EDITOR

Sam Bezalel R S
III year
Mechaical “B”

News Bulletin 2024

Issue -5

B.S. Abdur Rahman ™
Crescent
Institute of Science & Technology
Deemed to be University u/s 3 of the UGC Act, 1956

Department of Mechanical Engineering

Mrs. Qurrath Jameela
Chancellor

Mr. Abdul Qadir Abdul Rahman Buhari
Pro Chancellor

Prof. Dr. T. Murugesan
Vice-Chancellor

Dr. N. Thajuddin
Pro-Vice Chancellor

Dr. N. Raja Hussain
Registrar

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About The Department

About The Department

Mechanical Engineering, founded in 1984, is one of this institution's oldest departments. We provide Bachelors of Mechanical Engineering, Masters in CAD/CAM, Ph.D. by Research, and minor degree programs

We also offer Bachelors in Mechanical Engineering for the employees of Apollo Tyres and Mando Automotive Ltd. The department's program have been accredited by the National Board of Accreditation (NBA). The department has a new building that includes wifi-enabled classrooms, an air-conditioned conference hall, a seminar hall, and a department library. Modern multimedia teaching tools are utilized to supplement lectures and improve teaching quality. Modern practices such as project/ activity-based learning and peer-assisted learning are used. Students can access software on a variety of subjects at any time for self-learning. The department comprises 29 faculty members, 27 of whom have doctorates while others will be completing their Ph.D. shortly. Each laboratory also has experienced technicians on hand to train the students.

ROBO Lab 4.0, Mechatronics Lab, Design Appreciation Lab, Friction Materials Lab, Surface Engineering Lab, CAD Lab, CIM Lab, Dynamics Lab, Fluid Mechanics & Machinery Lab, Machine Shop, Metrology Lab, Material Testing and Characterization Lab, Thermal Engineering Lab, and Basic Workshop are among the department's well-equipped laboratories and workshops. PTC/ Creo 7, Siemens NX 12.0, ANSYS V 2023R2 Campus solution, HYPERWORKS 2017, Mat lab V8 R 2013 a, and Lab VIEW are the key software provided.

The primary research equipment that's readily accessible are ABB Industrial (Welding) Robo, Olivetti S2 - 3D Printer, CNC Turning Centre, CNC Vertical Machining Centre, Surface Roughness Tester, Coordinate Measuring Machine, Vision System, AE with Digital Scope & GPIB interface, Ultrasonic flaw detector, Pin on Disc Wear Tester, Salt Spray Corrosion Apparatus, Vibration Sensors, shakers, and DAQ, Cryogenic Treatment Chamber, Engine Testing Facility, Engine Exhaust Emission Tester, Electrical Discharge Machine, Chase Testing Machine, MMAW Machine, GTAW Machine, GMAW Machine.

Message From DEAN SMS

MESSAGE FROM DEAN SMS

DR. H. Siddhi Jailani
Professor & Dean

Dear Students, Faculty, and Friends of the Department,

I am filled with pride and optimism for the exciting developments happening within the Mechanical Engineering Department. Our community continues to innovate, grow, and excel in both teaching and research, advancing our commitment to shaping the future of engineering.

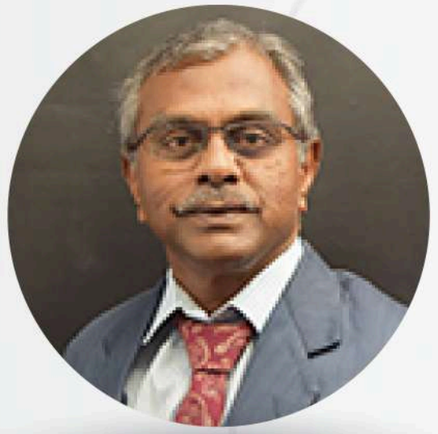
This past year, we have seen groundbreaking research from our faculty, incredible achievements from our students, and successful collaborations with industry partners. Our students, as always, remain at the heart of our mission.

It is truly inspiring to witness the dedication, creativity, and resilience they continue to show, both in the classroom and beyond. Whether through internships, research projects, or student-led competitions, they embody the future of engineering, and I am confident they will continue to make us proud.

I look forward to another year of innovation, learning, and success.

Message From HOD

MESSAGE FROM HEAD OF THE DEPARTMENT



DR. A.S. Selvakumar
Professor & Head

Dear Students, Faculty, and Staff,

As we begin another exciting term, I am filled with pride and enthusiasm for the outstanding progress within our Mechanical Engineering Department. Our collective efforts continue to push the boundaries of innovation, research, and academic excellence.

I would like to commend our faculty members who have recently published impactful research in renowned journals, as well as our students who have participated in national and international competitions,bringing home top honors and representing our department with distinction.

As we move forward, I encourage all of you to remain engaged, curious, and committed to the pursuit of knowledge. Together, we will continue to strengthen the reputation of our department as a leader in mechanical engineering education and research.

I wish you all the best for a productive and fulfilling semester.

02

DEPARTMENT NEWS

Professional Society Activities

List of Candidates awarded Ph.D

Professional Society Activities

01 Society of Mechanical Engineers

A workshop on "Engineering Design" was conducted on 11.09.2023 with 19 faculty members participating. Dr. A. Arockia Julias and Mr. M. Balasrinivasan led the sessions, while Dr. H. Siddhi Jailani and Dr. A.S. Selvakumar inaugurated the event. The workshop aimed to provide hands-on training to faculty members teaching the Engineering Design course to undergraduates, with a focus on introducing design thinking and relevant project assignments in the first session.

02 Computer Society of India, Chennai Chapter

A seminar on "Data Centre and High Performance Computing for Engineering Applications" was held on 26.10.2023, with 67 students in attendance. Dr. Pethuru Raj from Reliance Jio Infocomm Ltd., Bangalore, led the session, where he discussed the importance of High-Performance Computing (HPC) in enhancing engineering applications. He highlighted key benefits of HPC, such as cutting-edge technology development, parallel processing, data analysis, and improved accuracy in engineering processes.

03 SME, ISHRAE, SAE, and ASME of BSACIST

The inauguration of Society activities for the academic year 2023-24 was held with participation from all students and faculty members of the department. The guest speaker, Mr. S. Paramasivam, DGM – Technical Expert at Renault Nissan Business Centre India Pvt. Ltd., discussed topics such as creativity, innovation, sensors, and e-mobility.

Professional Society Activities

04 *Department of Mechanical Engineering*

A 3-day workshop on "Industry 4.0 - Industrial Design, Visualization & Conceptualization" was conducted from 06-08.11.2023 with 16 students from Mechanical, Aeronautical, and Automobile Engineering departments participating. Led by Er. Prabhu and Er. Mohan from Equad Engineering Services, Chennai, the workshop covered essential topics such as translating industrial engineering problems into design solutions, practical modeling for dynamic mechanical design, handling critical design parameters, and utilizing 2D drafting and 3D modeling for prototyping and production.

05 *Department of Mechanical Engineering*

A one-day national seminar on "High Performance Materials and Its Characterization for Aerospace and Mechanical Engineering Applications" was held on November 15th, 2023, with 44 students and 4 others attending. The seminar featured talks from Dr. D. Sathia Narayanan (NIOT, Chennai), Dr. S. Rajendra Boopathy (Anna University, CEG Campus), and Dr. K. Kalaichelvan (Anna University, ACT Campus). The sessions covered topics including high-performance materials, the effects of welding processes on the properties of super duplex stainless steel, and the testing of materials and ceramic matrix composites for aerospace and mechanical engineering applications.

Professional Society Actvivities

06 Four professional societies of the Department ASME, ISHRAE, SAE, and SME

The National Level Technical Symposium, CONFLUENCE 2023, was held on April 12, 2023, by the Mechanical Engineering department. Organized by multiple engineering societies, the event aimed to develop students' skills for employment and entrepreneurship, focusing on creativity, teamwork, problem-solving, and critical thinking. The inauguration featured speeches from Mr. Kasiraja Thanga Pandian, Senior Manager at Visteon, and Dr. N. Raja Hussain, Registrar, along with remarks from Dr. H. Siddhi Jailani, Dean of Mechanical Sciences, and a welcome address by Dr. A.S. Selvakumar, Head of the department. Faculty and students participated in the event.

ASME 07

On April 3, 2023, the ASME student chapter held an event titled "Drone Simulation and Analysis in ANSYS" in the department seminar hall, hosted by R. Thirumurugan. The program began with a prayer by Mohammed Fazil, followed by a welcome address from Sundarakrishnan and chief guest felicitation by Dr. H. Siddhi Jailani and Dr. A. S. Selvakumar. The event highlighted the significance of drones in fields like surveillance and agriculture, discussing the challenges of their design. Experts from ARK Infosolutions and CIIC presented their work, demonstrating how ANSYS simulation software can optimize drone components and enhance performance.

Professional Society Activities

08 Seminar on Safety Awareness

A seminar on Safety Awareness was held on February 9, 2023, organized jointly by the Departments of Mechanical and Electrical Engineering. Mr. Sureshkumar K, DGM of Corporate Management at EHS Mando Automotive India Pvt Ltd, served as the chief guest. The seminar was conducted in both Tamil and English. It emphasized the importance of collective safety awareness among employees to foster safe work environments and promote a healthier workplace culture. Without proper safety training, workplaces face hazards that can hinder productivity.

09 Value Added Courses on "Industrial Robotics and Artificial Intelligence" on 8th February 2023

The Department of Mechanical Engineering, in collaboration with Prag Robotics Private Ltd, organized value-added courses on "Industrial Robotics and Artificial Intelligence

Mr. K. Naveen, a Robotics Architect at Prag Robotics, delivered the presentation. The inauguration saw participation from 13 Mechanical Engineering students, along with 3 from EIE and 2 from EEE, as well as faculty members. The courses highlighted the significance of integrating manufacturing processes with systems, data communication, programming, automation, and advanced AI learning techniques.

List of Ph.D Awarded in the Year 2023

Dr. D. Pradeep Kumar completed his Ph.D. during February 2023 in the titled "Fault diagnosis of multipoint cutter using vibration signals and machine learningalgorithms".

Dr. A. Varunkumar completed his Ph.D. during May 2023 in the titled "Enhancement of MaterialProperties of Similar Stainless Steel Joints by Laser Welding Process".

Dr. Syed Shaul Hameed completed his Ph.D. during June 2023 in the titled "A Machine Learning Approach to Fault Diagnosis of Planetary Gearbox".

Dr.Mohd Durvesh Mohiudeen has completed his PhD titled "Fracture Analysis of wire arc additive Manufactured 1.25 Cr and 0.5 Mo Steel Weldments" during October 2023.

Dr. N. Ravikumar has completed his PhD titled "Investigations of Tribological Properties of Graphene Reinforced Friction Composites Tested on Modified Grey Cast Iron Disc" during September 2023

Dr. S. Zeenath Fathima has completed her PhD titled " Investigations on Microstructures, Mechanical and Corrosion Properties of Al 6101 Closed Cell Aluminium Alloy Foams under Heat and Cryogenic Treatments" during July 2023.

03

FACULTY ACHIEVEMTS

Conferences / FDP / Seminars / Work-shops Attended by faculty

Achievements of Faculty

Funded Project

Patents

CONFERENCES/SEMINARS ATTENDED BY FACULTY

S. No	Name of the faculty	Name of the programme	Type of Programme	Duration From - To	Organizing Agency
1	Dr. AROCKIA JULIAS A	Orientation for Faculty in Universities/Colleges /Institutes of Higher Education	Faculty Orientation Program	20 February – 21 March, 2023	TLC, Ramanujan College, Delhi
2	Dr. D. PRADEEP KUMAR	Faculty induction program for institutes of higher education	FIP	23 April – 22 May, 2023,	Ramanujan College, University of Delhi
3	Dr. D. PRADEEP KUMAR	Advance Research Methodology	FDP	21st June to 5th July 2023	Ramanujan College, University of Delhi
4	Dr. RAVIKUMAR N	Faculty induction program for institutes of higher education	FIP	23 April – 22 May, 2023,	Ramanujan College, University of Delhi
5	Dr. RAVIKUMAR N	Advance Research Methodology	FDP	22 May – 5 June 2023	Ramanujan College, University of Delhi
6	Dr. VARUN KUMAR ARULVIZHI	Advance Research Methodology	FDP	22 May – 5 June 2023	Ramanujan College, University of Delhi
7	Dr. VARUN KUMAR ARULVIZHI	Faculty induction program for institutes of higher education	FIP	23 April – 22 May, 2023,	Ramanujan College, University of Delhi
8	Dr. JAVEED AHMED	Faculty induction program for institutes of higher education	FIP	23 April – 22 May, 2023,	Ramanujan College, University of Delhi
9	Dr. JAVEED AHMED	Advance Research Methodology	FDP	22 May – 5 June 2023	Ramanujan College, University of Delhi
10	Mr. BALASRINIVASAN M	Faculty induction program for institutes of higher education	FIP	23 April – 22 May, 2023,	Ramanujan College, University of Delhi
11	Mr. SIVAKUMAR C	Faculty induction program for institutes of higher education	FIP	23 April – 22 May, 2023,	Ramanujan College, University of Delhi
12	Mr. SIVAKUMAR C	Advance Research Methodology	FDP	22 May – 5 June 2023	Ramanujan College, University of Delhi
13	Dr. ASRAR AHMED K	Faculty induction program for institutes of higher education	FIP	23 April – 22 May, 2023,	Ramanujan College, University of Delhi
14	Dr. ASRAR AHMED K	Advance Research Methodology	FDP	22 May – 5 June 2023	Ramanujan College, University of Delhi

S. No	Name of the faculty	Name of the programme	Type of Programme	Duration From - To	Organizing Agency
15	Dr. K. SATHICKBASHA	Faculty induction program for institutes of higher education	FIP	23 April – 22 May, 2023,	Ramanujan College, University of Delhi
16	Dr. K. SATHICKBASHA	Advance Research Methodology	FDP	22 May – 5 June 2023	Ramanujan College, University of Delhi
17	Dr. K. SATHICKBASHA	15th Summer School on Tribology	Conference	13 – 17 June 2023	TSI Sponsored by SERB at IISc Bengaluru
18	Dr. SIRAJUDEEN N	Faculty induction program for institutes of higher education	FIP	23 April – 22 May, 2023,	Ramanujan College, University of Delhi
19	Dr. SIRAJUDEEN N	Advance Research Methodology	FDP	21st June to 5th July 2023	Ramanujan College, University of Delhi
20	Mr. LOGANATHAN SEKAR	Faculty induction program for institutes of higher education	FIP	23 April – 22 May, 2023,	Ramanujan College, University of Delhi
21	Dr. SYED SHAUL HAMEED	Faculty induction program for institutes of higher education	FIP	23 April – 22 May, 2023,	Ramanujan College, University of Delhi

S. No	Name of the faculty	Name of the programme	Type of Programme	Duration From - To	Organizing Agency
22	Dr. SYED SHAUL HAMEED	Advance Research Methodology	FDP	21st June to 5th July 2023	Ramanujan College, University of Delhi
23	Dr. RAJESH G	Faculty induction program for institutes of higher education	FIP	23 April – 22 May, 2023,	Ramanujan College, University of Delhi
24	Dr. PERVAZ AHMED M	Recent Advancements and Activities in the manufacturing of Composite Materials (RAAMCA'23)	FDP	8th May - 13th May.2023	Karpagam Academy of Higher education
25	Dr. MOHAMED BAK KAMALUDEEN	DIGITAL PROTOTYPING USING CATIA	FDP	10-14 July, 2023	ICT ACADEMY
26	Dr. MOHAMED BAK KAMALUDEEN	FDP certificate of TRIMBLE SKETCHUP	FDP	19-23 June, 2023	ICT ACADEMY
27	Dr. SERAJUL HAQUE	Faculty induction program for institutes of higher education	FIP	23 April – 22 May, 2023,	Ramanujan College, University of Delhi
28	Dr. SERAJUL HAQUE	Advance Research Methodology	FDP	22 May – 5 June 2023	Ramanujan College, University of Delhi
29	Dr. SERAJUL HAQUE	Teching and learning in Technical Education	Workshop	5th Jan 2023 to 07th Jan 2023,	IIT Madras

S. No	Name of the faculty	Name of the programme	Type of Programme	Duration From - To	Organizing Agency
30	Dr. S. Mohamed Illyas	Exploring Dynamics of National Education Policy 2020 With reference to NAAC Perspectives	FDP	15.11.2023 - 24.11.2023	MKES Khandwala college
31	Dr. S. Jeavudeen	5th International Conference on Sustainable and Innovative Solutions for Current Challenges in Engineering & Technology	International Conference	21.10.2023 -22.10.2023	Soft Computing Research Society
32	Dr. K. SATHICKBASHA	MA'AM 2023	International Conference	31.10.2023 - 01.11.2023	Vel Tech Rangarajan Dr. Sagunthala R&D Institute of Science and Technology
33	Dr. K. SATHICKBASHA	FDP on Corrosion /Environmental Degredation /Surface Engineering	Atal FDP	July 2023-Oct' 23	Online - SWAYAM-NPTEL
34	Dr. K. Mohamed Bak	FDP on Digital Prototyping using CATIA	FDP	10.07.2023 -14.07.2023	ICT academy

5 Achievements of Faculty

Dr. M.A . Sai Balaji

Dr. M. A. Sai Balaji has been recognized as a Research Fellow by INTI University, Malaysia, for the period from December 2023 to December 2025.

Dr. K. Sathick Basha

He is recognised as a Research Fellow by INTI University, Malaysia. This fellowship is awarded for the period from December 2023 to December 2025

Dr. K. Asrar Ahmed

Dr. K. Asrar Ahmed was recognized as a resource person for a Faculty Development Program (FDP) organized by SRM and SAE on June 21, 2023.

Dr. A. Muthu Manohar

Dr. A. Muthu Manokar was recognized as one of the top 2% researchers in the world for 2022, based on citations and h-index, as published by Stanford University and Elsevier BV. The recognition was awarded in October 2023.

Funded Research / Project

Dr. H. Siddhi Jailani
Professor & Dean

Dr. J. Mahashar Ali
Associate Professor &
Deputy Dean (Academics)

Dr. H. Siddhi Jailani and Dr. J. Mahashar Ali are the principal and co-principal investigators of a research project titled "Non-Contact Surface Roughness Measurement of Machined Sur faces using the Wavelet Metrics of Laser Speckle Images." The project is funded by AICTE under the RPS scheme, with a sanctioned amount of 8.67 lakhs, and is currently ongoing.

Dr. R. Karunanithi
Associate Professor

1.) Dr. R. Karunanithi is the principal investigator of a sponsored research project titled "Synthesis and Characterization of ZrO2 Dispersed Ti Alloys," funded by DST-SERB under the TARE scheme. The project has been sanctioned a total amount of 18.3 lakhs and is currently ongoing.

2.) Dr. S. Sivasankaran and Dr. R. Karunanithi are the principal and co-principal investigators of a research project titled "Synthesis and Investigation of Zn-Based Biodegradable Alloys for Medical Implant Applications: Extensive Corrosion and Mechanical Properties Explorations." The project is funded by the Ministry of Education, Saudi Arabia, with a sanctioned amount of 16.3 lakhs. The project is currently ongoing.

Seed Money Project

Dr.S.Jeavudeen
Associate Professor

Dr. S. Jeavudeen is the Principal Investigator for a research project titled "Sensor-Based Physiological System for the Detection of Driver's Drowsiness," funded by the Crescent Seed money Project Scheme at BSACIST. The project has been granted an amount of Rs 85,000 and is currently ongoing.

Dr. D. Pradeep Kumar
Assistant Professor (Sr. Gr.)

Dr. D. Pradeep Kumar is the Principal Investigator of a sponsored research project titled "Tool Wear Assessment using Vibration Signals during Milling of EN 8 and EN 19 Steel Alloys." The project is funded under the Crescent Seed Money Project Scheme, BSACIST, with an amount of Rs 15,000 and is currently ongoing.

5

PATENT

Dr. A.S. Selvakumar from the Department of Mechanical Engineering at BSACIST has filed a patent for a "Steering Wheel for Monitoring Driver Health Emergencies for Automatic Braking of Automobiles." The design was filed under number 363975-001 on 8.12.2023

Dr. Md. Javeed Ahmed from the Department of Mechanical Engineering at BSACIST has filed a design patent for a "Solar Powered Hybrid Multi-Mode Water Wheeler" on 17.10.2023. The patent was granted on 26.04.2024 under Design No. 397807-001.

Dr. Rasool Mohideen Shahul Hameed from the Department of Mechanical Engineering, BSACIST, has filed a patent titled "An Add-On Device for Use in Wire Arc Additive Manufacturing" under file number 202341042114 andpublished on 01.12.2023.

Dr. C. Sivakumar and Dr. N. Ravikumar from the Department of Mechanical Engineering at BSACIST have published a patent titled "A System for Temperature Measurement in a Tribometer," with the patent number 202341046574.

Dr. M.A. Sai Balaji from the Department of Mechanical Engineering at BSACIST has filed "Development of Low Frequency Squealing Noise Insulator for Passenger Car Drum Brake." and published on 28.12.2023

Dr. B. Surya Rajan, Dr. K. Sathick basha, and Mr. P. Balaji have filed a patent titled "A Friction Material for Brake and Clutch Lining and a Method of Preparation Thereof" under the filing number 202341026050.

04

Journal publications

List of Journal publications

JOURNAL PUBLICATION

S. No	List of Journal publications
1	Sacithra Anandaraj, Manivannan Ayyasamy, Fausto Pedro Garcia Marquez, Muthu Manokar Athikesavan, "Experimental studies of different operating parameters on the photovoltaic thermal system using a flattened geometrical structure." Environmental Science and Pollution Research 30.1 (2023): pp.1116-1132.
2	Babu Sasi Kumar Subramaniam, Arun Kumar Sugumaran, Muthu Manokar Athikesavan, "Improving the performance of novel evacuated tube solar collector by using nanofluids: experimental study." Environmental Science and Pollution Research (2023): vol.30.5 pp.12728-12740.
3	Basanta Kumar Behera, Thirumurugan .M, "Study of viscoelastic behavior and mechanical characteristics of graphene-filled ABS composites." Journal of Mechanical Engineering, (2023). Vol.20 (1), pp.169-184.
4	M.Prashanth,R.Karunanithi, S.Rasool Mohideen, S.Sivasankaran, Milica Vlahovic, "A comparative study on X-ray peak broadening analysis of mechanically alloyed Al2O3 particles dispersion strengthened Al 7017 alloy." Materials Chemistry and Physics, (2023), 294, 127015.
5	Ahmed Abdullah Aafaq, H. Siddhi Jailani. "Multi-response optimization of processing variants to fabricate graphene reinforced Al 2124 metal matrix composite using friction stir processing." Materials Today: Proceedings (2023), vol.92, pp.779-786.
6	M. Abdur Rahman, Serajul Haque, Muthu Manokar Athikesavan, Mohamed Bak Kamaludeen, "A review of environmental friendly green composites: production methods, current progresses, and challenges". Environmental Science and Pollution Research, (2023). Vol.30, pp.16905–16929.
7	Illyas, S. M., A. MuthuManokar, and A. E. Kabeel. "Experimental and Computational Study on Effect of Vanes on Heat Transfer and Flow Structure of Swirling Impinging Jet." Journal of Applied Fluid Mechanics (2023), vol.16.2, pp. 205-221.
8	M.A.Sai Balaji, Jitendra Kumar Katiyar, A. Eakambaram, P. Baskara Sethupathi, J. Kamalakannan and A. Baskar, "Comparative study of sintered and composite brake pad for wind turbine applications". Proceedings of the Institution of Mechanical Engineers, Part J: Journal of Engineering Tribology, (2023), pp.1-16.

S. No	List of Journal publications
9	Emmanuel Agbo Tei, Rasool Mohideen, Shahul Hameed, Muthu Manokar Athikesavan, Aakash Srinivasan, "Enhancing the performance of conventional solar still using sensible heat energy storage materials." Environmental Science and Pollution Research (2023), 30.13: 39121-39130.
10	Venkatesan, M., Abd Elnaby Kabeel, Sriharikota Chandra Sekhar, Ravishankar Sathyamurthy, Muthu Manokar Athikesavan "Experimental investigation on seaweed (sargassum wightii) derived using methanolic extracts." Alexandria Engineering Journal 68 (2023): vol.68, pp.453-460.
11	Sathish kumar Rajamanikam, Natarajan Ponnusamy, Manoharan Mohanraj and Arockia Julias Arulraj, “Experimental investigation on mechanical and tribological characteristics of snake grass/sisal fiber reinforced hybrid composites, International Polymer Processing, (2023), pp.1-12.
12	Muthu Vimala, Geetha Ramadas, Muthaiya Perarasi, Muthu Manokar Athikesavan, Ravishankar Sathyamurthy, "A Review of Different Types of Solar Cell Materials Employed in Bifacial Solar Photovoltaic Panel." Energies, (2023), 16.8, 3605.
13	Jana Sai Ram, S. Jeavudeen, Pervaz Ahmed Mouda, Nadeem Ahamed, "The role of various dielectrics used in EDM process and their environmental, health, and safety issues", MaterialsToday: Proceedings, (2023), ISSN 2214-7853.
14	Jeavudeen Shiek, Jana Sairam, Pervaz Ahmed Mouda, "Parameter optimization in the enhancement of MRR of titanium alloy using newer mixing method in PMEDM process". Journal of Engineering and Applied Science, (2023), 70:59.pp.1-16.
15	Sivakumar C, Muralidharan V, Ravikumar N, Murali Manohar D, “Investigations on the Mechanical and Damping Properties of Styrene- Butadiene Rubber with Graphene and Carbon Black”, FME Transactions,(2023), vol 51, pp 386-395.
16	Sriram Surya Kirampadi Sankar, Anish Murugan, Abdur Rahman, Mohamed Illyas, Rajendran Duraisamy Ramalingam, Fausto Pedro Garcia Marquez, Muthu Manokar Athikesavan, "Recent advancements in flat plate solar collector using phase change materials and nanofluid: a review." Environmental Science and Pollution Research, (2023), pp. 1-21.
17	S. Thanga Kasi Rajan, K. J. Nagarajan, V. Balasubramani, K. Sathickbasha, M. R. Sanjay, S. Siengchin, and A. N. Balaji. "Investigation of mechanical and thermo-mechanical characteristics of silane-treated cellulose nanofibers from agricultural waste reinforced epoxy adhesive composites." International Journal of Adhesion and Adhesives, (2023), vol.126, 103492.

S. No	List of Journal publications
18	Ahmed Abdullah Aafaq, H. Siddhi Jailani, "Multi-response optimization of process parameters in fabricating Al 2124/GO metal matrix composite by friction stir processing," Arabian Journal for Science and Engineering, (2023), vol.48 (3), 3647-3664.
19	Balaji P., Surya Rajan B, "Effective utilization of high-temperature sulfides in coated form on steel fibers for brake pad application and evaluating its tribological performance," Tribology International, (2023), Vol. 188, Oct, 108869.
20	Jana Sai Ram, Jeavudeen Shiek, Shaul Hameed Syed. "Multi-response optimization of PMEDM on Inconel 718 using hybrid T-GRA, TOPSIS, and ANN model." FME Transactions (2023): vol.51, pp. 564-574.
21	Abdelkrim Khelifa, Mohammed El Hadi Attia, Zied Driss, A. Muthu Manokar. "Performance enhancement of photovoltaic solar collector using fins and bi-fluid: Thermal efficiency study." Solar Energy 263 (2023): 111987.
22	G. Mahadevan, N. Ramasamy, V. Jayaseelan, K. Mohamed-Bak. "Effect of hydrothermal aging behavior on surface treated Kevlar fiber laminated composites." Journal of Applied Research and Technology 21, No. 5 (2023): pp.850-857.

S. No	List of Journal publications
23	K. Mohamed Bak, K. Kalaichelvan, M. Abdur Rahman, S. Haque, S. Shaul Hameed, and A. S. Selvakumar, "Analysis of acoustic emission testing on the adherent layer thickness of lap joints under tensile loading." Acoustic Emission, (2023), vol. 65, No. 10 pp.1-6.
24	Mohd Muzammiluddin, M. Thirumurugan. "Friction Stir Processing of ZM21-nHA Surface Ceramic Nano-Composites in Simulated Body Fluid." Transactions of the Indian Institute of Metals, (2023), pp.1-9.
25	Samuel Garriba, H. Siddhi Jailani, "Extraction and characterization of natural cellulosic fiber from mariscus ligularis plant as potential reinforcement in composites", International Journal of Biological Macromolecules, (2023), vol. 253, 127609
26	S.Mohamed Illiyas, Kumaresan Vellisamy, A.Muthumanokar, "Numerical analysis on heat transfer, flow structure and exergy loss of combined truncated and circular ribs in a square duct" Journal of Thermal Engineering, (2023), vol.9, no.6.pp.1-19.
27	Dinesh Mevada, Hitesh Panchal, Anand Nayyar, Kamal Sharma, A. Muthu Manokar, Mahmoud S. El-Sebaey, and Abdelazim G. Hussien. "Experimental performance evaluation of solar still with zig-zag shape air cooled condenser: An energy–exergy analysis approach." Energy Reports, (2023), vol.10, pp.1198-1210.

05

Students Corner

Industrial visit

Placements

Student's Achievements

Student's Article

Industr ial Vist

The IV Sem A section students, accompanied by Dr. M. Abdur Rahman and Dr. N. Sirajudeen, visited SCHWING Stetter in Cheyyar on March 16, 2023, for a one-day industrial visit. A total of 42 students participated, gaining valuable practical exposure to the manufacturing processes involved in producing construction equipment. The visit also helped the students enhance their understanding of industry operations and quality standards, giving them a clearer insight into real-world practices within the construction equipment industry.

Industr ial Vist

The IV Semester A section students, along with their faculty members Dr. Asrar Ahmed and Mr. Loganathan, participated in a one-day industrial visit to Venture Automotive Pvt Limited in Andhra Pradesh on March 14, 2023. A total of 43 students attended the visit, which provided them with valuable practical exposure to automotive manufacturing processes. Additionally, the students were introduced to advanced and cutting-edge technologies used in the automotive industry, enriching their learning experience with real-world insights.

PLACEMENT

S. No	RRN	Name	Placed in
1	190021601001	AABID AHMED M	Avasoft
2	190021601002	AADIL KHAN A	Motherson automotive Engineering
3	190021601004	ABDUL BASHITH. A	Gestamp Automotive Chennai Private Limited
4	190021601005	ABDUL RAHUMAN. J	Motherson automotive Engineering
5	190021601006	AHAMED FAYIS M K	Gestamp Automotive Chennai Private Limited
6	190021601008	AJIMEER SHAN. M	Tenneco Automotive India Pvt. Ltd
7	190021601009	AKASH M	Tenneco Automotive India Pvt. Ltd
8	190021601012	AMMAR.E.A	L&T
9	190021601016	EBINEZER PAUL JEYASINGH.R	JBM AUTO
10	190021601017	GABRIAL JEBA DURAI. S	METOWAGEN
11	190021601019	GOKUL KUMAR C	TCS
12	190021601020	JAVITH AKTHAR J	Gestamp Automotive Chennai Private Limited
13	190021601021	KAMALESHWARAN M	Tenneco Automotive India Pvt. Ltd
14	190021601022	KAUSHIK KANNAN R	Gestamp Automotive Chennai Private Limited
15	190021601024	KINLUSH. G	Avasoft
16	190021601025	KISHORE I	Tenneco Automotive India Pvt. Ltd
17	190021601026	MASTHAN HAJA MAIDEEN H	Gestamp Automotive Chennai Private Limited
18	190021601027	MITHIL.S	APPLUS
19	190021601028	MOHAMED FAIDH.M.F	Avasoft

S. No	RRN	Name	Placed in
20	190021601030	MOHAMED MEERAN FAHIM. S	Tenneco Automotive India Pvt. Ltd
21	190021601032	MOHAMED THAJUL FAZILEEN. M	Gestamp Automotive Chennai Private Limited
22	190021601036	MOHAMMED ILYAAZ RAHIM. S	ALKRAFT
23	190021601037	MOHAMMED ROSHAN N	ALKRAFT
24	190021601038	MOHAMMED THANISH A	Tenneco Automotive India Pvt. Ltd
25	190021601039	MOHAMMED UMAR S.A	Tenneco Automotive India Pvt. Ltd
26	190021601042	NARESH. D	Tenneco Automotive India Pvt. Ltd
27	190021601043	NIHAAL AHAMED. D	Tenneco Automotive India Pvt. Ltd
28	190021601045	RIFATH AHAMED.S	L&T

S. No	RRN	Name	Placed in
29	190021601046	SYED ASHFAQ AHAMED	L&T
30	190021601050	RIYAZUR RAHMAN. A	L&T
31	190021601051	V SALAHUDEEN	Tenneco Automotive India Pvt. Ltd
32	190021601052	SAMSU BAHATH. K	Tenneco Automotive India Pvt. Ltd
33	190021601053	SANTHOSH GANESH RAJ	Tenneco Automotive India Pvt. Ltd
34	190021601054	SHAHEER AHAMED. S	Tenneco Automotive India Pvt. Ltd
35	190021601057	SHAIK RAYYAN BUHARI IMTHEYAZ	CTS
36	190021601060	A.SOMESSH	Tenneco Automotive India Pvt. Ltd
37	190021601061	SOORIA	WITTMANN
38	190021601062	SRIKANTH. M	Gestamp Automotive Chennai Private Limited

S. No	RRN	Name	Placed in
39	190021601065	SYED FARHAAN HUSSAIN	Tenneco Automotive India Pvt. Ltd
40	190021601066	SYED WAHID ALI M	JSW
41	190021602002	M ANISH	Tenneco Automotive India Pvt. Ltd
42	190021602003	GULSHAN KUMAR	Tenneco Automotive India Pvt. Ltd
43	190021602004	L KISHORE KUMAR	Creative synergies ltd
44	190021602006	MOHAMMED ASIF S	Tenneco Automotive India Pvt. Ltd
45	190021602007	MOHAMMED SUHAIL S	Tube Investments of India Limited: TII
46	190021602009	SHAMEER. B	Tube Investments of India Limited: TII

Students Achivments

Students Achivments

In February 2023, a team of students—Gokul Raam G (RRN: 200021601008), Abuthahir Kalam (RRN: 200021601010), Anan-thakrishnan (RRN: 200021601004), and Abdul Zawahirudeen (RRN: 200021601001)—won the Electrons Cash Award at the Auto Hack-athon 2023. This prestigious award was granted for their outstand-ing innovation and project proposal, which earned them a cash prize of Rs. 50,000. The financial reward was designated for incubation support, allowing them to develop their product idea further and transform it into a viable solution.

The award was conferred by the AIC-AU Incubation Foundation, a not-for-profit company established by Anna University. This founda-tion was created with the support of the Atal Innovation Mission, a flagship initiative of Niti Aayog, the Government of India's policy think tank. The foundation's primary mission is to nurture young talent and provide resources for entrepreneurs to bring their ideas to life. By offering financial assistance and access to a broad range of services—such as mentorship, expert guidance, and technical support—the foundation ensures that promising projects receive the backing they need to succeed.

Mr. Muhsin A R (RRN: 210021601062) demonstrated his excellence in innovation and problem-solving by securing the Second Prize at Cresathon'23. This competition, organized by CIIC Crescent, brought together some of the brightest minds to tackle real-world issues with smart and sustainable solutions. Muhsin, along with his team of six members, presented an innovative Smart Waste Management System that impressed the judges with its practicality and potential impact on urban waste handling.

The proposed system aimed to address inefficiencies in traditional waste management methods by integrating technology to optimize the collection, sorting, and disposal of waste. The team’s project likely included features such as smart bins, waste segregation auto-mation, and real-time monitoring to reduce manual labor and im-prove the overall efficiency of waste disposal processes.

CIIC Crescent, the awarding organization, is known for encouraging innovative ideas and fostering entrepreneurship through initiatives like Cresathon. Their recognition of the team's work in March 2023 highlights the importance of smart solutions in addressing environ-mental challenges and improving urban infrastructure.

Muhsin's contribution to the Smart Waste Management System re-flects his ability to work collaboratively in a team, his technical com-petence, and his drive to make a positive societal impact. This award not only acknowledges his talent but also provides a platform for further development and implementation of the solution.

Ms. Poojha (RRN: 210021601066) and Mr. Thirumurugan (RRN: 210021601087) achieved notable recognition by securing 3rd place in the Unconference Event at the E-Summit 2023. This event, hosted by IIT Madras in April 2023, provided a platform for students to showcase their creativity, problem-solving abilities, and entrepreneurial skills in an informal and collaborative environment.

The Unconference Event, part of the larger E-Summit initiative, is designed to encourage participants to think outside the box and develop innovative solutions to modern challenges. By placing third, Poojha and Thirumurugan demonstrated their ability to engage with complex topics, work effectively as a team, and present their ideas in a compelling manner.

IIT Madras, a leading institution in technology and entrepreneurship, organizes the E-Summit to inspire young minds and foster an entrepreneurial spirit. The recognition at this prestigious event is a testament to Poojha and Thirumurugan's potential to contribute to future innovations and leadership in their respective fields.

Gokul Raam G (RRN: 200021601008) was awarded a prestigious scholarship of 2000 dollars by the American Society of Mechanical Engineers (ASME) in June 2023. ASME, a globally recognized organization that supports mechanical engineers and students in the field, provides scholarships to encourage and reward academic excellence, innovative thinking, and commitment to the engineering profession.

Receiving this scholarship highlights Gokul's outstanding academic achievements and his dedication to the field of mechanical engineering. The award not only provides financial support but also enhances his profile as a promising engineer with the potential to contribute meaningfully to the industry.

This scholarship serves as recognition of his hard work and perseverance, motivating him to continue striving for excellence in his studies and future projects.

Shahul Hameed (RRN: 210021601076) achieved a significant milestone in his academic and professional journey by securing an international internship at Fluid Tech, a prominent organization in the Kingdom of Bahrain. This internship, which took place in July 2023, offered Shahul an invaluable opportunity to gain hands-on experience in his field, expand his global exposure, and enhance his technical expertise.

Fluid Tech is known for its contributions to industrial and fluid control technologies, making it a prestigious platform for interns to learn and develop their skills in a real-world environment. During his time at Fluid Tech, Shahul likely worked on various technical projects, gaining insights into advanced engineering practices, industrial systems, and innovative solutions in fluid technology.

This international exposure not only provided him with practical knowledge but also helped him understand the global standards and challenges in his industry. The experience will certainly enrich his academic pursuits and future career opportunities, positioning him as a globally competent professional with a broader perspective on engineering and technology.

Muhammad Younus (RRN: 210021601060) secured a prestigious international internship at Motorola, Malaysia, in July 2023. This opportunity signifies an important step in his academic and professional journey, as it provides him with the chance to work with one of the leading global companies in the telecommunications and technology sector. During his internship, Younus likely gained valuable experience in cutting-edge technologies,working alongside industry experts, and contributing to innovative projects.

Motorola, a company known for its pioneering work in communications and mobile devices, offers an environment where interns can develop their skills in areas such as software development, hardware engineering, and advanced communication technologies. The internship provided Younus with an opportunity to apply theoretical knowledge to real-world problems, engage in research and development, and enhance his professional skill set.

This achievement highlights Younus's dedication to his field of study and his ability to compete and succeed in the international arena. The experience gained through this internship will not only bolster his resume but also prepare him for a successful career in the tech industry.

Faculty Article

Dr. S. Jeavudeen
Associate Professor

Mechatronics in Medical Industries: A Technological Revolution

Introduction
Mechatronics, a synergistic blend of mechanical engineering, electrical engineering, control engineering, and computer science, has emerged as a transformative force in the medical industry. By integrating these disciplines, mechatronics engineers are developing innovative solutions that are revolutionizing healthcare delivery, improving patient outcomes, and enhancing the efficiency of medical procedures. This research article explores the multi-faceted applications of mechatronics in medical industries, from surgical robotics to wearable medical devices, and delves into the challenges and future prospects of this burgeoning field.

Surgical Robotics: A Paradigm Shift in Minimally Invasive Surgery
Surgical robotics has transformed healthcare by improving precision, reducing invasiveness, and enhancing visualization during procedures. Robotic systems allow surgeons to perform delicate movements with greater accuracy than human hands, leading to fewer complications and quicker recovery for patients. These systems, like the da Vinci Surgical System, offer high-definition, three-dimensional views, minimizing surgical risks and reducing physical strain on surgeons.

Wearable Medical Devices: Monitoring and Managing Health
Mechatronics has driven the rise of wearable medical devices that continuously monitor health metrics like heart rate, blood pressure, and physical activity. Devices such as smartwatches, continuous glucose monitors, and remote patient monitoring systems allow

for early detection of health issues and personalized care. These technologies make healthcare more accessible by enabling remote monitoring and timely intervention

Prosthetic Limbs: Restoring Mobility and Function
In prosthetics, mechatronics has enabled the creation of advanced limbs that mimic natural movement. Myoelectric prosthetics use muscle signals to control movements, while powered exoskeletons assist those with mobility impairments. Bionic hands offer complex functions like grasping and pinching. These innovations significantly improve the quality of life for amputees.

Rehabilitation Robotics: Enhancing Recovery
Rehabilitation robotics assist patients in recovering from injuries or disabilities. Devices like exoskeletons and robotic therapy systems guide patients through exercises, improving strength and mobility. Virtual reality rehabilitation also provides engaging environments for therapy, aiding recovery.

Challenges and Future Directions
Despite progress, high costs, regulatory challenges, and ethical concerns around data privacy hinder wider adoption of these technologies. Future efforts should focus on reducing costs, simplifying regulatory approval, and addressing ethical issues. Combining mechatronics with artificial intelligence and nanotechnology may lead to even more advanced medical solutions.

Conclusion
Mechatronics has emerged as a transformative force in the medical industry, enabling the development of innovative solutions that are improving patient outcomes, enhancing healthcare delivery, and revolutionizing the way we approach healthcare. From surgical robotics to wearable medical devices, prosthetics, and rehabilitation robotics, mechatronics is playing a critical role in addressing a wide range of medical needs. As technology continues to advance, we can expect to see even more exciting and groundbreaking applications of mechatronics in the medical field.

Students Article

JOSHUA JOY MARK
220021601023
3rd MECHANICAL

Thermodynamic Efficiency in Modern Engineering Solutions

Thermodynamics, the science of heat and energy conversion, is crucial in modern engineering, optimizing systems to minimize energy waste. Enhancing thermodynamic efficiency reduces fuel consumption, lowers costs, and cuts environmental impact, which is vital as global energy demands increase.

Importance of Thermodynamic Efficiency Thermodynamic efficiency reflects how well a system converts input energy into useful work, with losses occurring as heat or friction. Reducing these losses makes systems more energy-efficient, helping industries save on fuel, meet energy goals, and minimize emissions.

Engine Efficiency Innovations Advancements in internal combustion engines (ICEs), such as turbocharging, direct fuel injection, and variable valve timing, have improved thermal efficiency up to 40%. The challenge lies in handling high operating temperatures for better energy conversion, which is being addressed with high-temperature alloys and ceramics. Hybrid and electric engines are further pushing the limits of efficiency.

Efficiency in HVAC Systems HVAC systems are energy-intensive, but technologies like variable refrigerant flow (VRF) and geothermal heat pumps have significantly improved efficiency. These innovations reduce wasted energy by adjusting based on demand and utilizing stable underground temperatures for heating and cooling.

Thermodynamic efficiency is fundamental in engines, HVAC systems, and industrial processes. As energy demands rise, improving efficiency will play a crucial role in reducing environmental impact and achieving sustainability.

SUBBIAH S
220021601059
3rd MECHANICAL

Advances in Renewable Energy Systems

Renewable energy is transforming the global energy sector, driven by the need to cut emissions and reduce reliance on fossil fuels. Mechanical engineers are key to optimizing renewable technologies such as wind turbines, solar panels, and energy storage systems, enhancing their efficiency and reliability.

Wind Energy: Enhancing Turbine Design Wind energy is rapidly expanding, with engineers improving turbine efficiency by optimizing rotor blades, gearboxes, and generators. Larger, lighter blades made from materials like carbon fiber composites capture more wind, even in low-wind conditions.

Solar Energy: Increasing Panel Efficiency Solar power is another critical renewable source. Mechanical engineers are increasing the efficiency of photovoltaic (PV) panels with multi-junction solar cells, which capture a broader range of sunlight and have achieved efficiencies of over 40%, compared to 20% for traditional silicon-based panels.

Energy Storage: Stabilizing the Grid A major challenge for renewable energy is intermittency, as solar and wind power vary with weather conditions. Advanced energy storage systems, such as lithium-ion and solid-state batteries, are helping stabilize the grid by storing excess energy for later use.

The Role of Mechanical Engineers in Renewable Energy Mechanical engineers are critical in advancing renewable technologies by refining the components that capture, convert, and store energy. Their innovations help make renewable energy systems more efficient and cost-effective, supporting the shift to a reliable, sustainable energy supply.

Mechanical engineers are at the forefront of innovations in wind, solar, and energy storage technologies. By improving efficiency and reliability, they are helping renewable energy systems play a central role in reducing reliance on fossil fuels and combating climate change.

SAM BEZALEL R S
220021601049
3rd MECHANICAL

Mechanical Engineering in Space Exploration

Mechanical engineering is essential in space exploration, facilitating advancements that extend human capabilities beyond Earth. Engineers design and construct spacecraft, develop life-support systems, and create robotic technologies crucial for missions to explore distantplanets and celestial bodies.

Design and Materials
Spacecraft must withstand extreme temperatures, radiation, and vacuum conditions. Mechanical engineers use lightweight, durable materials and advanced modeling techniques to optimize spacecraft structures for safety and performance.

Propulsion Systems
Mechanical engineers develop efficient propulsion systems, such as rockets and thrusters, maximizing thrust while minimizing fuel consumption. Innovations like ion drives and reusable rockets exemplify their contributions to space travel.

Robotics and Automation
Robots designed by mechanical engineers explore regions inaccessible to humans. Rovers and automated systems gather data and perform experiments on distant planets, equipped with sensors and tools for complex tasks.

Life Support Systems
Engineers also design life support systems that provide oxygen, regulate temperature, and manage waste, ensuring astronaut safety during long-duration missions in isolated environments.

Conclusion
Mechanical engineering drives innovations in spacecraft design, propulsion, robotics, and life support. As space exploration advances, mechanical engineers play a crucial role in humanity's journey into the cosmos.

A. Yasar shariff
220021601066
3rd MECHANICAL

The Role of Mechanical Engineers in Disaster Resilience

Mechanical engineers play a crucial role in enhancing disaster resilience through their expertise in designing systems that withstand natural and man-made hazards. Their contributions are essential in various areas:

1. Infrastructure Design
Mechanical engineers design resilient structures like bridges and buildings using advanced materials and innovative techniques, ensuring they can endure extreme weather events.

2. Energy Systems
They develop energy systems, including renewable technologies and backup power solutions, to maintain a reliable power supply during disasters.

3. Water and Waste Management
Engineers design effective water purification and wastewater treatment systems, ensuring access to clean water and sanitation during recovery efforts.

4. Emergency Response Technologies
Mechanical engineers create technologies that enhance emergency responses, such as drones for search and rescue and automated systems for debris removal.

5. Sustainability
They advocate for sustainable practices and adaptive designs that minimize environmental impact, supporting long-term recovery and resilience.

Conclusion
Mechanical engineers are vital to disaster resilience, designing robust infrastructure and developing effective systems that protect communities and aid recovery, ultimately fostering a more resilient society.

Abdul Basith
220021601005
3rd MECHANICAL

Sustainable Manufacturing Practices

Sustainable manufacturing aims to reduce environmental impacts while maintaining economic viability by lowering resource consumption, waste, and emissions. Mechanical engineers play a key role in this transition by designing efficient systems and incorporating sustainable materials.

Energy Efficiency Energy use significantly affects manufacturing's environmental footprint. Engineers implement energy-efficient technologies, such as variable frequency drives and renewable energy sources like solar and wind power, reducing reliance on fossil fuels.

Waste Reduction Effective waste management is vital. Engineers develop techniques like additive manufacturing (3D printing) to minimize waste and create closed-loop systems for recycling materials from used products.

Sustainable Materials Choosing sustainable materials, such as biodegradable plastics and recycled metals, helps reduce environmental impact. These alternatives allow for the production of eco-friendly products without sacrificing performance.

The Future As regulations evolve, sustainable manufacturing will grow in importance. Engineers will lead advancements in efficiency and sustainable materials, helping businesses meet consumer demand for greener products.

Sustainable manufacturing is essential for reducing the environmental impact of industries. By improving energy efficiency, minimizing waste, and using sustainable materials, mechanical engineers are crucial in this transformation.

Hakkim.H
220021601033
3rd MECHANICAL

Robotics in Manufacturing: Transforming the Industry

The introduction of robotics in manufacturing has revolutionized production processes, making them faster, more efficient, and cost-effective. Robotics enhances precision, reduces human error, and improves safety in hazardous environments, reshaping how goods are produced.

Increased Efficiency and Productivity Robots perform tasks with unmatched speed and accuracy, significantly boosting productivity. They can operate 24/7 without fatigue, allowing continuous production lines to meet high demand. Automation streamlines repetitive tasks such as assembly, welding, and material handling, reducing cycle times and increasing output while maintaining quality.

Enhanced Precision and Quality Control In precision-critical industries like automotive, electronics, and aerospace, robotics is indispensable. Robots can execute tasks with micron-level accuracy, reducing errors from human limitations. Equipped with sensors and artificial intelligence (AI), robots enable real-time monitoring and quality control, identifying defects immediately and ensuring high production standards.

Cost Savings and Flexibility While initial investments in robotics can be high, the long-term savings are significant. Robots lower labor costs by taking over repetitive tasks, allowing humans to focus on complex activities. Automation leads to fewer defects, reduced waste, and less downtime, all contributing to cost savings.

Integrating robotics into manufacturing transforms the industry by enhancing efficiency, precision, safety, and cost-effectiveness. As automation technologies advance, the role of robots will becomev more prominent, driving innovation in production processes and helping manufacturers remain competitive in a fast-paced global market.

06

Staff Coordinators

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