.

Key resonant tank parameters, including resonant frequency, inductance, and capacitance, are calculated using optimized formulae to ensure performance under varying load and input conditions. LTspice simulations facilitate efficient frequency and circuit behavior analysis, reducing prototyping iterations. Open-loop and closed-loop simulations validate the design, ensuring zero-voltage switching (ZVS) and high efficiency. A step-by-step example demonstrates the streamlined design process and highlights the benefits of SPICE-based tools in enhancing modern power electronics design reliability.

Keywords: LLC resonant converter, Design, LTspice, zero-voltage switching, frequency modulation

PAPER ID: 164

Investigation of Performance of carcuma longu leaf oil as an Engine fuel and its comparison with Gasoline

Mudrika Ahmed[1], Kiran Khandarkar[2]

[1]*Associate Professor Dept. of Chemistry Government Polytechnic Nagpur, Nagpur, INDIA*
e-mail: mudrika.ahmed2@gmail.com

[2]*Assistant ProfessorDept. of Basic Science & Humanities,St. Vincent Pallotti College of Engineering & TechnologyNagpur, INDIAe-mail: kkhandarkar@stvincentngp.edu.in*

This paper designates to the investigational study concerning the possibility of consuming bio-oil i.e. turmeric leaves-based oil obtained from Turmeric plants. The gasoline and turmeric leaves oil were tested for the emission and performance characteristics of a 4-stroke spark ignition engine. Both the fuels were evaluated and compared for their performance and emission parameters viz. The performance parameters investigated were brake mean effective pressure (BMEP), specific fuel consumption (SFC), torque, brake power, and thermal efficiency; whereas the exhaust emission parameters investigated were the Carbon monoxide (CO), Carbon dioxide (CO2), hydrocarbons (HC) and oxides of nitrogen (NOX) emissions. The outcomes conclude that the turmeric leaves bio-fuel lowers the BMEP and the torque, compare to gasoline.

Key Words: Turmeric oil, Alternative fuel, Emission, fuel for SI engine, eco-friendly Biofuel.

PAPER ID: 168

Effect of Dust Particles Deposition on Performance of Photovoltaic Solar Panels

Mrugsarita D. Borkar[1] Dr. Ujwala V. Dongare[2]

[1]*Dept. of Electrical Engineering Govt. College of Engineering, Nagpur email: mrugsarita0782@gmail.com*

[2]*Assistant Professor Dept. of Electrical Engineering Govt. College of Engineering, Amravati email: ujwala.0610@gmail.com*

Nowadays, Renewable energy source of Solar Photovoltaic Panels is utilized mostly for electrical power generation for being green energy. The Solar panels are installed on rooftop or Open area exposed to direct sunlight, therefore the major difficulty to solve, is dust particle deposition on Solar panels. These dust particles impact the conversion efficiency and power generation of solar panels. Dust deposition has three effects: the shielding effect, the temperature effect, and the corrosion effect. The primary aim of this work is to assess the power and energy loss as a function of dust particle accumulation on solar panels. The influence of dust factors on the performance of monocrystalline and polycrystalline panels in a typical ambient milieu is examined, with a real-time assessment of several metrics such as voltage, current, power, and efficiency shown. Experimental observations indicate that the correlation between dust particle density and conversion efficiency is non-linear. Increased dust deposition negatively impacts the power production, conversion efficiency, and temperature within solar panels. So, some methodologies are presented to compensate power loss due to dust and to improve performance.

Keywords: Photovoltaic panels, milieu, dust densities, conversion efficiency, power output.

PAPER ID: 170

Design and Fabrication of Insulation Failure Detection System for Domestic Appliances with Metallic Enclosures

Dr. Sarang V. Khond[1]

[1]Associate Professor Dept. Of Allied Science & Allied Engg.HVP College of Engg. & Tech., Amravati. INDIA,e-mail-sarangkhond@yahoo.com

As per the records of the National Crime Records Bureau (NCRB) which is an Indian government agency that collects and analyzes the data related to crime as defined by the Indian Penal Code (IPC) and Special & Local Laws (SLL), about 100,000 people lost their lives due to electrocution during last decade (2011-20). It has reported an alarming figure of around 11,000 deaths per year due to electrocution all over the country. This number has further increased to 12,492 during 2022. This indicates that on an average about 34 people die every day due to accidents related to electrocution**.** This is a significantly higher figure than that of other developed countries. In the United States, the UK, and Germany, there are approximately 1000, 70, and 36 deaths per year respectively. In this paper, a device's construction and fabrication are presented, which will give an alarm in the form of a sound and LED indication with remote sensing of current when the appliance with metallic enclosures carries the electric current accidentally. The device works on the concept of the generation of electromagnetic fields due to current. The uniqueness of this device is contactless sensing of current which enhances its utility as a safety device in real-life applications.

Keywords: Electrocution, Injuries, Accident, Lethal, Safety Devices.

PAPER ID: 207

Automated Hydroponics System

Rajani Sahare[1], Twinkal Jumale[2], Reshal Bhati[3], MayankMasram[4], Tejashri Apturkar[5]

[1]Assistant Professor,Dept. of Electrical EngineeringGovernment College of Engineering, Nagpur,Nagpur, Indiae-mail: saharerajani29@gmail.com

[2]Student,Dept. of Electrical Engineering Government College of Engineering, Nagpur, Nagpur, India, e-mail: twinkaljumale123@gmail.com

[3]Student,Dept. of Electrical Engineering Government College of Engineering, Nagpur, Nagpur, India ,e-mail: rmbhati@gcoen.ac.in

[4]Student,Dept. of Electrical Engineering Government College of Engineering, Nagpur, Nagpur, India ,e-mail:masrammayank@gmail.com

[5]Student,Dept. of Electrical Engineering Government College of Engineering, Nagpur, Nagpur, India ,e-mail: tnapturkar@gcoen.ac.in

Hydroponics system provides a promising future all over the world with great growth in urbanization, agriculture and a pure life. A method with the help of which different plants can be grown indoors without soil, using nutrient rich water is known as Hydroponics. It has an ability to grow plants at faster rate and also offers the advantage of observing plants grow in front of you without any interference of vendor which ensures high-quality, chemical-free product. This project mainly focuses on the automating hydroponic system which is present at large scale. Key parameters of this project include concentration of nutrients (TDS), temperature and intensity of light. All these parameters are integrated with microcontrollers like Arduino and Raspberry Pi. Hydroponics system is suitable for urban area with limited access of land and water resources. Challenges such as scalability, cost management, perfect balance of nutrients and working of sensors are addressed in the paper further.

Keywords: Hydroponics, *TDS, Arduino, Scalability*

APER ID: 208

PV-Powered BLDC Motor Drive System for EV Using an Improved KY DC-DC Converter

Maharudra Subhashrao Shinde[1], Dr. Rajesh Shankarrao Surjuse[2]

[1]*Research Scholar Dept. of Electrical Engineering, Government College of Engineering*

Chandrapur, 442402, Indiae-mail: maharudra01@gmail.com

[2]*Head in Electrical Engineering, Dept. of Electrical and Engineering, Government College of Engineering Nagpur, 441108, India*

this paper proposes Photovoltaic (PV) based Improved KY DC-DC converter for BLDC motor. The proposed KY DC-DC converter addresses the fluctuating nature of PV systems, offering a wide conversion range, reduced voltage stress, and high efficiency. To stabilizing the output of the converter, an ACO-PI controller is utilized. Additionally, a battery-based bidirectional buck-boost converter is incorporated to ensure seamless power flow for both charging and discharging operations. Simulations in MATLAB validate that the proposed system improves efficiency of 93.53%, settling time at 0.1s, and enhances energy utilization.

Keywords: PV system, Electric Vehicle (EV), Improved KY DC-DC converter, ACO, PI controller.

PAPER ID: 211

Design and Analysis of a Phase-Shift Full-Bridge Converter for Wide Input Range and Constant Output Voltage

Vishal Sudhakar Kauskar[1], Anisha Wasudev Sarode[2], Pratik Jitendra Bhingardive[3], Rudraksh Arun Mandhare[4], Dr. Rajesh S. Surjuse[5]

[1]*Student, Dept. of Electrical Engineering, email: vishalkauskar7580@gmail.com*

[2]*Student, Dept. of Electrical Engineering email: anishasarode2003@gmail.com*

[3]*Student, Dept. of Electrical Engineering email: pratikbhingardive2606@gmail.com*

[4]*Student, Dept. of Electrical Engineering email: rmandhare4999@gmail.com*

[5]*Associate professor, Dept. of Electrical Engineering email: surjusemnit@rediffmail.com*

This paper features the design and simulation of a (PSFB) Phase-Shift Full-Bridge dc-dc converter that keeps output voltage constant in a wide input voltage range without dividing a lot of efficiency. The converters use Zero Voltage Switching (ZVS) to reduce the switching loss and increase the efficiency, taking the advantage of the transformer's leakage inductance and parasitic capacitance of the switches. Significant advancements were made in transformer design to minimize leakage inductance, and a very effective control topological response to the UCC28950 controller, which overcomes the drawbacks of motor drive and is scalable for control of multiport converters and maintain regulation of power flow to reduce circulating currents and improve conduction loss. Simulation and experimental results prove that the proposed converter is of high efficiency, stabled to operate during various load conditions, and robust for telecom rectifier and Data centre applications. This work fills vital gaps in PSFB converter research, offering a robust solution for

Keywords: phase-shift full-bridge converter, wide input voltage range, constant output voltage, zero voltage switching, power conversion efficiency.

PAPER ID: 213

Comparative Study of Various MPPT Techniques

Dr.R.S.Surjuse[1], Prachi Hadke[2], Neha Diwate[3], Sanjana Dhage[4], Chanchal Kharabe[5]

[1]*Head of Department, Department of Electrical Engineering Government College of Engineering, Nagpur (GCOEN) Email:surjusemnit@rediffmail.com*

[2]*Student Department of Electrical Engineering Government College of Engineering, Nagpur (GCOEN) Email: hadkeprachi1@gmail.com*

[3]*Student Department of Electrical Engineering Government College of Engineering, Nagpur (GCOEN) Email: nehadiwate@gmail.com*

[4]*Student Department of Electrical Engineering Government College of Engineering, Nagpur (GCOEN) Email: sanjanadhage8@gmail.com*

[5]*Student Department of Electrical Engineering Government College of Engineering, Nagpur (GCOEN) Email: chanchalkharabe6@gmail.com*

The technique used to extract maximum power from solar cells known as MPPT technique. The three different techniques have been surveyed and these techniques have been tested and analyzed under different environmental conditions. The operational principle, efficiency, dynamic response times, and adaptability under changing irradiance and temperature conditions are thoroughly analyzed in this paper. It has been also observed that all these algorithms are dependent on changing environmental conditions. The effectiveness of all these algorithms have been tested and performance have been evaluated with the help of simulation and experimental results. The benefits and drawbacks of various algorithms have also been discussed**.**

Keywords: MPPT, P&O, INC, OCV, PV, DC-DC Converter.

PAPER ID: 224

Optimal Co-ordination of Wind Farm and Electric Vehicle for Economical Operation of Grid

Manohar Kalgunde[1], Rajesh Surjuse[2], Amol Kalage[3], Sarika Tade[4]

[1]*Department of Electrical Engineering, Government College of Engineering, Chandrapur, India*

[2]*Department of Electrical Engineering, Government College of Engineering, Nagpur, India*

[3,4]*Department of Electrical Engineering, Sinhgad Institute of Technology, Lonavala, India*

The use of electric vehicle (EV) for personal and commercial transportation has increased tremendously. If the growth continues in the same way, then in next two decades around half of the transportation will be running on electricity. In this paper the very futuristic scene is viewed as an opportunity to avail the source of flexibility for the existing grid operation. The group of vehicles can be treated as a mass storage device for the grid operation. The important factors like effectiveness and economical aspects can be included wisely in the modern operation of the grid with incorporation of the future trend of EV alongwith renewable energy source like wind farm.

In this paper the three different cases are studied in this perspective. The first case carries the optimum unit commitment of thermal units for an isolated cost-effective generation of electricity. In second case, the introduction of the wind farm in grid operation is exercised to find out overall generation cost of electricity. The free-of-cost availability of wind energy plays crucial role in the economics of electrical power generation and dispatch. For the third case, the various scenarios of the groups of the electric vehicles are included in the electrical power system. The coordination between wind energy and EV ensures proper exploitation of the wind

farm as well as the requirements of charging system for the EV. The three case studies are presented in this paper and corresponding results are obtained and compared for the best operation of the grid.

Keywords:- unit commitment, wind farm, electric vehicle

PAPER ID: 232

Development of an Intelligent Smart Plant Monitoring System Using IoT and AI

Yash Balpande[1] , Shivani Gurnule[2], Vedant Pandit[3], Dhiraj Raghav Joshi[4]

[1]*Second-year Student,Dept. of Electrical Engineering Government College of Engg, Nagpur, INDIA e-mail: yashbalpande40@gmail.com*

[2]*Second-year Student,Dept. of Electrical Engineering Government College of Engg, Nagpur, INDIA e-mail: shivanigurnule00@gmail.com*

[3]*Second-year Student,Dept. of Electrical Engineering Government College of Engg, Nagpur, INDIA e-mail: vedantpandit3107@gmail.com*

[4]*Second-year Student,Dept. of Electrical Engineering Government College of Engg, Nagpur, INDIA e-mail: raghavgcoen2005@gmail.com*

The rapid advancement of Internet of Things (IoT) and Artificial Intelligence (AI) technologies has revolutionized agricultural monitoring, presenting innovative solutions for precision farming. This research introduces a comprehensive Smart Plant Monitoring System utilizing ESP32 microcontroller and advanced machine learning algorithms to provide real-time, intelligent plant health management. By integrating multiple environmental sensors and edge computing techniques, the proposed system offers unprecedented accuracy in monitoring plant growth parameters, predicting potential diseases, and optimizing resource allocation. The developed framework demonstrates superior performance in moisture regulation, temperature control, and predictive maintenance, with experimental results showing 92.5% accuracy in plant health prediction and a significant 35% reduction in water consumption compared to traditional monitoring methods.

Keywords: IoT, AI, Agricultural monitoring, Precision farming, Smart Plant Monitoring, ESP32 microcontroller, Machine learning, Real-time management, Environmental sensors, Disease prediction

PAPER ID: 233

Plant Health Monitoring System Using AI and ML

Vaibhav Wandre[1], Anjali Kawalkar[2], Chinmay Kale[3], Rohan Shinde[4]

[1]*Final-year Student, Dept. of Electrical Engineering, Government College of Engg. Nagpur, INDIA email: wandrev75@gmail.com*

[2]*Final-year Student, Dept. of Electrical Engineering, Government College of Engg. Nagpur, INDIA email: anjalikawalkar026@gmail.com*

[3]*Final-year Student, Dept. of Electrical Engineering, Government College of Engg. Nagpur, INDIA email: chinmaykale26@gmail.com*

[4]*Final-year Student, Dept. of Electrical Engineering, Government College of Engg. Nagpur, INDIA email: rs2154383@gmail.com*

The most important industry in our nation has always been agriculture. The world is expanding and changing quickly, and as most things are now automated, it is also necessary to maintain factories through automation. Generally speaking, each plant has certain requirements that must be met for it to survive. Therefore, a system that uses AI to allow plants to speak to users must be created. Monitoring these parameters will ensure that the plants are healthy. There is also a need to analyse, collect, and make the best use of the parameters for classifications about their state. It aims to model a system where we keep track of the requirements of the plants using AI and ML. The proposed system is to depend on image data taken from plants. This proposed work is composed of various sensors such as RGB cameras, multispectral, and thermal sensors to capture images and preprocess the data for its improvement. The CNN will diagnose the image and look for deformities and assess the problem with the plant. Trained AI and ML models can detect the disease or the problems that are present in that particular plant and if the plants are healthy then no deformation will be detected; hence if the plants are not healthy then the system will give out the notification with the problem and solution for curing or preventing the problem.

Keywords: Agriculture, AI and ML, sensors, Binary, Categorical model, Plantnet, PlantVillage, Dataset, Performance.

PAPER ID: 237

Analyzing the Impact of Electric Vehicle Charging on Distribution Transformer Life and Performance

Ameya Raut[1], Atharva Mande[2], Jaykumar Deotale[3], Om Shivankar[4], Aniket Deshmukh[5], Neha Khadse[6]

[1]*Fourth-year Student,Dept. of Electrical Engineering Government College of Engg. Nagpur, INDIA e-mail: rautameya47@gmail.com*

[2]*Fourth-year Student,Dept. of Electrical Engineering Government College of Engg. Nagpur, INDIA e-mail: atharvamande@gmail.com*

[3]*Fourth-year Student,Dept. of Electrical Engineering Government College of Engg. Nagpur, INDIA e-mail: jaykumardeotale@gmail.com*

[4]*Fourth-year Student,Dept. of Electrical Engineering Government College of Engg. Nagpur, INDIA e-mail: omshivankar03@gmail.com*

[5]*Fourth-year Student,Dept. of Electrical Engineering Government College of Engg. Nagpur, INDIA e-mail: aniketdeshmukh003@gmail.com*

[6]*Assistant professort,Dept. of Electrical Engineering Government College of Engg. Nagpur, INDIA e-mail: nehakhadse7@gmail.com*

This paper analyzes the impact of Electric Vehicle (EV) charging on distribution transformer performance and ageing. As the global EV fleet is projected to make up 30% of total passenger vehicles by 2040, the associated charging loads pose unprecedented challenges to existing power infrastructure. We propose an advanced electronic monitoring and control system based on IoT and GSM, utilizing the ESP32 microcontroller to regulate transformer loading patterns. Experimental results reveal that long-range EV chargers can overstress transformers by up to 50%, while our proposed system significantly reduces this stress to approximately 30%. The study concludes that unmanaged EV charging, particularly from long-range chargers, accelerates transformer ageing and increases overheating incidents. Our load management solution successfully flattens daily load profiles, reduces peak demands, extends transformer lifespan, and enhances grid reliability. This research offers critical insights for utilities and grid operators adapting infrastructure to the rapidly growing EV ecosystem.

Keywords: Distribution transformers, Transformer ageing, Load management, IoT monitoring

PAPER ID: 239

Solar Power Street Light with Auto Intensity Adjustment and Fault Detection

Neha Khadse[1], Urjita Kulkarni[2], Nikita Mohod[3], Nandini Thaware[4], Laxmi Sakore[5], Nivedita Ramteke[6]

[1]*Assistant Professor, Dept. of Electrical Engineering, Government College of Engg. Nagpur, INDIA*

[2]*Fourth-year Student, Dept. of Electrical Engineering, Government College of Engg. Nagpur, INDIA*

[3]*Fourth-year Student, Dept. of Electrical Engineering, Government College of Engg. Nagpur, INDIA*

[4]*Fourth-year Student, Dept. of Electrical Engineering, Government College of Engg. Nagpur, INDIA*

[5]*2Fourth-year Student, Dept. of Electrical Engineering, Government College of Engg. Nagpur, INDIA*

[6]*Fourth-year Student, Dept. of Electrical Engineering, Government College of Engg. Nagpur, INDIA*

In this study, a solar-powered system with auto-intensity adjustment and fault detection is presented as a sustainable and affordable street lighting solution. The suggested solution uses renewable energy to run off the grid, which lowers carbon emissions and energy use. Motion-triggered lighting for improved functionality, automated brightness management depending on ambient light levels, and real-time fault detection to guarantee dependability and save downtime are some of the key features. The financial advantages are demonstrated by a thorough 10-year cost analysis, which shows an 84% decrease in the total cost of ownership when compared to conventional streetlights. In line with international objectives for sustainability and energy conservation, the system provides a scalable and effective substitute for public lighting in both urban and rural areas.

Keywords: Solar-powered streetlight, auto-intensity adjustment, fault detection, renewable energy, cost-benefit analysis, energy efficiency, sustainability, LED lighting, motion sensor, smart public infrastructure.

PAPER ID: 240

ANN-based Evaluation of Transformer Performance through Terminal Current and Voltage Monitoring

Sushant Thakre[1] ,Dhanshri Kshirsagar[2], Sahil Shende[3], Rohan Nandanwar[4]

[1]*Final-year Student,Dept. of Electrical Engineering, Government College of Eng Nagpur, INDIA e-mail: sushantthakre2017@gmail.com*

[2]*Final-year Student,Dept. of Electrical Engineering, Government College of Eng Nagpur, INDIA e-mail: dhanshreekshirsagar123@gmail.com*

[3]*Final-year Student,Dept. of Electrical Engineering, Government College of Eng Nagpur, INDIA e-mail: sahilshende7777@gmail.com*

[4]*Final-year Student,Dept. of Electrical Engineering, Government College of Eng Nagpur, INDIA e-mail: sahilshende7777@gmail.com*

The transformer is an important component in the electrical power system that ensures efficient power transmission and distribution. While the distribution transformer proved to be the most efficient element in the power system, its upkeeping is of crucial importance. Traditional methods for distribution transformer health monitoring pose challenges in predictive maintenance and real-time assessment. This approach proposes an artificial neural network (ANN)-based system for determining transformer performance by collecting its terminal current and voltage data. This project uses IoT technology equipped with ANN models to provide real-time monitoring as well as predictive maintenance capabilities. Historical and live data analysis facilitates early fault detection, which helps in minimizing downtime and avoiding operational risks. This ANN-based approach is employing a feedforward-backpropagation model and classifies transformer health into normal, under-voltage, over-voltage, under-current, and over-current conditions with higher accuracy. The results obtained at the end demonstrate the effectiveness of this intelligent monitoring system in enhancing transformer reliability, optimizing maintenance schedules, and reducing operational losses, thereby contributing to the modernization of power systems.

Keywords: ANN, feedforward-backpropagation, distribution transformer health, Predictive maintenance.

Track-4 Computer Science and Engineering

PAPER ID: 20

Revolutionizing Furniture Shopping Using Augmented Reality

Prof. Mohd. Anwarul Siddiqui[1], Prof. Qudsiya Naaz[2], Aakib Shaikh[3], Dusi Venkat Meghna[4], Noman Ali[5], Noman Ali[6], Sarthak Meshram[7], Sai Vaibhavi Tatimeti[8]

[1,2,3,4,5,6,7,8] *Department of Computer Science And Engineering ,Anjuman College of Engineering And Technology, Rashtrasant Tukdoji Maharaj Nagpur University.*

Purchasing for furniture the traditional method may be an intimidating lengthy process. Now, with our AR-based app, these challenges become easier to overcome as it allows you to see furniture virtually in your own house. AR lets you see how items will look, fit, and work in your decor, giving you less chance of making an impulse buy. When combined with AR, it leads to greater customer satisfaction and lower returns, and a legacy of augmented reality customization solutions. Using state-of-the-art AR technology, we created our app having UI/UX in mind. It has been rigorously tested to prove that it works. Abstract: This paper describes a furniture shopping application based on AR and its construction, technical architecture, user interface design, and evaluation approach. We hope to prove through user testing and feedback that AR can bring true transformation into the furniture buying experience, but providing a more personalized and convenient experience for consumers.improving the performance of existing Sewage treatment plant in the college campus and water can be recycle for gardening and washing purpose.

Keywords: Wastewater management, sewage treatment, MBBR method, urban wastewater, water conservation, COD, BOD.

PAPER ID: 63

PERFORMACE EVALUATION OF IOT BASED AIR POLLUTION MONITIORING SYSTEM

Mr. Sarthak A. Dhumal[1], Mr. Mahesh R. Mule[2], Mr. Sanket S. Pawar[3], Dr. Sudhir B. Lande[4]

[1]*Department Of Electronics and Telecommunication VPKBIET Baramati*

Savitribai Phule Pune University, Maharashtra, India.email: dhumalsarthak32@gmail.com[2]

[2]*Department Of Electronics and Telecommunication VPKBIET Baramati*

Savitribai Phule Pune University, Maharashtra email: mulemahesh4@gmail.com

[3]*Department Of Electronics and Telecommunication VPKBIET Baramati*

Savitribai Phule Pune University, Maharashtra email: sudhir.lande@vpkbiet.org4

[4]*Department Of Electronics and Telecommunication VPKBIET Baramati*

Savitribai Phule Pune University, Maharashtra email: sudhir.lande@vpkbiet.org4

Air pollution is a big problem that affects our health and the environment. To help address this, we have developed an Air Pollution Monitoring System using IoT devices. This system uses several types of sensors to monitor the air quality, including gas sensors, particle sensors, noise sensor, temperature, and humidity sensors. The system collects data from these sensors and sends it to a central server where it can be processed and analyzed. This data is then display, allowing users to see the current air quality in real-time. Additionally, this

system has an alarm feature that alerts users when the air quality becomes unsafe. This helps people know when they should take action to reduce exposure to pollution. This Air Pollution Monitoring System provides valuable information about air quality, helping users to stay informed and take steps to improve the air they breathe. It's a simple yet effective tool for monitoring and managing air pollution.This system overcomes the limitations of traditional methods by providing real-time, multi-parameter air quality monitoring. Its cost-effective design, instant alerts, and dynamic data visualization empower users to take immediate action, making it a practical and impactful tool for reducing pollution and protecting public health.

Keywords: Air Quality, Environmental Pollution, Microcontroller, Sensors..

PAPER ID: 73

Employee Attrition Prediction

Eshwar Enugurti[1], Sayali Ambekar[2], Gaurav Nagarkar[3], Gaurav Nagarkar[4], Utkarsha Punekar[5], Dr. Nitin Janwe[6]

[1]Student, Dept. of Computer Science and Engineering , R.C.E.R.T Chandrapur , India ,

email: eshwarenugurti123@gmail.com

[2] Student, Dept. of Computer Science and Engineering , R.C.E.R.T Chandrapur , India ,

email: sayaliambekar18@gmail.com

[3]Student, Dept. of Computer Science and Engineering , R.C.E.R.T Chandrapur , India ,

email: nagarkargaurav32@gmail.com

[4]Student, Dept. of Computer Science and Engineering , R.C.E.R.T Chandrapur , India ,

email: rohitdethe333@gmail.com

[5]Student, Dept. of Computer Science and Engineering , R.C.E.R.T Chandrapur , India ,

email: utkarshapunekar19@gmail.com

[6]Profesor, Dept. of Computer Science and Engineering , R.C.E.R.T Chandrapur , India email: nitin.janwe2015@gmail.com

Organisations struggle with employee attrition, which costs a lot to hire new staff, lowers productivity, and causes talent to leave. By predicting employee loss, proactive strategies to increase staff stability and retention may be implemented. This study investigates how machine learning techniques like XGBoost , Random Forest , and Logistic Regression may be used to successfully forecast employee attrition. Additionally, a complex hybrid model for feature selection and hyperparameter optimisation is proposed, which combines the Deep Belief Networks (DBN) and the Improved Sparrow Search Algorithm (ISSA) . Class balancing using SMOTE is one data preparation technique used to enhance model performance . The model is assessed using metrics such as ROC-AUC, F1-score, recall, accuracy, and precision. The advantages and disadvantages of conventional, ensemble, and hybrid techniques are emphasised via comparative analysis. For HR professionals, the study provides insightful information that supports data-driven decision-making to lower turnover and hold onto important personnel. Real-time data streams will be incorporated into future research to enhance prediction skills even further.

Keywords: Employee Attrition, Predictive Analytics, Machine Learning, Logistic Regression, Random Forest, XGBoost, Deep Belief Networks, Improved Sparrow Search Algorithm, SMOTE, Workforce Retention

PAPER ID: 84

NAVGUIDE: Indoor Navigation for Visually Impaired

Dr. P. B. Jawade[1], Dr. Laxman Kumarward[2], Chetna R. Salve[3], Lalit K. Ghatole[4], Dhiraj G. Sahare[5], Esha C. Rangari[6]

[1]Assistant professor (GCOEN) ,Dept. of Computer Science and Engineering ,RTMNU University Nagpur, INDIA, email: prashantjawade1234@gmail.com

[2] Regional Director, Indira Gandhi National open University Nagpur INDIA., E-mail: laxmankumarward@gmail.com

[3]Student (GCOEN) ,Dept. of Computer Science and Engineering ,RTMNU University Nagpur, INDIA, email crsalve@gcoen.ac.in

[4]Student (GCOEN) ,Dept. of Computer Science and Engineering ,RTMNU University Nagpur, INDIA, email: lkghatole@gcoen.ac.in

[5]Student (GCOEN) ,Dept. of Computer Science and Engineering ,RTMNU University Nagpur, INDIA. email: dgsahare@gcoen.ac.in

[6]Student (GCOEN) ,Dept. of Computer Science and Engineering ,RTMNU University Nagpur, INDIA, email: ecrangari@gcoen.ac.in

Navigating indoor spaces can be challenging for individuals with visual impairments, often resulting in restricted mobility and reduced independence. To address this issue, the" NAVGUIDE" system has been developed as an autonomous indoor navigation tool specificallydesigned to assist visually impaired individuals. The system utilizes cutting-edge technologies, including sophisticated sensors, and realtime data processing, to offer accurate, reliable, and actionable guidance NAVGUIDE continuously maps its surroundings, detecting obstacles and changes in the environment. This dynamic approach allows the system to adapt to various indoor spaces, whether in unfamiliar areas or constantly shifting layouts.The system is equipped with auditory and haptic feedback mechanisms, which provide real- time guidance, enabling users to confidently navigate without visual cues. By delivering information in these formats, NAVGUIDE ensures the user can easily interpret the data, leading to greatersituational awareness and spatial understanding.

Keywords: Artificial Intelligence, Natural Language Processing, Machine Learning, Deep Learning, Information Retrieval, Ranking, Knowledge Representation.

PAPER ID: 92

LegalLens: AI-powered Legal Document review system using Large Language Model

Atharva Shrikhande[1], Aashish Tawale[2] Sakshi Nimje[3], Kinjal Tiwari[4]

[1]Research Scholar, Department of Computer Science, Government College of Engineering, Nagpur,Nagpur, India email: : adshrikhande@gcoen.ac.in

[2]Research Scholar, Department of Computer Science, Government College of Engineering, Nagpur,Nagpur, India email: : : aptawale@gcoen.ac.in

[3]Research Scholar, Department of Computer Science, Government College of Engineering, Nagpur,Nagpur, India email: : sanimje@gcoen.ac.in

[4]Research Scholar, Department of Computer Science, Government College of Engineering, Nagpur,Nagpur, India email: kdtiwari@gcoen.ac.in

LegalLens (AI-Assisted Legal Document Analysis Platform) is an advanced and innovative solution designed to address the challenges faced by legal professionals in manually reviewing extensive legal documents. The manual navigation of extensive legal documents poses a significant challenge to legal professionals. By automating the process of document analysis, LegalLens streamlines legal review, enhancing efficiency and accuracy for lawyers and law firms. Leveraging advanced technologies, including natural language processing and machine learning, LegalLens provides a comprehensive solution for automating the extraction, processing and retrieval of information from diverse sources. Incorporating emerging technologies like large language model for content processing, LegalLens ensures cutting edge performance. The platform's frontend is built using the modern React framework, offering an intuitive, user-friendly interface for seamless integration and enhanced user experience. LegalLens ensures security and confidentiality of sensitive legal information, adhering to industry-standard data protection protocols. By empowering legal professionals to focus on higher value tasks, the platform serves as a valuable tool in transforming the efficiency of legal processes.

Keywords: Natural Language Processing, Machine Learning, Large Language Model, Artificial Intelligence, Text Summarization, Tokenization, Vector Embedding

PAPER ID: 101

Review on Fraud App Detection using Machine Learning Techniques

Dr. G.M.Asutkar[1], Ms. Jaishree Wankhede[2], Anjali Chaudhari[3], Vaishnu Rewatkar[4], Janhvi Armarkar[5], Gautami Chitre[6], Ketki Thaware[7]

[1] Head of Department, gajendraasutkar@gmail.com, Department of Artificial Intelligence & Data Science Priyadarshini College of Engineering Nagpur

[2]Assistant Professor, jaishreewankhede@gmail.com, Department of Artificial Intelligence & Data Science Priyadarshini College of Engineering Nagpur

[3]anjalichaudhari 305@gmail.com., Dept. of Artificial Intelligence and Data Science, Priyadarshini College of Engineering, Nagpur

[4]Dept. of Artificial Intelligence and Data Science, Priyadarshini College of Engineering, Nagpur email: vaishnurewatkar024@gmail.com,

[5]armarkarjanhvi@gmail.com, Dept. of Artificial Intelligence and Data Science, Priyadarshini College of Engineering Nagpur

[6]*Dept. of Artificial Intelligence and Data Science, Priyadarshini College of Engineering Nagpur email: gautami323chitre@gmail.com*

[7]*Dept. of Artificial Intelligence and Data Science, Priyadarshini College of Engineering Nagpur email: ketkithaware9@gmail.com*

The growth of mobile applications has been accompanied by the rise of fraudulent applications, posing risks to user security and distorting app store rankings. This review paper explores techniques for fraud detection, emphasizing machine learning (ML) and sentiment analysis. By analyzing user reviews and app metadata, this study synthesizes insights from recent research, including hybrid approaches, rule-based sentiment models, and ranking fraud detection frameworks. Recommendations for future work include real-time systems and cross-platform applications to improve fraud detection accuracy and scalability

Keywords: Sentiment, reviews, analysis, data

PAPER ID: 109

REVIEW ON AUTOMATED PULL & DROP ROBOT USING VIRTUAL MAPPING

Dr.G.M.Asutkar[1], Trupti Thakre[2], Aarchi Tiwari[3], Tanvi Ghorpade[4], Himanshu Bopche[5], Lekhni Churhe[6], Khumesh Rahangdale[7]

[1]*Professor Dept. of Artificial Intelligence & Data Science PCE, Nagpur, India email: gajendraasutkar@gmail.com*

[2] *Assitant Professor Dept. of Artificial Intelligence & Data Science PCE, Nagpur, India email: truptithakre123@gmail.com*

[3]*Dept. of Artificial Intelligence & Data Science PCE, Nagpur, India email: aarchitiwari04@gmail.com*

[4]*Dept. of Artificial Intelligence & Data Science PCE, Nagpur, India email: tanvigh45@gmail.com*

[5]*Dept. of Artificial Intelligence & Data Science PCE, Nagpur, India email: himanshubopche226@gmail.com*

[6]*Dept. of Artificial Intelligence & Data Science PCE, Nagpur, India email: lekhni2003@gmail.com*

[7]*Dept. of Artificial Intelligence & Data Science PCE, Nagpur, India email: khumeshrahangdale43198@gmail.com*

This paper takes a quick look in material handling robots focusing on the groundbreaking Automated Pull & Drop Robot (APDR). It relies on magnetic tape, 3D LiDAR sensors, and sophisticated path creation methods—essential features for today's industrial automation systems that guarantee quick, precise, and secure transport of items. The APDR stands out for its cutting-edge combination of magnetic tape guidance and 3D LiDAR sensing for error recovery during navigation. Teamed up with top-notch path shaping and barrier dodging program codes, it overcomes the limits of classic AGVs. We scrutinize the APDR against other Agent gadgets eyeing improvements in route planning, budget-friendly guidance, and instant hurdle recognition. This study underlines the APDR's role in boosting safeguard, flexibility, and efficiency in a range of production setting.

Keywords: Automated Guided Vehicle, Pathfinding, LiDAR, Automation

PAPER ID: 112

AI-Driven Framework for Early Cancer Detection and Diagnosis

Atharva Gadge[1], Khushi Latey[2], Aman Pawade[3]

[1] *Yeshwantrao Chavan College of Engineering, Nagpur, email: gadgeatharva7@gmail.com*

[2]*Yeshwantrao Chavan College of Engineering, Nagpur, email:khushilatey16@gmail.com*

[3]*Yeshwantrao Chavan College of Engineering, Nagpur, email:amanpawade25@gmail.com*

This research investigates the potential applications of artificial intelligence (AI) in the early detection and growth prediction of various cancer types. By analyzing patient data, it identifies significant risk factors such as age, gender, and underlying medical conditions. Advanced AI techniques, including artificial neural networks (ANN) and logistic regression, are utilized, with the ANN model demonstrating strong performance metrics—sensitivity at 0.757, specificity at 0.755, and an area under the curve (AUC) of 0.873. The study underscores AI's transformative role in cancer management, encompassing diagnosis, treatment, drug development, and postoperative care. It also addresses challenges like standardizing AI protocols and minimizing image variability, particularly in ultrasound imaging. Finally, the research highlights the importance of ethical AI implementation and ongoing innovation to improve clinical outcomes. Artificial Intelligence, Early Detection, Cancer Prediction, Artificial Neural Networks (ANN), Logistic Regression, Sensitivity, Specificity, Area Under the Curve (AUC), Risk Factors, Cancer Management, Diagnosis

Keywords: Intelligence, Early Detection, Cancer Prediction, Artificial Neural Networks (ANN), Logistic Regression, Sensitivity, Specificity, Area Under the Curve (AUC), Risk Factors, Cancer Management, Diagnosis.

PAPER ID: 113

Artificial Intelligence based knowledge organizer for diverse data formats

Devansh Parapalli [1], Kaustubh Warade [2], Aditya Deshmukh[3], Yashasvi Thool[4]

[1]*Department Conputer Sciencel Engineering, Government Collage of Engineering Nagpur, Nagpur India.email:* : dsparapalli@gcoen.ac.in

[2]*Department Conputer Sciencel Engineering, Government Collage of Engineering Nagpur, Nagpur India.email:* *kdwarade@gcoen.ac.in*

[3]*Department Conputer Sciencel Engineering, Government Collage of Engineering Nagpur, Nagpur India.email:* asdeshmukh@gcoen.ac.in

[4]*Department Conputer Sciencel Engineering, Government Collage of Engineering Nagpur, Nagpur India.email:* *ybthool@gcoen.ac.in*

This system addresses knowledge organization challenges by managing diverse data formats, including images, audio, and various document types like PDFs, DOCX, and PPTX. Its modular architectureensures seamless updates, using “plugins” to connect with large language models (LLMs) and ingestheterogeneous data. Svelte enables a fast, responsive interface, FastAPI provides asynchronous capabilities, and Pinecone serves as the vector database for embedding management. Semantic search leverages embeddings generated by

transformer-based models. Retrieval-augmented generation (RAG) utilizes a unified text-only intermediate format, enabling accurate representations of image content (with OCR),transcribed audio, and extracted document text. Chunking further optimizes retrieval. Applications range from organizing class notes and schedules for students to enabling research content retrieval for academics and facilitating document access for corporate users. User feedback indicates a 75% reduction in search times, with documents found within 30 seconds on average. User studies show a 95% + accuracy for retrieval. Currently a proof of concept, the system aims to evolve into a self-hostable solution, ensuring all computations occur locally for enhanced privacy in addition to support for video formats. This worker presents a significant advancement in efficient, scalable knowledge management for diverse data formats.

Keywords: Knowledge Management, Information Retrieval, Semantic Search, Natural Language Processing, Machine Learning

PAPER ID: 117

BookAR : Augmented Reality Experience for Traditional Books

Gaurav Khadilkar[1], Chetankumar Meshram[2], Pratik Khairwar[3], Kaivalya Tannirwar[4], Himanshu Sharma[5], Dr .Nitin Janwe[6]

[1,2,3,4,5] *Students, CSE Department, RCERT, Chandrapur.*

[6] *Head Of Department, CSE Department, RCERT, Chandrapur*

Augmented Reality (AR) books use technology to blend physical books with digital content, providing an interactive reading experience. In AR books, readers can use devices such as smartphones or tablets to scan specific pages or markers in the book, which then trigger animations, videos, or 3D models that appear on the screen. This creates a mixed-reality environment where the digital and physical worlds merge. The abstract of an AR book would typically describe the combination of traditional reading materials with these interactive, multimedia elements. The content in such books can range from educational tools (e.g., 3D models of the solar system) to immersive stories, where character. AR provides an opportunity to merge the tactile, immersive experience of reading physical books with the dynamism of interactive digital content. The potential applications of AR books are vast and ever-expanding. From immersive storytelling and gamified learning to corporate training and product manuals, the possibilities are limited only by imagination and technological advancements. For example, an AR-enabled cookbook could show step-by-step video instructions for recipes as readers scan the ingredients list, making it easier to follow along. AR books exemplify the harmonious fusion of physical and digital media, offering readers a richer, more interactive experience. They represent a paradigm shift in how we consume written content, bridging the gap between traditional books and the limitless potential of digital technology. As AR technology continues to evolve, the impact of AR books is poised to grow, unlocking new ways to learn, engage, and be inspired through the art of storytelling and education

PAPER ID: 123

Review on AI Scribe for Medical Transcription

Mrs.U.A.S. Gani[1], Anshuman Raut[2], Aditya Prajapati[3], Himanshu Shiwane[4], Ceazane Sheikh[5]

[1]*Profsor, Artificial Intelligence and Data Science Department, Priyadarshini Collegeof Engineering Nagpur, India email: saqibayeman@gmail.com*

[2]*Artificial Intelligence and Data Science Department, Priyadarshini College of Engineering Nagpur, India*
email: rautanshuman388@gmail.com

[3]*Artificial Intelligence and Data Science Department, Priyadarshini Collegeof Engineering Nagpur, India*
email: ap728991@gmail.com

[4] *Artificial Intelligence and Data Science Department, Priyadarshini Collegeof Engineering Nagpur, India*
email: shiwanehimanshu@gmail.com

[5]*Artificial Intelligence and Data Science Department, Priyadarshini Collegeof Engineering Nagpur, India*
email: sheikhceazane@gmail.com

Artificial Intelligence (AI) scribe devices have revolutionized the area of medical transcription solving the issues connected to the clinical assessment via natural language processing (NLP) and speech recognition. These systems help to offload the administrative burden of health care professionals by offering an automated transcription and EHR's integration. This review focuses on recent Further, the paper identifies the significant rise in AI scribe technologies as well the multiple uses of AI scribes including their growing adoption across various sectors of medicine, however, there is concern with regard to effectiveness as well as the confidentiality of personal information of patients. In further detail, the work of Sporo AI and other researchers shows that AI scribes emit a powerful effect on healthcare provision depicting several important limitations: a strong need to 2regulate scribes, usability, and relevant factors of communication. Moreover, the paper identifies significant rise in AI scribe technologies as well the multiple uses of AI scribes including their growing adoption across various sectors of medicine, however, there is concern with regard to effectiveness as well as the confidentiality of personal information of patients. In further detail, studies by Sporo AI and others demonstrated that AI scribes have a great impact on transforming healthcare, while however many policies and practices must be in place to use them effectively

PAPER ID: 130

Automated Flood Prediction Using LSTM and RNN- A Deep Learning-Based Approach

Onkar Gaurkar[1], Palash Arun Nandanwar[2] Nishiket Patil[3], Prathamesh Tadas[4], Shreyash Shahu[5], Shruti Nimje[6], Ravindra Kale[7]

[1,2,3,4,5,6]*Student, Computer Science and Engineering, GHRCEM, Nagpur, Maharashtra, India.*

[7]*Assistant Professor, Computer Science and Engineering, GHRCEM, Nagpur, Maharashtra, India.*

Floods cause significant damage, and the impacts of global warming and urbanization highlight the need for efficient flood prediction systems. This paper introduces a modern flood prediction system using deep learning models, Long Short-Term Memory (LSTM) and Recurrent Neural Networks (RNN). The study contributes to disaster management and preparedness, showcasing the extended role of deep learning in environmental evaluation and catastrophe management.

Keywords: Machine Learning, Naive Bayes, Random Forest, Artificial Intelligence, Convolutional Neural Network, Natural Language Processing, Long Short Term Memory, Recurrent neural Network

PAPER ID: 139

Machine learning algorithm for High-Speed Face Recognition Based on RBF Neural Networks and Discrete Cosine Transform

Punam Sangole[1] Dr. Lowlesh Yadav[2], Mr.Nilesh Mhaiskar[3]

[1]*Research Scholar, Department of CSE, TGPCET,Nagpur.*

[2]*Head of Department of CSE, TGPCET, Nagpur*

[3]*Assistant Professor, Department of CSE TGPCET, Nagpur*

When it comes to biometric identification systems, face recognition has grown in importance due to the need for fast and accurate results in real-time applications. By merging Discrete Cosine Transform (DCT) feature extraction with Radial Basis Function (RBF) Neural Networks, this study introduces a new method for rapid face identification. By applying the DCT to face photos, we may decrease the data's dimensionality and compress it while keeping the most important facial traits, which are crucial for person identification. In order to classify the face data effectively, the RBF neural network is fed the reduced feature set obtained from the DCT. The RBF network is well-suited for rapid identification because to its quick convergence and capacity to process non-linear input. The network parameters are initialized using unsupervised learning, and the classification limits are fine-tuned using supervised learning; this two-phase training strategy is used to improve performance. When compared to more conventional approaches to face recognition, the suggested system performs far better in terms of both speed and recognition rates across a number of benchmark face datasets. Because of this, it shows promise as a real-time biometric solution for surveillance, access control, and security systems—anywhere speed and reliability are paramount.

Keywords: High-speed face recognition, Discrete Cosine Transform (DCT), Biometric authentication, Feature extraction, Radial Basis Function (RBF) ,Neural Networks.

PAPER ID: 146

Blockchain Technology-Based Paperless Digital Loan Processing System

Dr.Shruti Tiwari [1], Apurva Bhade[2] ,Manaswi Nimje[3], Mayuri Banayat[4],Prerna Bahoriya[5], Smit Dorlikar[6]

[1]*Assistant Professor Dept.of Computer Technology Priyadarshini College of Engineering RTMNU Nagpur, INDIA e-mail: shruti.tiwari08@gmail.com*

[2]*Research ScholarDept.of Computer Technology Priyadarshini College of Engineering RTMNUNagpur, INDIA e-mail: apurvabhade@gmail.com*

[3]*Research Scholar Dept.of Computer Technology Priyadarshini College of Engineering RTMNUNagpur, INDIA e-mail:manaswinimje@gmail.com*

[4]*Research Scholar Dept.of Computer Technology Priyadarshini College of Engineering RTMNUNagpur, INDIA e-mail:mayuribanayat@gmail.com*

[5]*Research Scholar Dept.of Computer Technology Priyadarshini College of Engineering RTMNU Nagpur,*

INDIA e-mail: bahoriyaprerna9@gmail.com

[6]Research ScholarDept.of Computer Technology Priyadarshini College of Engineering RTMNUNagpur, INDIA e-mail: smitdorlikar123@gmail.com

The increasing demand for safe and more efficient financial services is crucial to replacing the lending process. Then, this paper describes a paperless digital loan application process through a sider 3 – a blockchain system, a DMS, and cloud technology implementation on NET. This is the turmoil, which is in this sector, which is being simplified by the combination of blockchain.the security components of technology and smart contracts, in which the merging of them automates approval, and repayment processes; therefore, reducing processing time. This enables the system to tackle This is one of the potential area where BPR system application can be useful. This is also the same area where the use of BPR (Business Process Reengineering) identifies problem and the utilization of the best means to improve work processes is used. market confidence established on transparency and legitimacy and compliance systems. The paper elaborates on the systems design, installation

Keywords: : Blockchain, Digital Loan Processing, Smart Contracts, Document Management System

PAPER ID: 149

Detecting lung cancer histopathological images with a reliable Machine learning Based approach utilizing Convolutional neural network

Amruta Joshi[1], Abhimanyu dutonde[2], Anita Yadav[3]

[1]Research Scholar, Department of CSE, TGPCET,Nagpur

[2]Professor, Department of CSE, TGPCET, Nagpur

[3]Professor, Department of CSE TGPCET, Nagpur email: amrutajoshi206@gmail.com1

The vital relevance of precise tumor categorization for prompt diagnosis and efficient treatment planning is underscored by the fact that lung cancer is still one of the top cancer-related killers globally. Medical image analysis tasks, such as tumor classification, are now dominated by deep learning methods. But, input picture quality—which could be compromised by noise, artifacts, and inadequate contrast—heavily affects how well deep learning models function. Here, we provide a new method for enhancing pictures using deep learning and hybrid particle swarm optimization (PSO) to better classify lung tumors. Image augmentation and tumor categorization are the two primary components of the suggested approach. To improve the quality of the photos, a powerful convolutional neural network (CNN) is taught to distinguish between low- and high-resolution pictures of lung tumors. Lung tumor photos may have their contrast, sharpness, and general quality improved by using a CNN architecture that efficiently captures both local and global picture information. By using its global search capabilities to explore the possible solutions more effectively, a hybrid method known as PSO is used to fine-tune the CNN model's parameters, further optimizing the improvement process.

Keywords: Lung Tumor Classification, Convolutional Neural Networks (CNN), Hybrid Particle Swarm Optimization (PSO), Noise Reduction in Medical Imaging, Computer-Aided Diagnosis (CAD)

PAPER ID: 184

Machtracker: Machine health monitoring system

Dr. Prashant B. Jawade[1], Akanksh Bodakhe[2], Nisarga Telang[3], Sakina Ali[5], Vedanti Dhole[6]

Department of Computer Science and EngineeringGovernment College of Engineering NagpurNagpur, Maharashtra, India email: pbjawade @gcoen.ac.in

Department of Computer Science and EngineeringGovernment College of Engineering NagpurNagpur, Maharashtra, India email: aabodakhe @gcoen.ac.in

Department of Computer Science and EngineeringGovernment College of Engineering NagpurNagpur, Maharashtra, India email: nctelang @gcoen.ac.in

Department of Computer Science and EngineeringGovernment College of Engineering NagpurNagpur, Maharashtra, India email: ssali @gcoen.ac.in

Department of Computer Science and EngineeringGovernment College of Engineering NagpurNagpur, Maharashtra, India email: vddhole @gcoen.ac.in

This paper presents the MachTracker project, an IoT-based Machine Health Monitoring System (MHMS) for hammer drills, leveraging the ESP32 microcontroller and various sensors. By employing machine learning algorithms, the system predicts potential failures and enhances operational reliability. The data collected is visualized on a web platform, providing real-time insights into machine health.

Keywords—MHMS, ML, Drill Machine, IOT

PAPER ID: 191

Enhancing Emotion Detection with K-Nearest Neighbours for Facial Expression Classification

Amol Chaudhar[1], Dr. Pankaj Dashore[2]

[1]Research Scholar Professor Dept. of computer science and Engineering Sandip University, Nashik email: amol2385.chaudhari@gmail.com

[2]Professor Dept. of computer science and Engineering Sandip University, Nashik email: dashorepankaj@gmail.com

Facial expression recognition (FER) is an essential facet in human understanding of emotions, with numerous applications from human-computer interaction to mental health assessments. In this paper, the knearest neighbours (KNN) algorithm, which is used to recognize seven different facial expressions, such as Happy, Sad, Angry, Surprise, Fear, Disgust, and Neutral. The K-Nearest Neighbours classifier based upon the K-Nearest Neighbours algorithm classifies facial expressions according to the distance between the test sample and its K-nearest neighbours in the feature space via a majority voting process. Moreover, the model utilizes important pre-processing techniques like feature extraction using Local Binary Patterns (LBP) and Histogram of Oriented Gradients (HOG) in order to increase model's efficacy. KNN is a simple yet powerful classifier that has been

proven to work well for FER and similar kinds of data where computation cost is not an issue, particularly models can easily be overfit, and data can be highly imbalanced. Notwithstanding its weaknesses in computing power and sensitivity to noise in datasets, KNN remains a sound choice for emotion recognition tasks. This study also shows that KNN is an effective implementation for emotion recognition systems and can be extended with more complex architectures to boost accuracy and robustness in future works.

Keywords: Facial Expression Recognition, K-Nearest Neighbours (KNN), Emotion Detection, Feature Extraction

PAPER ID: 201

Text–based Mental State Detection using Various Learning Techniques

Ms. Dhanashree Shashikant Tayade[1], Dr. Girish Kumar Patnaik[2]

[1]Research Scholar, Department of Computer Engineering, Shram sadhana College of Engineering & Technology Jalgaon, MH, India Email: dhanon19@gmail.com

[2]1Research Scholar, Department of Computer Engineering,Shram sadhana College of Engineering & Technology Jalgaon, MH, India email: patnaik.girish@gmail.com

In artificial intelligence and human-computer interaction, mental state detection which includes emotions, stress levels, and cognitive conditions has become an important field. Natural language processing (NLP) techniques show promise in capturing a person's psychological condition using non-invasive techniques like textual analysis has several uses in social media surveillance, healthcare, and security. The deep learning architectures like transformers is used to capture more subtle emotions in textual data, where early methods were concentrating only on sentiment analysis and lexicon-based approaches. Research demonstrates that deep learning models can accurately predict emotions, mental states, and even mental health conditions, such as stress or depression. The Hybrid modeling shows the promising result for detecting mental state in text. Challenges and future trends in mental state detection and psychological assessments across various domains are discussed at the end.

Keywords— Mental State Detection, Text-based Emotion Analysis, NLP, Deep Learning.

PAPER ID: 214

A Collaborative Text Editing Tool for Use in Real Time

Dr. Sangita B. Nemade[1], Dr. Varsha Gaikwad[2], Dr. Bhushan Yelure[3], Dr. Prashant B. Jawade[4], Dr. Siddheshwar V. Patil[5]

[1]Assistant Professor, Computer Engg. dept, Govt. College of Engg and Research Awasari Pune email: sangitanemade20@gmail.com

[2]Assistant Professor, IT dept, Govt. College of Engg Aurangabad Chh,. Sambhajinagar,

[3]Assistant Professor, IT dept, Govt. College of Engg Karad,

[4]Assistant Professor, Computer Engg. dept, Govt. College of Engg. Nagpur

[5]HOD and Associate Professor, AIML dept, D.Y. Patil College of Engineering and Technology, Kolhapur

The need for smooth real-time text editing and collaboration tools has grown in the modern, digitally connected world of remote teamwork and international collaboration. To address this need, the paper introduces a flexible

web application made to make synchronous code and text collaboration among numerous users possible. The tool provides a safe and user-friendly environment by utilizing contemporary web technologies like WebSocket's for real-time communication, Node.js for server-side logic, and react for front-end development. The paper attempts to streamline the collaborative editing experience by incorporating real-time synchronization of edits, a powerful text editor, and user authentication. Professional and educational collaboration needs are met by features like document version control, error-free, secure access, and the creation of virtual rooms. The tool's usefulness in a variety of domains is further enhanced by optional features like code syntax highlighting, advanced authentication methods, and support for collaborative code execution and debugging. The proposed word is positioned as a way to give users smooth collaboration capabilities. It breaks down geographical barriers and promotes productivity in a globalized society. With its promise of an effective, safe, and entertaining collaborative environment, this paper is a significant step forward in reimagining collaborative text and code editing.

Keywords: Digital collaboration, Text editor, WebSocket's, Virtual rooms

PAPER ID: 227

MedGPT: An Healthcare Chatbot for Disease Prediction

Prabhas Naidu Mahanti[1], Ashwin Kodur [2], Annamalai R[3], Soundaram Y[4]

[1]Student Dept. of Computer Science and Engineering Amrita School of Computing Chennai, India email: prabhasnaidu2004@gmail.com

[2]Student Dept. of Computer Science and Engineering Amrita School of Computing Chennai, India email: ashwin.koduri28@gmail.com

[3]Associate Professor Dept. of Computer Science and Engineering Amrita School of Computing Chennai, India email: annamalaimtech@gmail.com

[4]Assistant professor Dept. of Computer Science and Engineering St. Peter's Institute of Higher Education Chennai, India e-mail : soundarayaa@gmail.com

Medical chatbots have become tools of preference in the healthcare sector because they provide preliminary advice and respond to medical queries. This paper presents MedGPT, an intelligent chatbot for healthcare diagnosis based on symptom predictions and general medical questions answered using advanced AI technologies, including LangChain, Google Generative AI, and a vector-based retrieval system, such as Chroma. The system differentiates between two streams of user input: symptom-based disease prediction and general medical questions. It makes intelligent use of a multi-agent architecture in order to handle these inputs in an effective way with intuitive switching between diagnostic and informational tasks. The MedGPT is not professional medical advice, but an accessible first-line resource that allows for informed engagement of patients with healthcare providers and may help optimize the efficiency of first-line healthcare interactions. This research demonstrates the transformative capability of AI-driven medical assistants in improving accessibility and outcomes of healthcare services.

Keywords: Medical assistant chatbot, Symptom analysis, Google Generative AI, Cohere models.

PAPER ID: 228

Automatic disease Identification and Detection for Jasminum leaf using DL Methods

Jaya Krishna S[1], G Venkata Rohan[2], U Muthaiah[3]

[1]*Student Dept. of Computer Science and Engineering Amrita School of Computing Chennai, India email:* jayakrishna23042004@gmail.com

[2]*Student Dept. of Computer Science and Engineering Amrita School of Computing Chennai, India email: venkatarohangudimetla@gmail.com*

[3]*Assistant professor Dept. of Computer Science and Engineering Amrita School of Computing Chennai, India email: u_muthaiah@gmail.com*

Indeed, the effects of plant diseases on agricultural productivity are gigantic, so early detection becomes the key to effective management. This paper uses a deep learning approach that can be used for automatic identification and determination of diseases attacking the leaves of Night Jasmine, Cestrum nocturnum. We used a dataset, categorized in three classes—Healthy, Multiple (leaves with multiple diseases or stages), and Rust (leaves affected by rust or fungal diseases)—to develop the classification model using the MobileNet V2 architecture and compare that to CNN architecture and Inception V3. We have used the MobileNet V2 model because of efficiency in doing image classification on fewer computational resources. Hence, it is best suited for usage in real-time applications. These results suggest that deep learning approaches, where lightweight architectures like MobileNet V2 could form an important component of plant disease detection, can open up scalable solutions toward field applications. Future work includes improving the model's generalization capability and considering other categories of diseases.

Keywords: MobileNet V2, CNN, Inception V3, Deep Learn ing, Accuracy.

Track-5 Electronics and Telecommunication Engineering

PAPER ID: 57

Wild Animal Detection Using Convolutional Neural Networks in Resedential Area

Dr Sheetal Gundal[1], Dr. Rajeshree Raut [2], Prof. Rekha Vairagade[3], Ms Neeta Gadakh[4].

[1]*Assistant Professor Electronics & Computer Engineering, Gyan Ganga College of Technology, Amrutvahini College of Engineering, Sangamner India, email:sheetal.gundal@avcoe.org*

[2] Associate Professor*, Electronics & Telecommunication Engineering, Government College of Engineering, Nagpur India email: rautgcoen@gmail.com*

[3]*Electronics & Telecommunication Engineering, Government Polytechnic, Nagpur India, email: rekhadange73@gmail.com*

[4]*Computer Engineering, Amrutvahini College of Engineering, Sangamner,email: neetara911@gmail.com*

Habitat desturbances and modern lifestyle needs has caused by human-promoted activities such as industrial, commercial and residential developments, logging, farming, deforestation in forest reserved areas, livestock grazing, mining, roads and dam building has charged heavily on the wildlife populations to shift in civil areas for food and shelter. Therefore, Human-wildlife conflicts in residential areas have become a major safety concern for both humans and animals too. To mitigate these conflicts the system is proposed for wild animal detection using Convolutional Neural Network (CNN)R-CNN and Faster R-CNN algorithms along with the warning system to alert residents and hence to control any life damage. The system performance has shown 95% accuracy in detecting variety of wild animals.

Keywords: Convolutional Neural Network , R-CNN, Faster R-CNN.

PAPER ID: 93

Performance of the WSN on Different IoT Technologies

Chaitanya Girhepunje[1], Sahil Bhakare[2], Sanika Kamble[3], Pankaj Ashtankar[4]

[1]*5th Semester, B.Tech, Dept. of Electronics and Communication Engineering, Kavikulguru Institute of Technology and Science (RTMNU university)Ramtek, Nagpur, Maharashtra, INDIA, email: chaitanyagirhepunje8@gmail.com*

[2]*5th Semester, B.Tech, Dept. of Electronics and Communication Engineering, Kavikulguru Institute of Technology and Science (RTMNU university)Ramtek, Nagpur, Maharashtra, INDIA, email: sahilbhakare0@gmail.com*

[3]*5th Semester, B.Tech, Dept. of Electronics and Communication Engineering, Kavikulguru Institute of Technology and Science (RTMNU university)Ramtek, Nagpur, Maharashtra, INDIA, email: sanikakamble682@gmail.com*

[4]*Professor, Dept. of Electronics and Communication Engineering, Kavikulguru Institute of Technology and Science (RTMNU university)Ramtek, Nagpur, Maharashtra, INDIA, email: psashtankar@gmail.com*

Wireless Sensor Networks (WSNs) play a pivotal role in the Internet of Things (IoT), enabling efficient data collection and monitoring across varied environments. This study examines the performance of three WSN technologies—ZigBee, LoRa, and NB-IoT—by analyzing key metrics such as latency, throughput, energy efficiency, and reliability in simulated real-world IoT scenarios. The results reveal distinct strengths for each technology: ZigBee is optimal for low-latency, high-throughput applications like real-time

PAPER ID: 95

Smart Alert System for Road Accident Detection: A Design and Implementation Framework

Jayesh Karemore[1], Vaishu Tikle[2], Radhika Dhote[3], Pankaj Ashtankar[4].

[1] *5th Semester, B.Tech, Dept. of Electronics and Communication, Kavikulguru Institute of Technology and Science Ramtek, Nagpur, Maharashtra, India e-mail: rootxjayesh@gmail.com*

[2]*Vaishu Tikle 5th Semester, B.Tech, Dept. of Electronics and Communication, Kavikulguru Institute of Technology and Science Ramtek, Nagpur, Maharashtra, India e-mail: vaishutikle9@gmail.com*

[3]*5th Semester, B.Tech, Dept. of Electronics and Communication, Kavikulguru Institute of Technology and Science Ramtek, Nagpur, Maharashtra, India e-mail:rsdhote21@gmail.com*

[4]*Professor, Dept. of Electronics and Communication, Kavikulguru Institute of Technology and Science Ramtek, Nagpur, Maharashtra, India e-mail:psashtankar@gmail.com*

The growing number of vehicles on roads has contributed to an alarming rise in traffic accidents, often leading to significant loss of life due to delays in emergency response and medical care. To mitigate these challenges, the development of an automated accident detection and alert system has become crucial for improving road safety. This study proposes a cost-effective and reliable solution that leverages sensor technology and communication systems to detect accidents in real-time and promptly alert emergency services and relevant authorities. By incorporating components such as GPS modules, GSM technology, and accelerometers, the system ensures precise accident detection and rapid transmission of location details to responders. This innovation aims to reduce response times, enable timely medical assistance, and streamline investigative processes, thereby minimizing the consequences of road accidents and saving lives.

Keywords: GSM, GPS, Accident Detection, Alert System.

PAPER ID: 96

A Study of Different Sensors for Accurate HMI System

Shreya Thawkar[1], Vinod Metta[2], Nayan Lilhare[3], Pankaj Ashtankar[4]

[1]*5th semester (B. Tech) , Dept. of Electronics & Communication , Kavikulguru Institute of Technology & Science, Ramtek , RTMNU (Nagpur university), Nagpur, Maharashtra, INDIA, e-mail:shreyathawkar18@gmail.com*
[2]*5th semester (B. Tech), Dept. of Electronics & Communication, Kavikulguru Institute of Technology & Science, Ramtek, RTMNU (Nagpur university), Nagpur, Maharashtra, INDIA, e-mail: vinodmetta2024@gmail.com*
[3]*5th semester (B. Tech), Dept. of Electronics & Communication, Kavikulguru Institute of Technology & Science, Ramtek, (RTMNU University), Nagpur, Maharashtra, INDIA, e-mail:nayanlilhare8@gmail.com*
[4]*Professor, Dept. of Electronics & Communication, Kavikulguru Institute of Technology & Science, Ramtek, RTMNU (Nagpur university)*
Nagpur, Maharashtra, INDIA, e-mail: psashtankar@gmail.com

Human-machine interaction (HMI) describes the process through which information is transferred between individuals and machines. It involves gathering information from users to convey their intentions, which the machine then processes and acts upon. Traditional HMIs, such as mice and keyboards, often require a designated workspace, limiting users' movements and failing to accurately represent their intentions. This setup necessitates that individuals learn how to operate these devices effectively, which can hinder overall work efficiency. HMI encompasses a variety of communication and control methods, simplifying the management and understanding of intricate systems. There are numerous forms of HMI, such as graphical user interfaces (GUIs), commonly seen in software and touchscreen devices, enabling users to engage with visual components. Voice control, another type, employs speech recognition to enable users to command machines verbally. HMI and sensor technologies are essential components of contemporary technology systems, facilitating communication and interaction between humans and machines while gathering and supplying data for multiple applications.

Keywords: Flexible Tactile Sensor, Human-machine interaction (HMI), Infrared and Proximity Sensor.

PAPER ID: 135

Review On Real Time Monitoring System for Medical Treatment Using Smart Syringe Pump

Pratiksha Girsawre[1], Kushal Masarkar[2], Suraj Mahajan[3]

[1]Student Dept. of Electronics an Communication Engineering Tulsiramji Gaikwad-Patil College of Engineering & Technology, Nagpur

[2]Asst. Professor Dept. of Electronics and Communication Engineering Tulsiramji Gaikwad-Patil College of Engineering & Technology, Nagpur

[3]Asst. Professor Dept. of Electronics and Communication Engineering Tulsiramji Gaikwad-Patil College of Engineering & Technology, Nagpur

The real-time monitoring system for medical treatment using a smart syringe pump aims to improve patient care and ensure accurate drug delivery through continuous monitoring and control. The system integrates a syringe pump with sensors, microcontrollers, and wireless communication technologies to track the medication flow, dosage, and patient status in real-time. By leveraging IoT (Internet of Things) and data analytics, the system offers remote monitoring capabilities, allowing healthcare professionals to monitor multiple patients simultaneously and intervene when necessary. The smart syringe pump adjusts the infusion rate dynamically based on patient parameters, reducing the risk of over or under-infusion. It provides alerts for anomalies such as blockages, air bubbles, or incorrect dosage, ensuring patient safety. Additionally, the system can log patient data for further analysis and trend identification, enhancing treatment outcomes and personalized healthcare. This real-time monitoring system promises significant improvements in the accuracy, efficiency, and safety of intravenous medication administration, contributing to better clinical decision-making and optimizing patient care.

Keywords: Smart Syringe Pump, Real-Time Monitoring, Medical Treatment, IoT, Patient Safety.

PAPER ID: 148

Revolutionizing Air Pollution Control: Automated Technology with Ink as a Byproduct

Shubham Nikhade[1], Vaishnavi Pardhi[2] , Apeksha Fuse[3] ,Samrudhi Wakade[4] , Riya Kakde[5], Prof .Suraj Mahajan[6]

[1]Department of Electronics and Communication Engineering, Tulsiramji Gaikwad Patil College of Engineering and Technology, Nagpur, India, email: ssnikhade252003@gmail.com

[2]Department of Electronics and Communication Engineering, Tulsiramji Gaikwad Patil College of Engineering and Technology, Nagpur, India, email: vjpardhi31@gmail.com

[3]*Department of Electronics and Communication Engineering, Tulsiramji Gaikwad Patil College of Engineering and Technology, Nagpur, India, email: apekshafuse17@gmail.com*

[4]*Department of Electronics and Communication Engineering, Tulsiramji Gaikwad Patil College of Engineering and Technology, Nagpur, India, email: samrudhiwakade1990@gmail.com*

[5]*Department of Electronics and Communication Engineering, Tulsiramji Gaikwad Patil College of Engineering and Technology, Nagpur, India, email: kakderiya87@gmail.com*

[6]*Department of Electronics and Communication Engineering, Tulsiramji Gaikwad Patil College of Engineering and Technology, Nagpur, India, email: suraj.mahajan123@gmail.com*

This research presents an innovative air pollution control technology designed to mitigate road pollution by capturing vehicular emissions and repurpose them into ink. The system integrates renewable energy sources, such as solar panels and wind turbines, installed on road dividers to power smoke absorbers equipped with IR sensors. When vehicles pass, the absorbers activate, drawing in polluted air. Advanced carbon filters process emissions, separating harmful pollutants from clean air, ensuring environmental cleanup.

Overall, this technology demonstrates a scalable, eco-friendly solution to urban air pollution while raising awareness of sustainable practices. By converting pollutants into ink, it encourages innovative uses of captured carbon and contributes to reducing the environmental and health impacts of vehicular emissions.

Energy efficiency is a core design principle. The system activates only when necessary, optimizing electricity usage. This automated mechanism highlights operational efficiency and environmental consciousness.

PAPER ID: 172

Review Paper on Embedded System Based Real Time Monitoring and Data Management System of Cutting Tools for Improving Efficiency of Machine Using IOT

Kruttika Modak[1], Rohini Pochhi[2], Amol Dhenge[3]

[1]*Student, Dept. of Electronics and Communication Engineering, Tulsiramji Gaikwad-Patil College of Engineering &Technology, Nagpur, email:kruttika.modak15feb@gmail.com.*

[2]*Assistant Professor, Dept. of Electronics and Communication Engineering, Tulsiramji Gaikwad Patil Collage of Engineering & Technology, Nagpur, email:rohini.ece@tgpcet.com*

[3]*Assistant Professor, Dept. of Electronics and Communication Engineering, Tulsiramji Gaikwad Patil Collage of Engineering & Technology, Nagpur, email: amol.ece@tgpcet.com*

The development of an embedded system-based real-time monitoring and data management solution for cutting tools using the Internet of Things (IoT). Cutting tools are critical in precision machining, and their performance significantly impacts product quality and manufacturing efficiency. The integration of IoT with embedded systems enables advanced monitoring and data analysis, providing insights into count number of tools are cut in particular given time setup. This paper examines an applications of IoT-enabled systems for cutting tool monitoring, including data acquisition, fault diagnosis, and predictive maintenance. The system enables real-time tracking of CNC operations and parameters, leading to more efficient and smarter manufacturing processes. Additionally, it reduces the power consumption of the wireless sensors used to monitor the machines, contributing to cost and energy savings. By focusing on data collection and monitoring, this approach gives the way for intelligent manufacturing workshops that are more connected and efficient.

Keywords: Cutting tools, IOT, Embedded system, Data management.

PAPER ID: 174

Anomaly Detection in Mobile Adhoc Network to Prevent Denial-of-Service Attack

Jitendra Nikhade[1], V.M. Thakare[2], Mohammad Atique[3]

[1]*Research Scholar, Department of Computer Science & Engineering,Sant Gadge Baba Amravati University, Amravati, Maharashtra, email: jrnikhade@gmail.com*

[2]*Post Graduate Department of Computer Science & Engineering, Sant Gadge Baba Amravati University, Amravati, Maharashtra, email: vilthakare@yahoo.co.in*

[3]*Post Graduate Department of Computer Science & Engineering, Sant Gadge Baba Amravati University, Amravati, Maharashtra, email: mohd.atique@gmail.com*

The security strategy for Mobile Ad-Hoc Networks (MANET) must be complex because nodes have low energy and processing capacity. Dealing with denial of service (DoS) attacks is challenging because of their characteristics, including changing attack rates, a variety of targets, a large botnet, etc. MANET has characteristics of dynamic topologies, limited battery capacity, multicast routing, node transmission range, routing overhead, scalability, etc. which are susceptible to DoS attack. The analysis presented behavioral strategies of adversary nodes to breach availability and non-repudiation security services using DoS attack. This work presented authentication of genuine nodes using their trust level and blacklisting malicious nodes. Simulation is done on Ad Hoc On-demand Distance Vector (AODV) routing protocol with and without malicious nodes. The result analysis shows the impact of behavioral changes on the adversary node. Simulation results show average throughput is 51.57% and the packet delivery ratio is 73%. Also routing overhead is decreased to 18%.

Keywords: AODV, Black-hole, Gray-hole, Sink-hole, DoS, Anomaly Detection, Intrusion Detection.

PAPER ID: 181

Integration of LoRa Networks and Machine Learning for Optimized Remote Healthcare Monitoring: A Comprehensive Review

Rajeshree D. Raut [1], Neha I. Ingle[2]

[1] *Associate Professor, (Dean III & P), Department of Electronics & Telecommunication, GCOEN Nagpur, MH, India, email: rdraut@gcoen.ac.in*

[2]*Research scholar, Department of Electronics & Computer Science, RTMNU Nagpur MH, India, email: ingleneha13@gmail.com*

The paper provides a framework for optimizing remote healthcare monitoring employing LoRa (Long Range) networks with integrated machine learning models. LoRa networks have gained prominence owing to their low-power, long-range capabilities integrated with advanced ML techniques aimed at improving the overall impact of health systems, especially in remote and resource-limited areas. The framework allows real-time data collection and predictive analytics for continuous whom health monitoring and early diagnosis with timely intervention by personalized medicine. The various ML techniques may include supervised learning, unsupervised learning as well as reinforcement learning. Emphasis is given on applying algorithms like neural networks, SVMs, and decision trees for healthcare applications. It also addresses the most critical challenges such as data privacy, network latency, and reliability, and proposed solutions like enhanced encryption and latency reduction techniques. The final discussion in the paper presents the energy efficiency and scalability of the system additionally, myths and case studies can give evidence of applicability on the aforementioned considerations. This framework would certainly emerge as a feasible solution to improving health delivery and patient care.

Keywords: Remote Healthcare monitoring, LoRa networks, Machine learning

PAPER ID: 188

Towards Sustainable Space Exploration: Approaches and Challenges in Space Debris Management

Minakshi Dhage[1], Rajashree Raut[2]

[1]*Department of Electronics & Telecommunication Eng., Government College of Eng., RTMNU, Nagpur, MH, India, email: minakshidhage18@gmail.com*

[2]*Department of Electronics & Telecommunication Eng., Government College of Eng., RTMNU, Nagpur, MH, India, e-mail: rdraut@gcoen.ac.in*

The increasing number of satellite launches and by-defunct spacecraft and fragments in orbit today endangers satellites, payloads, and people in low Earth orbit (LEO) and beyond, making space debris a very real and growing threat to space activities. In fact, there has never been a more pressing need for efficient space debris control. The types, causes, and effects of space debris on space infrastructure are discussed in the sections that follow. The paper includes technological approaches to debris management, including both passive and active methods, such as debris capture, deorbiting techniques, and new innovative methods like AI-based tracking and laser ablation. It then highlights detection and tracking challenges, removal, and gaps in international policy and regulation that continue to make it most difficult to comprehensively address environmental concerns. The case studies of both the RemoveDEBRIS and ClearSpace-1 missions provide ample examples for assessing the effectiveness of debris removal technologies. The study concludes by discussing the necessity for sustainable methods in satellite launches and active debris removal, as well as the ethical and environmental concerns surrounding space debris management. The Conclusion is a recommendation to stakeholders for improved international collaboration, investments into technological advancements, and the development of robust policies to ensure long-term sustainability in exploring space.

Keywords: Debris removal, environmental impact, space debris, space sustainability, technological innovations

PAPER ID: 194

Smart Wheelchair for Semi-Disabled

Miss Mayuri Harde [1], Mr. Tishank Pawar [2], Mr. Sagar Manik[3], Mr. Arpit Wagare[4], Mr. Ayush Makade[5], Mr. Lokesh Charde[6]

[1]*Electronics and Communication Department, Tulsiramji Gaikwad-Patil College of, Engineering and Technology, Nagpur, Maharashtra, India*

[2]*Electronics and Communication Department, Tulsiramji Gaikwad-Patil College of, Engineering and Technology, Nagpur, Maharashtra, India email:tishankpawar18gmail.com*

[3]*Electronics and Communication Department, Tulsiramji Gaikwad-Patil College of, Engineering and Technology, Nagpur, Maharashtra, India,email:sagarmanik526@gmail.com*

[4]*Electronics and Communication Department, Tulsiramji Gaikwad-Patil College of, Engineering and Technology, Nagpur, Maharashtra, India, email: arpitwagare@gmail.com*

[5]*Electronics and Communication Department, Tulsiramji Gaikwad-Patil College of, Engineering and Technology, Nagpur, Maharashtra, India,email:ayushmakade123@gmail.com*

[6]*Electronics and Communication Department, Tulsiramji Gaikwad-Patil College of Engineering and Technology, Nagpur, Maharashtra, India, email:lokeshcharde@gmail.com*

The rising demand for assistive mobility devices necessitates the development of innovative solutions tailored to the needs of semi-disabled individuals. This paper presents a comprehensive design for a Voice Operated Smart Wheelchair that addresses the limitations of conventional wheelchairs by integrating advanced features such as manual and voice-controlled operation, a GSM-based emergency communication tool, and a motorized reclining mechanism. These enhancements aim to improve user independence, safety, and comfort. The system leverages an ergonomic joystick for manual control, a pre-trained voice recognition module for hands-free operation, and a GSM module for rapid communication with caregivers in emergencies, including real-time location sharing. Additionally, the motorized reclining feature allows users to rest or sleep comfortably, with integrated safety sensors to prevent misuse. Powered by a 12V rechargeable battery supplemented by solar panels for extended operation, the prototype demonstrates robust functionality in both indoor and outdoor environments. Testing and validation indicate high user satisfaction, reliability of emergency alerts, and efficient energy management. This work sets a benchmark in assistive mobility technology, providing a foundation for future enhancements such as obstacle detection and IoT connectivity to further elevate user experience.

Keywords: Smart Wheelchair, Voice Control, Semi-Disabled, GSM Communication, Reclining Mechanism, Assistive Technology, Emergency Alert System, Mobility Enhancement

PAPER ID: 198

Security Mechanisms in Wireless Sensor Network-A Survey

Prajakta S. Khelkar[1], Gautam M Borkar[2]

[1]Dept. of Computer Technology, RAIT , Navi Mumbai, D. Y. Patil Deemed to be University, Nerul Navi Mumbai, email: prajakta.sudhir@rait.ac.in

[2]Dept. of Information Technology, RAIT, Navi Mumbai, D. Y. Patil Deemed to be University, Nerul Navi Mumbai , email: gautam.borkar@rait.ac.in

Wireless Sensor network is infrastructure less and self configurable wireless network. With the advancement in technology Wireless sensor network are widely used in various applications like military defense, healthcare industry, environment monitoring, smart home systems etc. Security is important characteristic of WSN when used in military applications to carry very sensitive information. Important features like limited energy, limited bandwidth and dynamic topology makes wireless sensor network prone to various potential attacks. Internal attacks are harder to protect against than external attacks. To safeguard the former, encryption and authentication techniques are utilized. Trust management technology is also one of the most effective strategies for recognizing and guarding against internal threats. A user authentication scheme that allows only authenticated users to access network services is required to keep a network secure. This paper does the survey of dierent security solutions and security analysis for dierent attacks in wireless sensor network.

Keywords: Encryption, Authentication, Trust Management.

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A Review on Parametric Analysis of Consensus Algorithms in Blockchain Technology

Dr. Hemlata Kohad[1], Dr. R. K. Krishna[2], Dr. P. Sangeetha[3]

[1]Assistant Professor, Department of Electronics and Communication, DBATU , INDIA, email: hemlata.pangantiwar@gmail.com

[2]Assistant Professor, Department of Electronics and Communication, DBATU , INDIA, email: rkrishna40@rediffmail.com

[3]Assistant Professor, Department of Electronics and Communication, DBATU , INDIA, email:

sangeethakalaiselvan1@gmail.com

Blockchain tecnnology used for many industrial applications because of security. Bitcoin cryptocurrency was the first application of the blockchain technology. Depending on the application different parameters of consensus algorithms is considered for the implementation. In this paper different consensus algorithm were discussed with its block generation time and confirmation time. Parameters of algorithm may vary depend on the application of blockchain. Proof of Work algorithm scalability is less compared to PoS and DPoS.

Keywords: PoW, PoS, DPoS, Transaction validation, Delay time.

PAPER ID: 197

Security Mechanisms in Wireless Sensor Network-A Survey

Ramesh D. Moon[1], Rajendra M. Rewatkar[2]

[1]*Department of Electronics Engineering, Faculty of Engineering and Technology, Datta Meghe Institute of Higher Education & Research (Deemed tobe University), Sawangi (Meghe) Wardha, India*

[2]*Department of Electronics Engineering, Faculty of Engineering and Technology, Datta Meghe Institute of Higher Education & Research (Deemed tobe University), Sawangi (Meghe) Wardha, India*

Breast cancer is a serious health concern for women in both developed and developing countries and early diagnosis is crucial for an effective treatment. Artificial Intelligence (AI) can improve early detection of breast cancer; the goal of such algorithms is to distinguish healthy breasts from those with malignant tumours. To detect breast cancer existing research presented an AI based approaches, however, it has several limitations such as overfitting, fine- tuning to achieve optimal results, and lose a fine details. To overcome the limitations, this research presented proposed an Adaptive Hybrid Models Infused with Physics Insights Framework. Initially, to pre-process the data, this research proposed a transformed dynamic and adaptive filter, it can achieve a balance between noise reduction and edge preservation, it leads to preserves the important image structures while discarding the less important information. Then, Robotic physics informed model is proposed which contains diffusion convolution, batch normalization layers, activation layers, pooling layers, optimization layer and ends with a classification layer. As a result, our research provides a higher accuracy, precision, recall, and fl-score.

Keywords: Breast cancer, Physics informed model, Artificial intelligence, Convolutional neural network.

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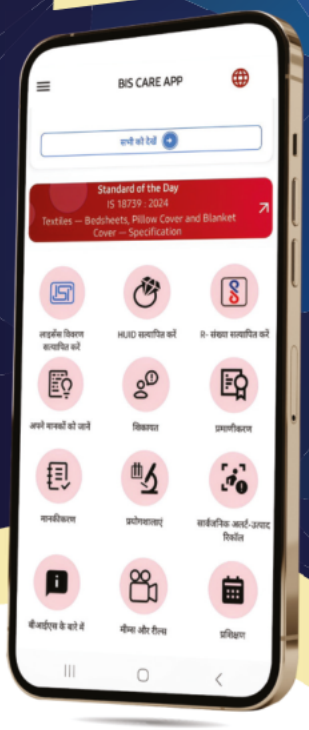

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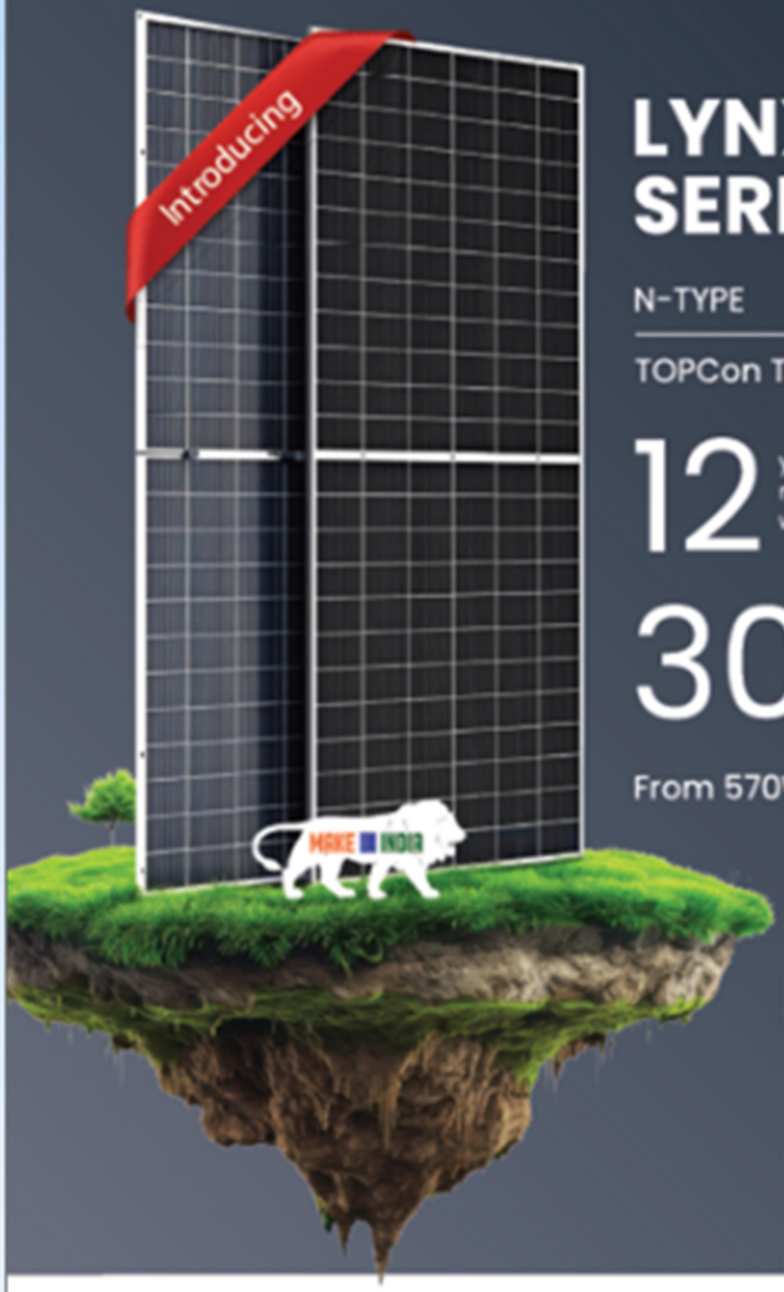

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