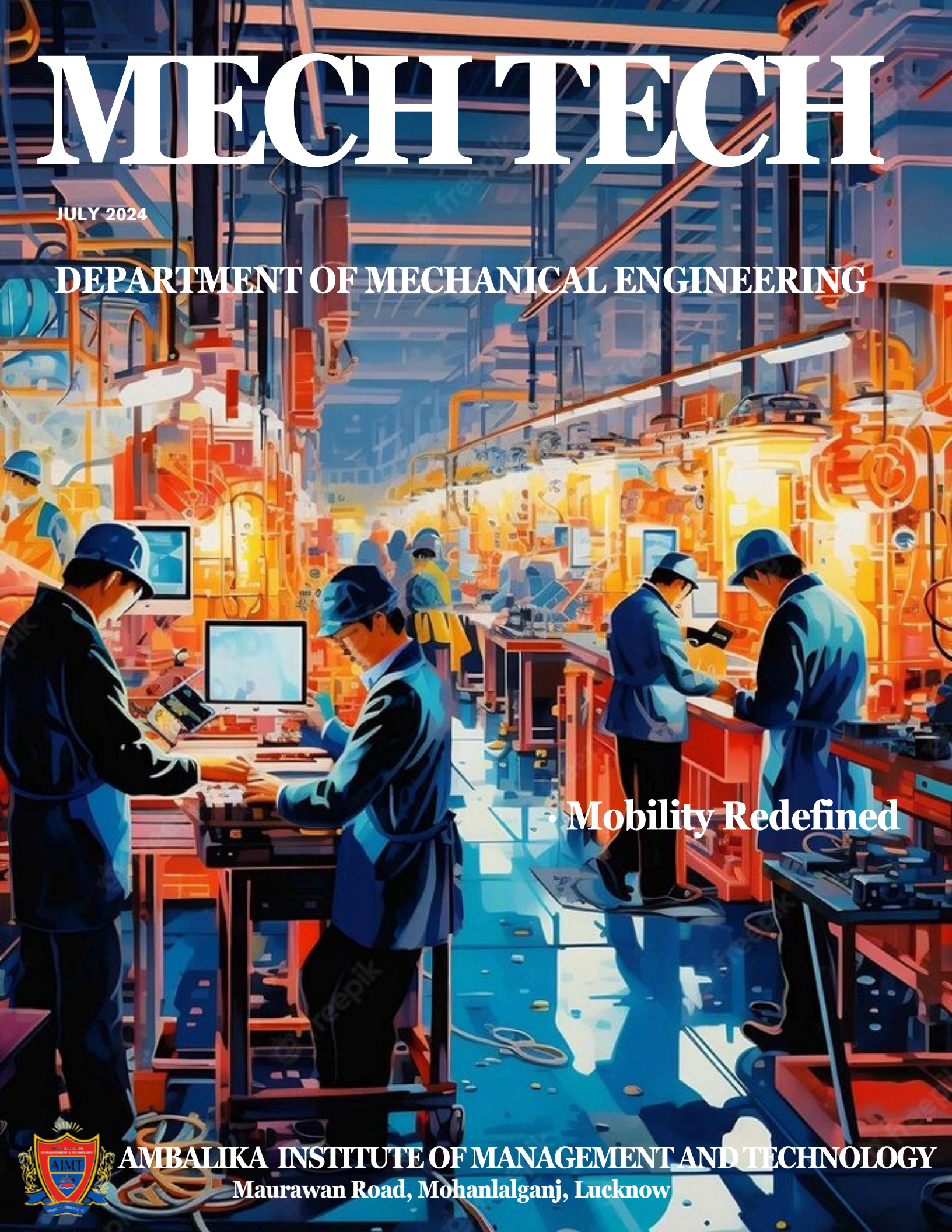
MECHTECH

JULY 2024

DEPARTMENT OF MECHANICAL ENGINEERING



• Mobility Redefined

AMBALIKA INSTITUTE OF MANAGEMENT AND TECHNOLOGY
Maurawan Road, Mohanlalganj, Lucknow

TABLE OF CONTENTS

Magazine Credits

CHIEF EDITOR

MADHUR PRAKASH SRIVASTAVA (ASST. PROF.)

OPERATIONS HEADS

MR.CHANDRA KUMAR DUBEY (ASST. PROF.)
ANKIT KUMAR (B.TECH ME IVTH YEAR)

EDITORS

MR.VIBEK KUMAR SHARMA (ASST. PROF.)
MR.SHIV SINGH (ASST. PROF.)

DESIGN AND LAYOUT

MRS.VANDANA PATHAK (ASST. PROF.)
ANAND SINGH (B.TECH ME IIIRD YEAR)
MAYANK KUMAR (B.TECH ME IIND YEAR)

MAGAZINE NAME

MADHUR PRAKASH SRIVASTAVA (ASST. PROF.)

DEPARTMENTALMAGAZINE LOGO

MR. PRASHANT KUMAR SRIVASTAVA (ASST. PROF.)

ABOUT OUR WRITTERS

ALOK SINGH (2203630400001)
SHUBHAM KUMAR PANDEY (2203630400009)

MUNNA KUMAR (2103630400013)
MUMTAJ ANSARI 2103630400014)

ANKIT KUMAR 2003630400011
EHASHAN SHEKH 2003630400018

SACHIN SHARMA 2003630400038
ASIM MOHAMED MURTAZA 2103630400004

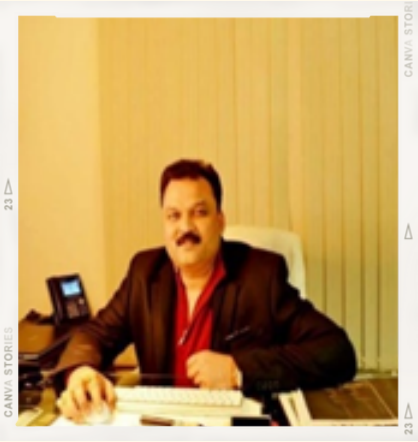
WWW.AIMT.EDU.IN

ABOUT AMBALIKA INSTITUTE OF MANAGEMENT AND TECHNOLOGY

Ambalika Institute of Management and Technology (AIMT) was established in 2008 as a private engineering and management college in (Mohanlalganj) Lucknow, Uttar Pradesh India and is affiliated to AKTU and BTE and Approved by AICTE. The Lucknow campus is spread over 200 acres and is located near NH-56B, surrounded by lush green field and enhanced by a beautiful lake which makes it Best Private Engineering Institute in Lucknow. The institute is 24 kilometers from Lucknow Railway Station and 20 kilometers from Amausi Airport, Lucknow. It is very well connected to the district headquarters. Ambalika center of excellence has become the most dominating center delivering high-end technical skills to our engineers to make them highly employable. AIMT, Lucknow is imparting training and joint certification programs of innovative technologies in collaboration with the Industry giants such as Microsoft, KUKA Robotics, Siemens, Ace Micromatics, MTab, Master CAM etc.

03

CHAIRMAN 'S MESSAGE



It gives me immense pleasure to introduce our Technical Magazine "MechTech" from Dept. of Mechanical Engg will be published bi- annually. Our students are very innovative and ever eager to learn new concepts. Apart from teaching, our faculty members are deeply engaged in research work. Our faculty and students regularly present their research findings in various academic conferences. It will help the documentation culture of the institute. One of our greatest strength is our highly qualified and dedicated faculty members and staff. I congratulate the editorial team, faculty, staff members and students for their contribution in the maiden issue of "MechTech". It is an attempt of the Technical Magazine to acquaint its readers with the Techological updation in the field of Mechnical Engineering.

Mr. Ambika Mishra
Executive Director
Ambalika Group of Institutions

DIRECTOR'S MESSAGE

I feel honored and grateful to start the fifth edition of our Technical Magazine "MechTech" from Dept. of Mechanical Engineering. This magazine will serve to reinforce and allow an increased awareness in the field of Mechanical Engineering and an improve interaction among all of us. It will not only serve the objective of creating responsiveness but will give a platform to new ideas, progress and creativity. I do hope that it will encourage faculty, students and others to contribute regularly in making our newsletter a success and may it acquire great heights in the years to come.

Dr. Ashutosh Dwivedi

Director

Ambalika Institute Of Management & Technology

ADDITIONAL DIRECTOR'S MESSAGE

I am privileged to introduce the fifth edition of our esteemed Technical Magazine, "MechTech," from the Department of Mechanical Engineering. This publication stands as a testament to our collective dedication to advancing knowledge and fostering innovation within our field. It aims to not only enhance our understanding of Mechanical Engineering but also to strengthen the bonds among us as a community.

Through this platform, we aspire to inspire creativity, share pioneering ideas, and showcase progress. I am confident that this magazine will continue to serve as a beacon for excellence, encouraging regular contributions from our faculty, students, and colleagues. Let us work together to ensure its continued success and propel it to even greater heights in the years ahead.

Dr. Shweta Mishra
Additional Director
Ambalika Institute Of Management & Technology

HOD'S MESSAGE

We are delighted to introduce our department and share with you all the exciting things happening in Mechanical Engineering. Our department is committed to providing students with an excellent educational experience that prepares them for successful careers in engineering. Our faculty members are dedicated to excellence in teaching, research, and service. Our students are engaged in innovative projects that are making a difference in the world.

Our department offers a wide range courses, including design and analysis of mechanical systems, robotics, materials science, and energy conversion.

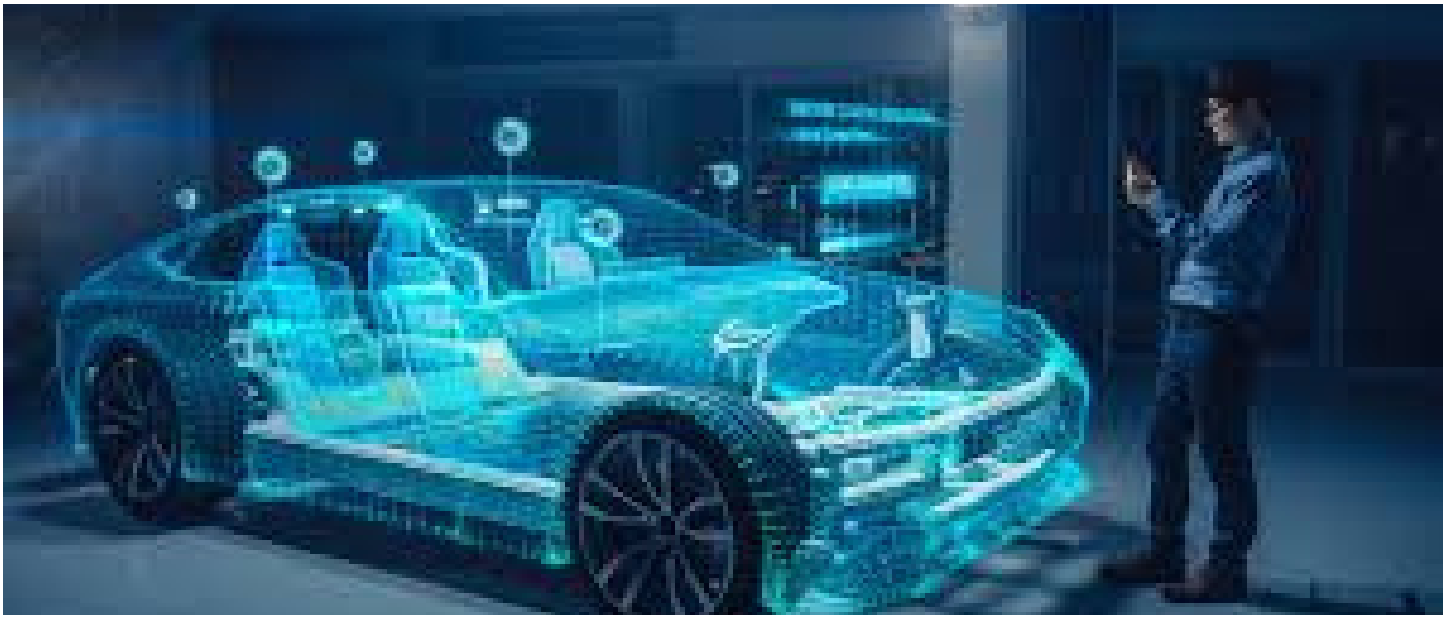
We invite you to learn more about the Mechanical Engineering Department and the exciting opportunities available to our students.

Mrs. Vandana Pathak
HEAD
Department of Mechanical Engineering
Ambalika Institute Of Management & Technology

CHIEF EDITOR ’S MESSAGE

We are proud to present our latest issue of the Mechanical Engineering Technical Magazine. This issue is packed with cutting-edge research and development in the field.We hope that this magazine will help you stay up-to-date with the latest trends and advancements in mechanical engineering. We would like to thank our dedicated team of writers and editors who worked hard to make this magazine possible. We are also thankful for the generous support of our sponsors, who made this publication possible. We hope that you enjoy this issue of the Mechanical Engineering Technical Magazine and find it to be a valuable resource in your professional journey.

Mr.Madhur Prakash Srivastava
Assistant Professor
Department of Mechanical Engineering
Ambalika Institute Of Management & Technology



Engineering the Future: How Technology is Shaping Tomorrow's Vehicles

1. Intelligent Systems and Automation

One of the most transformative trends in automotive technology is the integration of intelligent systems. These systems include everything from advanced driver-assistance systems (ADAS) to fully autonomous vehicles. By leveraging artificial intelligence, machine learning, and sensor technology, vehicles are becoming safer, smarter, and more efficient. Adaptive cruise control, lane-keeping assistance, and automated braking are just a few examples of how these systems are already improving safety and convenience on the road.

Autonomous driving, once a distant dream, is rapidly becoming a reality. Companies like Tesla, Waymo, and traditional automakers are investing heavily in self-driving technology. These vehicles use a combination of cameras, radar, LiDAR, and AI to navigate complex environments, making split-second decisions to avoid accidents and optimize travel routes. As these systems evolve, we can expect a future where human error is significantly reduced, leading to fewer accidents and more efficient traffic flow.

2. Sustainable Materials and Power Sources

As the world grapples with the challenges of climate change, the automotive industry is at the forefront of developing sustainable solutions.

Electric vehicles (EVs) are leading this charge, with battery technology advancing at an unprecedented rate. Innovations in lithium-ion batteries, solid-state batteries, and even hydrogen fuel cells are making EVs more practical, with longer ranges, faster charging times, and lower costs.

In addition to power sources, the materials used in vehicle construction are also evolving. Lightweight, high-strength materials such as carbon fiber, aluminum, and advanced composites are reducing vehicle weight, improving fuel efficiency, and enhancing performance. These materials are not only strong and durable but also more sustainable, contributing to a reduction in the overall carbon footprint of vehicle manufacturing.

3. Advanced Design and Manufacturing

The design and manufacturing processes of vehicles are being revolutionized by digital tools and techniques. Computational Fluid Dynamics (CFD), Finite Element Analysis (FEA), and 3D printing are enabling engineers to design, test, and iterate more rapidly than ever before. These technologies allow for the optimization of aerodynamics, structural integrity, and material use, resulting in vehicles that are not only more efficient but also more customized to consumer needs.

3D printing, in particular, is having a significant impact on prototyping and production.

This technology allows for the creation of complex components with intricate geometries that would be impossible to manufacture using traditional methods. It also enables on-demand production, reducing waste and inventory costs while allowing for greater customization.

4. Connectivity and the Internet of Things (IoT)

Connectivity is another key area where technology is shaping the future of vehicles. The Internet of Things (IoT) is enabling vehicles to communicate with each other and with infrastructure, leading to smarter, more connected transportation networks. Vehicle-to-Everything (V2X) communication allows cars to exchange information about traffic conditions, road hazards, and even parking availability in real-time. This connectivity will lead to more efficient traffic management, reduced congestion, and enhanced safety.

In conclusion, the vehicles of tomorrow are being engineered with a blend of intelligence, sustainability, and connectivity that promises to transform the way we travel. As these technologies continue to evolve, we can look forward to a future where transportation is safer, more efficient, and more in harmony with our planet. The future of automotive engineering is not just about getting from point A to point B– it's about how we get there and the impact it has on our world.

ALOK SINGH (2203630400001)
SHUBHAM KUMAR PANDEY (2203630400009)

EMERGENCY INNOVATION: THE E-BRAKE SYSTEM FOR CABLE TROLLEY SAFETY

In the world of transportation, safety is paramount. Whether on the ground, in the air, or along a steep incline, the security of passengers and cargo is non-negotiable. One of the most critical safety innovations in recent years is the development of the E-Brake System for cable trolleys. This system is a testament to the importance of reliable braking mechanisms in preventing accidents and ensuring controlled descent in emergency situations.

Cable trolleys, often used to transport people and goods across steep terrains or between buildings, operate on a single pull cable that controls the trolley's movement. While these systems are generally safe, the potential for cable or winch failure poses a significant risk. In the event of such a malfunction, the trolley could descend uncontrollably, leading to catastrophic consequences. Recognizing this risk, engineers have designed the E-Brake System, a revolutionary solution that automatically activates in emergencies to prevent free fall and allow for a safe, controlled descent.

The E-Brake System works by employing a secondary cable that runs parallel to the primary pull cable. This secondary cable passes through a mechanical brake caliper attached to the trolley. Under normal operation, the brake caliper remains disengaged, allowing the trolley to move freely. However, if the primary cable snaps or the winch malfunctions, a series of linkages and springs are triggered, applying braking force to the secondary cable. This immediate response halts the trolley's descent, preventing any dangerous acceleration.

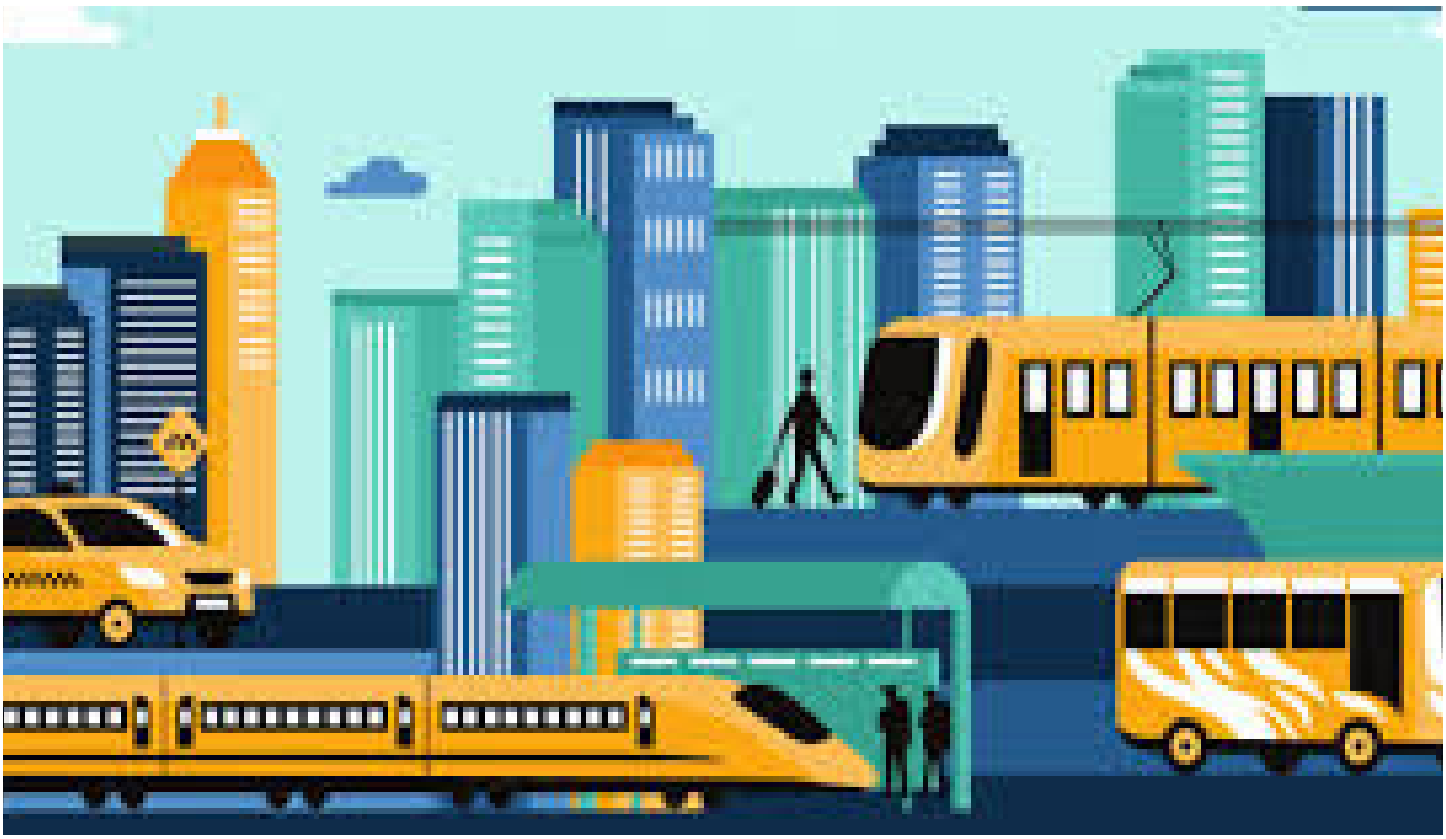
One of the key features of the E-Brake System is its mechanical reliability. Unlike electronic systems that may fail due to power loss or software glitches, the E-Brake is purely mechanical, ensuring it can function without external power and in all weather conditions. Additionally, the system includes a manual override, allowing occupants to control the descent if necessary. This feature is particularly crucial if the trolley stops midway, providing a means to safely reach the bottom without waiting for external rescue.

The design process of the E-Brake System involved extensive testing and analysis. Engineers had to ensure that the braking force was strong enough to stop the trolley's descent under full load but also smooth enough to prevent jarring or damage to the trolley's structure. The use of durable materials and precise engineering ensures that the system can withstand the rigors of long-term use without frequent maintenance.

The introduction of the E-Brake System marks a significant advancement in cable trolley safety. By providing a reliable and automatic response to emergencies, this system not only protects lives but also instills confidence in the continued use of cable trolleys in challenging environments. As we continue to push the boundaries of transportation technology, innovations like the E-Brake System will play a vital role in ensuring that safety remains at the forefront of every design.

MUNNA KUMAR (2103630400013)
MUMTAJ ANSARI 2103630400014)

"THE ROLE OF PUBLIC TRANSPORTATION IN A POST-PANDEMIC WORLD



The COVID-19 pandemic brought unprecedented challenges to public transportation systems worldwide. As cities locked down and social distancing became the norm, buses, trains, and subways saw a dramatic decline in ridership. Concerns about safety and hygiene further exacerbated the situation, leading to a temporary but significant shift away from public transit in favor of private vehicles, cycling, and walking. Now, as the world gradually recovers from the pandemic, the role of public transportation is being redefined to meet new realities and expectations.

Adapting to New Health Standards

One of the most immediate changes in public transportation is the implementation of stringent health and safety protocols. Sanitization efforts have been intensified, with vehicles being cleaned more frequently and thoroughly. Additionally, many transit systems have adopted touchless payment options and installed hand sanitizer stations in vehicles and stations. Mask mandates, though relaxed in some areas, continue to be enforced in others, reflecting the ongoing concern for public health.

To further enhance passenger confidence, some cities have introduced real-time data on crowd levels, allowing commuters to make informed decisions about when to travel. This shift towards transparency and technology-driven solutions is likely to persist, making public transit safer and more user-friendly.

To further enhance passenger confidence, some cities have introduced real-time data on crowd levels, allowing commuters to make informed decisions about when to travel. This shift towards transparency and technology-driven solutions is likely to persist, making public transit safer and more user-friendly.

Redesigning Spaces for Social Distancing

Social distancing has reshaped the design of public transportation spaces. Seating arrangements have been modified to ensure adequate spacing between passengers, and markers on platforms and in vehicles guide commuters on where to stand. While some of these measures may be relaxed as the pandemic wanes, the experience has highlighted the need for more spacious and flexible designs in public transit systems.

Urban planners are now rethinking the layout of transit hubs to reduce crowding and improve the flow of passengers. This might include wider platforms, more entry and exit points, and the use of outdoor spaces for waiting areas. These changes aim to create a more comfortable and less congested environment for commuters, which could help attract riders back to public transportation.

Promoting Sustainability and Resilience

One of the most immediate changes in public transportation is the implementation of stringent health and safety protocols. Sanitization efforts have been intensified, with vehicles being cleaned more frequently and thoroughly. Additionally, many transit systems have adopted touchless payment options and installed hand sanitizer stations in vehicles and stations. Mask mandates, though relaxed in some areas, continue to be enforced in others, reflecting the ongoing concern for public health.

The pandemic has underscored the importance of building resilient public transportation systems that can withstand future crises. In many cities, there is a renewed focus on sustainability, with investments being made in electric buses, bike-sharing programs, and pedestrian-friendly infrastructure. These initiatives not only reduce the environmental impact of transportation but also provide alternative modes of travel that are less reliant on large, crowded vehicles.

Moreover, the shift towards remote work, which gained momentum during the pandemic, may result in long-term changes in commuting patterns. Public transportation systems will need to adapt to fluctuating demand and potentially lower ridership levels by offering more flexible schedules and routes. In some cases, this could involve integrating on-demand services or partnering with ride-sharing companies to provide last-mile connectivity.

Rebuilding Trust and Ridership

Rebuilding public trust in transportation systems is crucial for their post-pandemic recovery. Public awareness campaigns that highlight the safety measures being implemented and the benefits of using public transit will play a key role in encouraging people to return to buses and trains. Additionally, ensuring affordability and accessibility will be essential to making public transportation an attractive option for all segments of the population.

As cities continue to evolve in the post-pandemic world, public transportation will remain a cornerstone of urban mobility. By prioritizing health, sustainability, and resilience, transit systems can not only recover from the impact of COVID-19 but also emerge stronger and better equipped to serve the needs of the future.

ANKIT KUMAR 2003630400011
EHASHAN SHEKH 2003630400018

FLYING CARS AND PERSONAL DRONES: SCIENCE FICTION OR NEAR-FUTURE REALITY?

For decades, flying cars and personal drones have been the hallmark of futuristic visions portrayed in science fiction. From the airborne taxis in "The Fifth Element" to the sleek, hovering vehicles in "Blade Runner," these technologies have captured the collective imagination, promising a world where the skies are as navigable as our roads. But as we move further into the 21st century, the question arises: are flying cars and personal drones still science fiction, or are they on the brink of becoming our new reality?

Recent advancements in technology suggest that the dream of flying cars is closer than ever. Companies like Terrafugia, AeroMobil, and PAL-V have made significant strides in developing functional prototypes of roadable aircraft–vehicles that can transition seamlessly between driving on roads and flying in the sky. These flying cars are equipped with retractable wings, compact designs, and advanced avionics, making them suitable for both terrestrial and aerial travel. Some models have even received regulatory approval for road use and limited airspace access, indicating that the transition from concept to consumer product is well underway.

Personal drones, on the other hand, are already a reality in various forms. While current consumer drones are primarily used for photography, surveillance, and recreation, the development of larger, human-carrying drones is rapidly progressing. Companies like EHang and Volocopter are at the forefront of this innovation, designing autonomous passenger drones capable of vertical takeoff and landing (VTOL). These drones are envisioned as part of a broader urban air mobility (UAM) network, where they would operate as flying taxis, ferrying passengers across congested cities at a fraction of the time it would take by car.

Despite these advancements, several challenges remain before flying cars and personal drones can become mainstream. Air traffic management, safety regulations, and infrastructure development are critical hurdles. Integrating these vehicles into existing airspace, ensuring reliable battery life, and establishing clear guidelines for their use are essential to prevent chaos in the skies. Moreover, the cost of these vehicles currently places them out of reach for the average consumer, though this is expected to change as technology matures and economies of scale come into play.

In conclusion, while flying cars and personal drones were once the stuff of science fiction, they are now on the verge of becoming a tangible part of our transportation ecosystem. The reality of zipping through the skies in a personal vehicle is no longer a distant fantasy but a near-future possibility. As technology continues to advance, we may soon witness a new era of mobility–one where the sky is not the limit, but the highway.

SACHIN SHARMA 2003630400038
ASIM MOHAMED MURTAZA 2103630400004

ABOUT DEPARTMENT OF MECHANICAL ENGINEERING

Mechanical engineering is a subset of general engineering. Engineers use science and mathematical principles to solve technical problems. Since they often create new products to solve these problems, they are in high demand. Engineers are essentially inventors. By dreaming up ideas and turning them into a reality they push technology to its limits.

Mechanical engineers are specialized engineers who work with mechanical devices. These may include elevators, refrigeration and air-conditioning equipment, robots, and electric generators. Mechanical engineers design tools used in other engineering disciplines. As you can imagine, mechanical engineering is one of the broadest engineering specialties.

Mechanical Engineering is an engineering discipline that involves the application of principles of physics for analysis, design, manufacturing, and maintenance of mechanical systems. It requires a solid understanding of key concepts including mechanics, kinematics, thermodynamics and energy. Mechanical engineers use these principles and others in the design and analysis of automobiles, aircraft, heating and cooling systems, manufacturing plants, industrial equipment and machinery, medical devices and more.

To develop department of mechanical engineering as a centre of excellence in the various advance fields.

To develop the habit of continuous learning, team work and fulfill the societal needs.

DEPARTMENT VISION & MISSION

VISION

To nurture the students in achieving excellence in mechanical engineering to develop proficiency in the field of research activities along with overall personality development and contribute to the nation and humanity.

MISSION

· To motivate students to indulge in analytical and creative thinking by putting them in challenging environment by means of appropriate pedagogy.
· To develop department of mechanical engineering as a centre of excellence in the various advance fields.
· To develop the habit of continuous learning, team work and fulfill the societal needs.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOS)

1. To prepare students for successful career in Core Mechanical and Interdisciplinary Industries through strong foundation in mathematical, scientific and engineering fundamentals. (Pre-preparation)
2. To develop ability among the students for acquiring technical knowledge in specialized areas of Mechanical Engineering such as Materials, Design, Manufacturing and Thermal Engineering with a focus on research and innovation and gaining the technical skills in classical software packages. (Core competence and professionalism)
3. To equip students with broad based knowledge to support the service industries, economic development and to address social and engineering challenges of the nation. (Breadth)
4. To promote the students for continuous learning, research and development with strong professional, moral and ethical values and zeal for life-long learning. (Learning environment)

PROGRAMME OBJECTIVES (POS)

PO 1: Engineering knowledge: Ability to perform academic activities and achieve the expected requirements by conforming to a pre-defined process as set by the institute and university.

PO 2: Problem analysis: Ability to effectively apply knowledge of computing and mathematics to computer science problems.

PO 3: Design/development of solutions: Ability and skills to effectively use state-of-the-art techniques and computing tools for analysis, design and implementation of computing systems which resolve real life problems.

PO 4: Conduct investigations of complex problems: Ability to utilize multi-disciplinary knowledge across domains to effectively apply computer technology in a global and social environment.

PO 5: Modern tool usage: Ability to efficiently make use of additional training provided throughout the course, satisfying industry requirements and thereby becoming globally employable.

PO 6: The engineer and society: Ability to successfully pursue professional development through lifelong learning.

PO 7: Environment and sustainability: Ability to communicate effectively with both technical and non-technical audiences.

PO 8: Ethics: Ability to become a versatile professional and function effectively as an individual and as a member.

PO 9: Individual and team work: Ability to understand professional, ethical, legal, security, and social issues and responsibilities.

PO 10: Communication: Communicate effectively with the engineering community and with society at large. Be able to comprehend and write effective reports documentation. Make effective presentations, and give and receive clear instructions.

PO 11: Project management and finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team. Manage projects in multidisciplinary environments.

PO 12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.