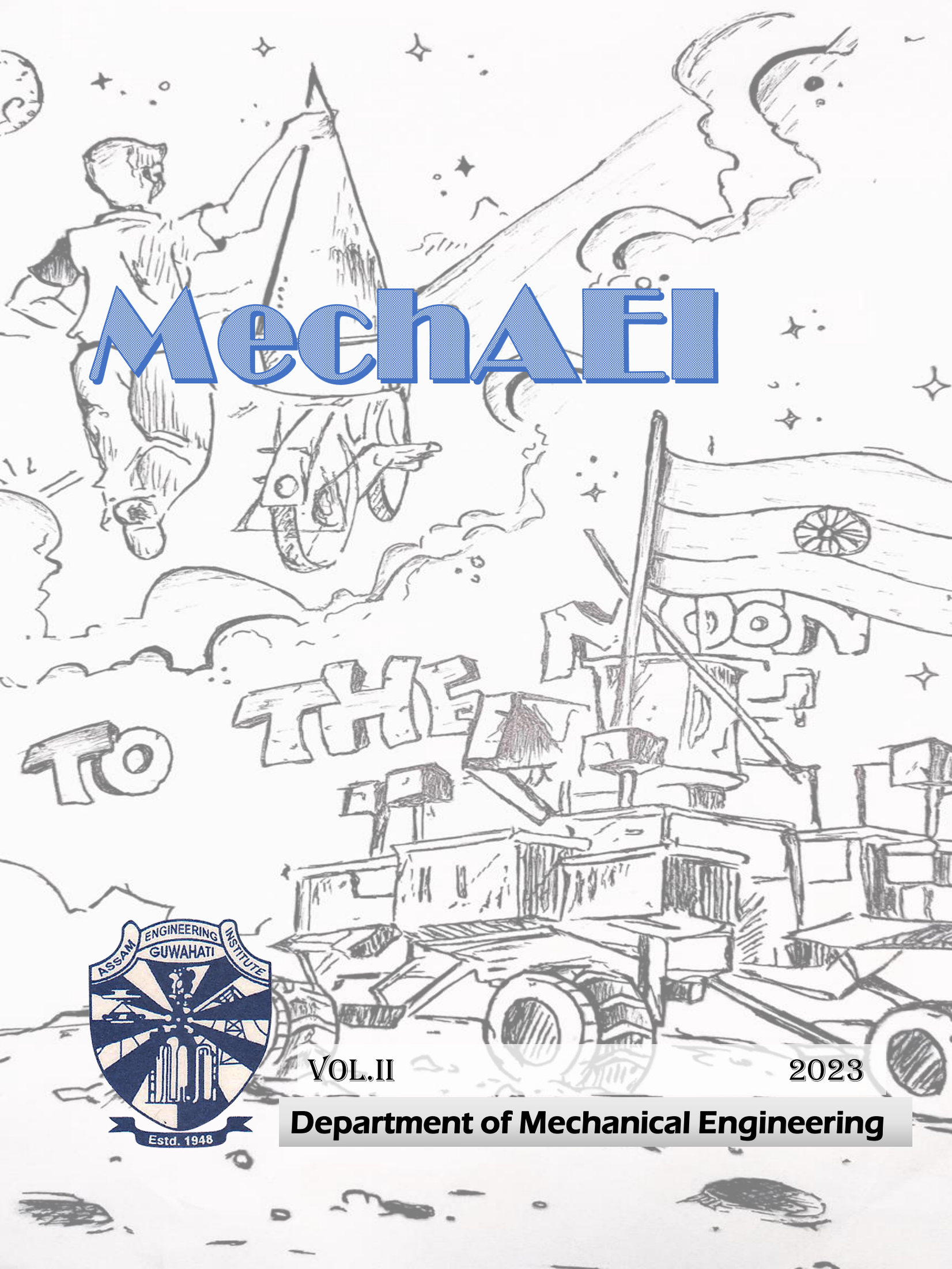


VOL.II 2023

Department of Mechanical Engineering

MECHANICAL ENGINEERING DEPARTMENT

ASSAM ENGINEERING INSTITUTE
CHANDMARI, GHY-781003

VISION

To be a center of excellence by producing qualified skilled Diploma professionals in the field of Mechanical Engineering who are innovative contributors to the society.

MISSION

- To create an excellent teaching learning environment through value based education as well as the skills and innovation to adopt to change in the global environment.
- To promote industry relevant employable skills, professional competencies through Outcome Based Education (OBE), and practice.
- To instill ethical values and social awareness through constant interaction, motivation and guidance.

MechAEI

VOLUME II , 2023-24

EDITORIAL BOARD

Published by Department of Mechanical Engineering Engineering

Assam Engineering Institute Guwahati -3

CONTENT

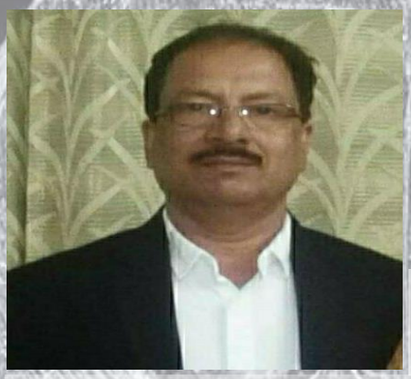
Message from Principal

I am very happy to know that the Mechanical Engineering department is bringing out the Newsletter named MechAei.

I congratulate the faculty members, Students & other supporting staff for successful competition of the Newsletter.

I am sure that the newsletter will bring out the hidden talent of faculties, students and staff in the field of departmental activities and will also encourage the faculties and students to understand the different activities to be done for continuous improvement of the department.

Dr. Hitesh Tahbildar
Principal



Message by
Head of the Department

It gives me great pleasure to write a few words for our departmental magazine MechAei 2nd Edition . It is meant for bringing out the potential writing talent as a part of overall personality development of students and faculties. I am sure this magazine will help our students to acquire knowledge and skill, build character and enhance employability to become globally competent .

The all round progress of our students is of paramount importance and our most cherished moto as it will help our students to empower better INDIA through education.

I extend my wishes to all readers of this message and invite you to join hands with us in our noble mission

Mr. Gautam Barman
HOD of MECHANICAL ENGINEERING DEPARTMENT .

Message from
Faculty In-charge

It gives me immense pleasure to present the very second issue of "MechAEI" magazine of the Department of Mechanical Engineering. This is one of the best platforms for our students to present multifaceted personalities and innovative ideas.

I take this opportunity to thank our respected Dr. Hitesh Tahbildar Principal, Mr. Gautam Barman HOD, Mr. Utpal Kalita NBA Coordinator for mechanical engineering and all the faculty members for their inspiration and kind support.

I express my heartfelt gratitude to the editorial committee for their relentless efforts, the young writers for their valuable articles and all those who have been a part of "MechAEI".

Ms Archana Choudhury
Faculty In-charge

EDITOR'S SPEECH

Dear readers,

It is my pleasure to welcome you to the Second issue of our departmental magazine. As the editors, I am proud to present a platform for our aspiring engineers to showcase their technical knowledge and writing skills. Our magazine aims to provide a space for students and staff to express their ideas and achievements in the field of mechanical engineering.

In this issue, we have included articles on a variety of topics related to mechanical engineering and some historical events, including the mechatronics, cybersecurity & Chernobyl disaster etc. to give a broader view to the readers.

I would like to take this opportunity to thank everyone who has contributed to the magazine, including the writers, editors, and designers. Your hard work and dedication have made this issue possible, and I am grateful for your efforts.

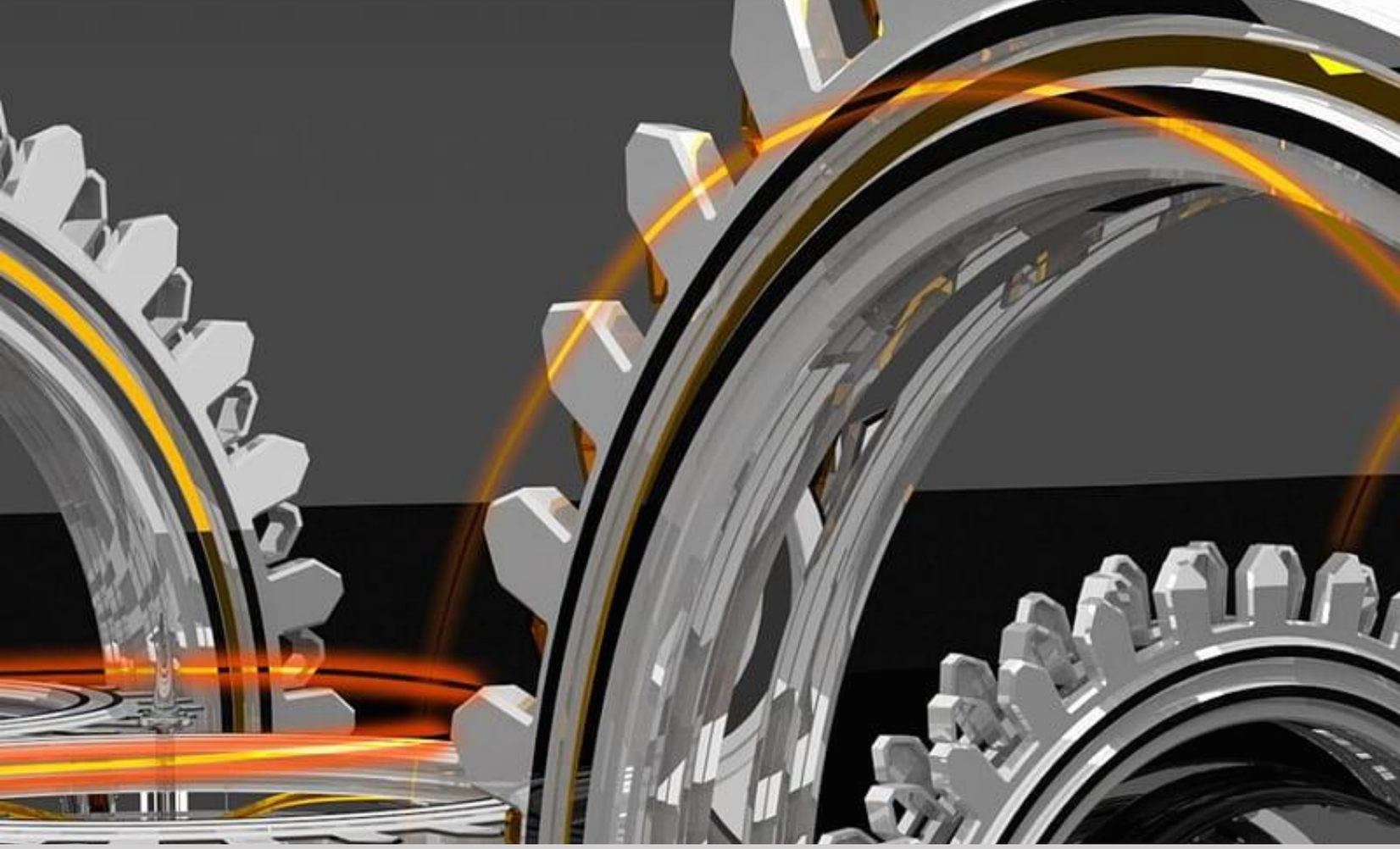
I hope you enjoy reading this issue of our magazine and look forward to your feedback. Thank you for your continued support.

Sincerely,

Dishant Kalita

5th Semester

Mechanical Engineering Department



STUDENTS ARTICLES

Kinetic Energy Resource (K.E.R.S)

Sudarshana Gogoi (1st Sem)

System: Boosting Efficiency and Sustainability

In a world where the depletion of natural resources is a growing concern, the need for innovative solutions to conserve energy has never been greater. One such innovation is the Kinetic Energy Recovery System (KERS), which has revolutionized the way we harness and utilize kinetic energy, particularly in the realm of automotive technology. In this article, we delve into the mechanics, applications, and future prospects of KERS, shedding light on its environmental benefits and potential to transform the automotive industry.

Harnessing Lost Energy: The Concept of KERS

In the realm of automobiles, a significant amount of energy is lost during deceleration and braking. Enter regenerative braking and the Kinetic Energy Recovery System. KERS is a groundbreaking approach designed to recover and restore the energy lost during braking, effectively converting kinetic energy losses into gains.

KERS in Formula 1

KERS finds its most prominent application in Formula 1 racing, where it plays a pivotal role in enhancing the performance of these high-speed machines. The system functions by converting the energy generated when the car decelerates into electrical or mechanical energy, which is then stored for future use. Drivers have the ability to activate the KERS system, releasing the stored energy and providing a significant power boost.

Key Components of KERS

KERS relies on the below essential components:

1. Motor/Generator Unit (MGU): This unit converts mechanical energy into electrical energy and vice versa, facilitating the energy transfer process.
2. Power Control Unit (PCU): The PCU manages the flow of electric current between the MGU and the energy storage device, optimizing the system's efficiency.

The Power of Flywheel Energy Storage

Flywheel Energy Storage (FES), a subset of KERS technology, finds applications across various technical fields. FES systems harness energy by rapidly accelerating an inertial mass, effectively storing it as rotational energy. The energy can later be retrieved by slowing down the flywheel.

Design Considerations

Designing an effective flywheel for KERS applications is crucial. It must be centrally bored to accommodate a ball bearing for rotational movement without friction. The weight of the flywheel must also be carefully chosen to avoid affecting the bicycle's performance adversely.

How KERS Operates in a Bicycle

KERS in bicycles operates by connecting a crank wheel to the rear wheels, ensuring constant rotation of the clutch plate on the flywheel axle. This rotation is achieved through chain transmission, allowing for increased flywheel speed. When deceleration is required, engaging the clutch causes the flywheel to rotate, simultaneously reducing the bicycle's speed. The energy generated is stored in the flywheel. In situations where full braking is needed, the clutch is disengaged to apply the brake directly. Subsequently, when riding resumes, the stored energy in the flywheel can be transferred back to the wheels, reducing the rider's pedalling effort.

Future Prospects of KERS

The future of KERS is promising, with several noteworthy developments on the horizon. Mechanical KERS systems, like flywheel-based ones, have distinct advantages over their electrical counterparts. They are more powerful, efficient, and cost-effective. As technology continues to advance, KERS is poised to become even more efficient and affordable.

Environmental Impact

One of the standout features of KERS, particularly flywheel-based systems, is their positive impact on the environment. They significantly enhance fuel efficiency, resulting in reduced CO2 emissions. Research indicates that the environmental benefits of a single flywheel KERS system offset its carbon footprint within 12,000 kilometres of driving.

Versatility

KERS systems are not limited to Formula 1 racing; they have potential applications in everyday cars.

Companies like Volvo have expressed interest in integrating flywheel-based KERS into their vehicles. These systems are particularly well-suited for vehicles with start-stop driving cycles, offering the potential to reduce fuel consumption by up to 20%.

Retrofittable Technology

One of the key advantages of KERS systems is their ability to be retrofitted into existing vehicles, enhancing their efficiency without the need for a complete overhaul. Further advancements in minimizing forces acting on the flywheel will boost efficiency and energy storage capabilities.

Conclusion

The Kinetic Energy Recovery System, especially in its flywheel-based form, represents a revolutionary approach to improving vehicle performance and promoting environmental sustainability. It not only enhances power but also significantly contributes to greater fuel efficiency, reducing CO2 emissions in the process.

In a world where the need for eco-friendly solutions is paramount, KERS stands out as a beacon of hope. It offers the perfect blend of power and efficiency, making vehicles equipped with this technology a compelling choice for a more sustainable and dynamic driving experience. As technology advances and adoption grows, KERS may very well shape the future of the automotive industry, providing a greener, more efficient path forward.

EXPLORING ABOUT THE MATERIAL SCIENCE

Khanindra Deka (3rd Sem)

Mechanical engineering is a dynamic field constantly evolving with advancements in material science. These advancements have a profound impact on various industries, from aerospace and automotive to manufacturing and construction. In this article, we will explore some key developments in material science that are reshaping the landscape of mechanical engineering.

ADVANCED COMPOSITE MATERIALS:

One of the most significant developments in material science is the emergence of advanced composite materials. These materials combine two or more constituent materials with distinct properties to create a material with superior characteristics. For instance, carbon fiber-reinforced composites are now widely used in aircraft and automotive industries due to their exceptional strength-to-weight ratio, contributing to fuel efficiency and enhanced performance.

SMART MATERIALS:

Smart materials are engineered materials designed to respond to external stimuli, such as temperature, pressure, or electrical current. Shape memory alloys, for example, can "remember" their original shape and return to it when subjected to specific conditions. These materials find applications in actuators, sensors, and medical devices, making them indispensable in various mechanical engineering applications.

NANOTECHNOLOGY:

Nanotechnology has opened up new frontiers in material science. By manipulating materials at the Nano scale, engineers can enhance their mechanical, electrical, and thermal properties. Nano composites, for instance, offer improved strength, durability, and electrical conductivity, revolutionizing fields like automotive engineering, where lightweight yet strong materials are crucial.

3D PRINTING AND ADDITIVE MANUFACTURING:

Additive manufacturing technologies, such as 3D printing, have revolutionized how mechanical engineers design and fabricate components. This approach allows for intricate geometries and rapid prototyping, reducing material waste and production time. Engineers can now create complex, customized parts with greater precision, which is particularly valuable in aerospace and medical applications.

CONCLUSION:

Material science advancements continue to drive innovation in mechanical engineering, enabling the development of lighter, stronger, and more responsive materials and technologies. As the field evolves, engineers are poised to address the challenges of tomorrow's industries with solutions that were once deemed impossible. With a commitment to research and development, mechanical engineers are at the forefront of shaping a more sustainable and technologically advanced future.

MECHANICAL ENGINEERING

Rupjyoti Das (3rd Sem)

Mechanical Engineering is the descipline that applies the principles of engineering, physics, and materials science for the design, analysis, manufacturing, and maintenance of mechanical systems. It is the branch of engineering that involves the design, production, and operation of machinery. It is one of the oldest and the broadest of the engineering disciplines.

The mechanical engineering field reauires and under standing of cores areas including mechanics, kinematics, thermodynamics, materials science, structural analysis, and electricity. Mechanical Engineers use those core principles along with tools like computeraided design, and product lifecycle managements to design and analyze manufacturing plans, Industrial Equipment and Machinery, Heating and cooling systems, Transport systems, Aircrafts, Watercraft, Robotics, Medical Devices, Weapons and others.

Mechanical engineering emerged as a field during the Industrial Revolution in Europe in the 18th century; however, its development can be traced back several thousand years around the world. Mechanical Engineering science emerged in the 19th century as a result of developments in the feild of physics. The field has continually evolved to incorporate advancements in technology, and Mechanical Engineers today are pursuing developments in such feilds as companies, Mechatronics, and Nanotechnology. Mechanical engineering overlaps with Aerospace Engineering, Materllurgucal Engineering, Civil Engineering, Electrical Engineering, and Manufacturing Engineering, Chemical Engineering, Industrial Engineering and the other engineering desciplines to varying amounts. Mechanical engineers may also work in the field of Biomedical Engineering, specifically with Biomechanics, Transport Phenomena, Biomechatronics, Bionanotechnology, and Modeling of biological systems.

“AIR BRAKE SYSTEM OF INDIAN RAILWAYS”

Dulan Moni Patowary. (5th Sem)

In Air Brake system compressed air is used for operating the brake system. The locomotive compressor charges the feed pipe and the brake pipes throughout the length of the train. The feed pipe is connected to the auxiliary reservoir and the brake pipe is connected to the brake cylinder through the distributor valve. Brake application takes place by dropping the pressure in the brake pipe.

The air brake system of Indian railways offers several advantages, such as efficient and reliable braking of heavy trains, reduced wear and tear on brake components, and the ability to control brakes remotely from the locomotive. However, it also comes with disadvantages, including the need for regular maintenance to ensure proper functioning, susceptibility to air leaks that can compromise braking efficiency, and the initial high cost of installation and maintenance, which can strain the railway budget.

The air brake system of Indian Railways plays a pivotal role in ensuring the safe and efficient operation of trains. Its cause lies in the need to provide a reliable braking mechanism for heavy trains traveling on long, diverse terrains. When the locomotive's engineer applies the brakes, compressed air is sent through brake pipes to each carriage's brake cylinders, causing them to expand and apply pressure to the brake shoes against the wheels. This effect results in the train's deceleration and eventual halt. The system's efficiency not only enhances safety but also reduces wear and tear on track and rolling stock, contributing to the overall reliability and longevity of the railway infrastructure.

The problem with the air brake system of Indian Railways has been its aging infrastructure, leading to maintenance challenges and safety concerns. The solution involves a comprehensive modernization program, including the replacement of outdated components with advanced, reliable ones, improved training for maintenance personnel, and the implementation of real-time monitoring systems to ensure the efficient functioning of the brakes. This overhaul will enhance the safety and operational efficiency of the Indian Railways' air brake system, ensuring the continued reliability of this vital transportation network.

The air brake system of Indian Railways is a critical component of the country's extensive railway network, ensuring safe and efficient train operations. Developed over the years to meet the specific requirements of India's diverse railway infrastructure, this system relies on compressed air to apply brakes across multiple interconnected cars simultaneously. Its widespread adoption has significantly improved train safety, reducing the risk of derailments and collisions, while also enabling longer and heavier trains to be operated. The Indian Railways' air brake system embodies a vital engineering achievement, enhancing the reliability and safety of one of the world's largest and busiest railway networks.

CHERNOBYL DISASTER

Bishal Patowary (5th Sem)

The Chernobyl disaster, which occurred on April 26, 1986, in Pripyat, Ukraine, is one of the most devastating nuclear accidents in history. This catastrophic event unfolded during a safety test on Reactor Number 4 at the Chernobyl Nuclear Power Plant. The test went terribly wrong, causing a massive power surge and a violent explosion that blew off the reactor's concrete lid, releasing a plume of radioactive material into the atmosphere.

The immediate aftermath was marked by a relentless fire that raged for days. The nearby town of Pripyat was evacuated hastily, and the reactor building was sealed. A concrete sarcophagus, known as the "Chernobyl Shelter," was constructed over the reactor to contain the radioactive materials.

The consequences of the disaster have been profound and enduring. It caused immense human suffering, with radiation exposure leading to serious health problems, including thyroid cancer and leukemia. The environmental impact was severe, rendering large areas uninhabitable and causing genetic mutations in local wildlife. Economically, the cleanup and containment efforts were extensive and costly.

The Chernobyl disaster also had a global impact, raising awareness about the dangers of nuclear power and leading to significant changes in safety protocols and reactor designs. It serves as a sobering lesson about the importance of transparency, safety, and thorough training in the nuclear industry.

In conclusion, the Chernobyl disaster stands as a grim reminder of the catastrophic risks associated with nuclear energy. It left an indelible mark on the lives of those affected, the environment, and the nuclear industry. While nuclear power has its advantages, Chernobyl underscores the critical need for rigorous safety measures and transparency to prevent such tragedies in the future.

CYBER SECURITY

Partha Sarothi Phukan (5th Sem)

In our increasingly interconnected world, cybersecurity has emerged as a critical concern. The rapid growth of the internet and digital technologies has brought tremendous benefits, but it has also exposed individuals, organizations, and nations to a multitude of cyber threats. This article delves into the significance of cybersecurity, the evolving threat landscape, and the measures required to safeguard our digital ecosystem.

The Importance of Cybersecurity

Cybersecurity is the practice of defending digital systems, networks, and data from unauthorized access, cyberattacks, and damage. It is integral to protecting our privacy, financial assets, and critical infrastructure. The consequences of inadequate cybersecurity are severe, ranging from financial loss and identity theft to the compromise of national security.

The Evolving Threat Landscape

Cyber threats are continually evolving, becoming more sophisticated and dangerous. Common cyberattacks include malware, ransomware, phishing, and Distributed Denial of Service (DDoS) attacks. Nation-states and criminal organizations often perpetrate these attacks, seeking to steal valuable information or disrupt critical systems.

Measures to Enhance Cybersecurity

1.Robust Password Practices: Strong, unique passwords and multi-factor authentication are essential to protect accounts and sensitive data.

2.Regular Software Updates: Keeping software and systems up to date is vital as it patches known vulnerabilities that cybercriminals may exploit.

3.Education and Training: Raising awareness and providing training to employees and individuals on recognizing and responding to cyber threats is crucial.

4.Firewalls and Antivirus Software: Employing effective security tools can prevent or mitigate attacks.

5.Incident Response Plans: Developing a clear plan for responding to cyber incidents can minimize damage and recovery time.

6.Data Encryption: Encrypting sensitive information ensures that even if it's accessed, it remains unreadable without decryption keys.

Conclusion

Cybersecurity is no longer an option but a necessity in our digital age. It is essential for safeguarding our personal information, financial assets, and critical infrastructure. The evolving threat landscape and increasing complexity of cyberattacks demand proactive measures and heightened vigilance. Individuals, organizations, and governments must collaborate to establish a robust defense against cyber threats.

In the future, the importance of international cooperation in addressing cyber threats cannot be overstated. As technology continues to advance, a unified approach is crucial in setting global cybersecurity standards and norms. By taking these steps and continuously improving cybersecurity practices, we can better protect our digital world and enjoy the many benefits that the digital age has to offer.

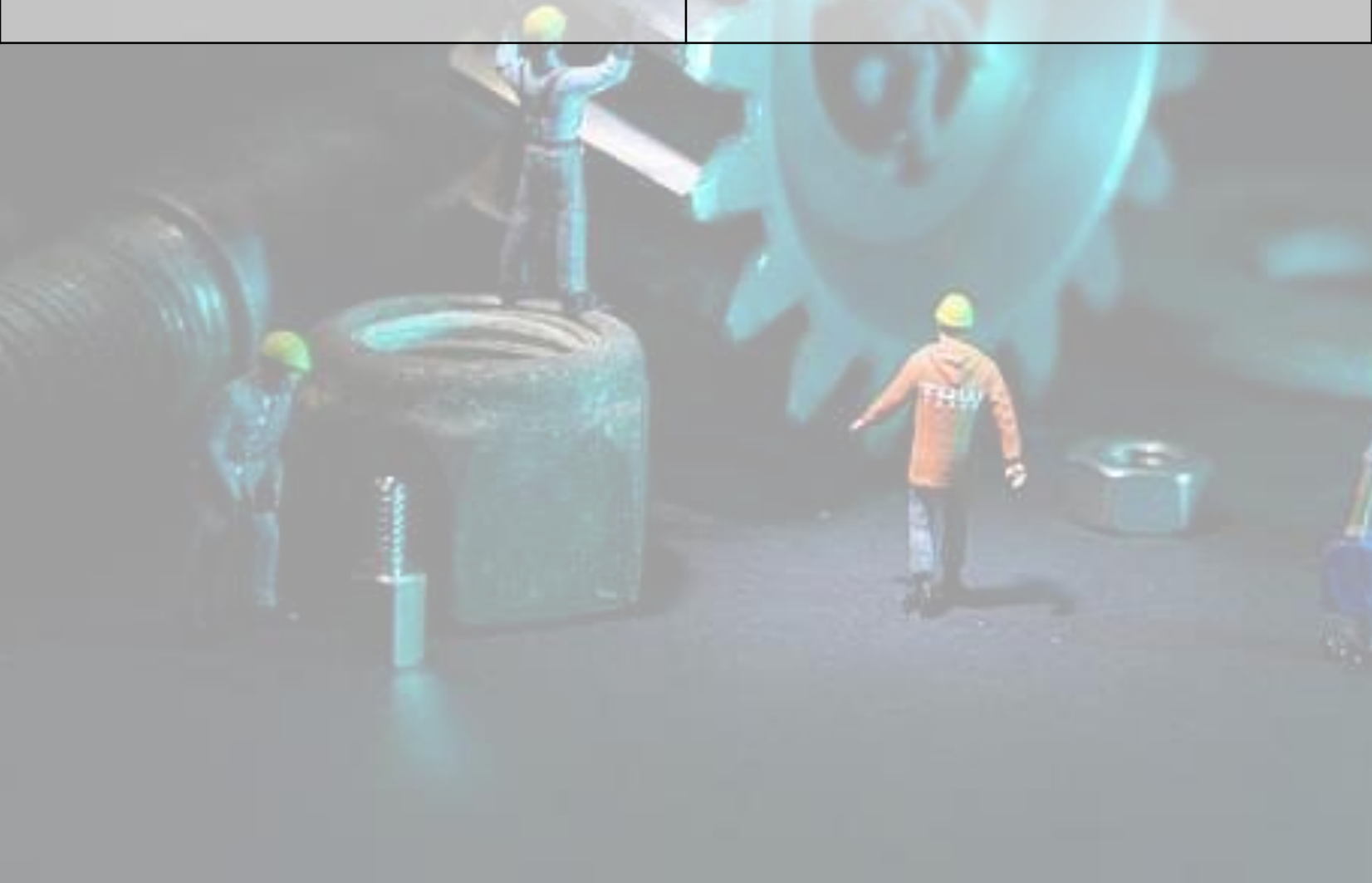
ROBOTICS :- The new Generation

Duke Gogoi (5th Sem)

What is Robotics :Robotics is a field of engineering and technology that focuses on the design, construction, operation, and use of robots. Robots are programmable machines designed to perform tasks autonomously or with limited human intervention. They can range from simple devices like automated vacuum cleaners to complex industrial robots used in manufacturing. Robotics combines elements of mechanical engineering, electronics, computer science, and artificial intelligence to create machines capable of mimicking human actions or performing tasks in environments that may be hazardous or impractical for humans. This field has applications in various industries, including manufacturing, healthcare, transportation, and exploration.Research of Robotics : Research in robotics involves the study, development, and application of technologies related to autonomous machines or systems that can perform tasks without human intervention. This field encompasses various sub-disciplines such as computer vision, artificial intelligence, mechanical engineering, and control systems. Researchers in robotics aim to create robots that can navigate environments, manipulate objects, interact with humans, and adapt to changing situations. This includes areas like industrial automation, healthcare robotics, autonomous vehicles, and even social robots designed to assist and interact with people in various settings. The ultimate goal is to advance the capabilities and versatility of robots to address real-world challenges across industries and improve quality of life.Impact of Robotics in our world : Robotics has had a significant impact on various aspects of life on Earth. It has revolutionized industries such as manufacturing, healthcare, and transportation by automating tasks and improving efficiency. In healthcare, robots assist in surgeries and rehabilitation. In agriculture, they optimize crop management. However, there are concerns about job displacement and ethical considerations surrounding the use of robots, highlighting the need for responsible development and regulation. Overall, robotics has the potential to enhance productivity and improve quality of life, but it also poses challenges that require careful consideration.

START –UP PROJECT TITLE	ABSTRACT
AGRICULTURAL WHEEL SPRAYER	On an average 60 to 70% of the Indian population depends directly or indirectly on agriculture for their income or we can say basic needs(food, cloth and shelter) . In this agriculture sector, spraying is an important operation to be performed by the farmer and this spraying is done with the help of sprayer. So, this research work aims at designing and manufacturing the sprayers which operates with minimal effort and better case . There are many types of sprayers available in the market but due to high cost they are not suitable for small farmers for small farming. The small farmers cannot afford to buy the power operated sprayers or tractor mounted sprayer available in the market . So we have developed a agriculture wheel sprayer which is not costly and are suitable for small farming .
JUTE BAG PRODUCTION	Jute is versatile and sustainable natural fiber that has been used for centuries in various industries. It is primarily grown in countries like India and Bangladesh and has gained popularity worldwide due to its eco friendly properties. Jute is known for its strength, durability, and biodegradability, making it an ideal material for the production of various products such as bags, ropes, carpets, and textiles . The use of jute offers several advantages. Firstly it is renewable resources as it is derived from the jute plants stem. This market it an environmentally friendly alternative to synthetic materials reducing the dependence on non-renewable resources . Additionally jute cultivation has a low carbon footprint and contributes to the absorption of carbon dioxide thus helping combat climate change .

IMPROVISED CANE AND METAL AMALGAMATED FURNITURE MAKING	The metal amalgamated furniture startup shows great potential and several advantages in the furniture industry. The innovation use of metal alloys in furniture design offers numerous benefits, including enhance durability, strength and versatility . This unique approach sets the setup apert from traditional furniture manufacturing companies and opens up opportunities for creative and functional designs .
DISPOSABLE PAPER PLATE AND PAPER CUP	Strong planning and a fine marketing sense can help you grow your paper plant business in no time. Most important paper plants are continuously in demand and if you fulfil the demands and your customers are satisfied with your quality you fulfil the demands and your customers are satisfied with your quality you may get continuous orders. You will face loss only when you buy the wrong machine or low-quality raw material or don’t do paper plate marketing well enough . Besides that to handle the client base perfectly , its important to keep the calculations handy to know the profit margin .



FINAL PROJECT REPORT	ABSTRACT
MODEL ON HYDRAULIC DISC BRAKE SYSTEM	The Hydraulic disc brake is a highly efficient And reliable braking system commonly used in various vehicles especially bicycles and motorcycles . This innovation braking mechanism harnesses the power of hydraulic fluid to transmit force from the brake lever to the brake caliper, which them clamps the brake pads onto the disc rotor . The hydraulic system ensures consistent and smooth braking performance even in adverse condition while providing superior stopping power and minimal effort from the rider. With its enhance modulation and excellent heat dissipation capabilities the hydraulic optimal braking control and safety on their rides.
SOLAR GRASS CUTTING MACHINE	The Solar Grass Cutter is a mechanical device used for cutting grass with the help of solar energy instead of electricity . First of all its body is made with the help of hollow square bar , then caster wheel is placed below the body of square bar . Then incline fiber plate is kept on a body, then on incline fiber plate pannel is kept . Which transmit solar energy & then solar energy is converted into electrical energy & electrical energy is converted in to mechanical energy . This electrical Energy is transmitted to electric motor . On the shaft of the electric motor a blade is connected having cutting edge which cuts the grass.

SOLAR GRASS CUTTING MACHINE	The Solar Grass Cutter is a mechanical device used for cutting grass with the help of solar energy instead of electricity . First of all its body is made with the help of hollow square bar, then caster wheel is placed below the body of square bar. Then incline fiber plate is kept on a body, then on incline fiber plate solar panel is kept. Which transmit solar energy & then solar energy is converted into electrical energy & electrical energy is converted in to mechanical energy . This electrical energy is transmitted to electric motor . On the shaft of the electric motor a blade is connected having cutting edge which cut's the grass .
MINI PROJECT ON REGENERATIVE BRAKING SYSTEM	Regenerative braking system is the system in which the kinetic energy of the vehicle is stored temporarily; during deceleration and is reused as kinetic energy. Regenerative braking is a step to reduce the use of fossil fuels. While braking, a large amount of energy is lost in form of heat. A regenerative braking system aims to utilize this energy instead of getting it wasted . In this mechanism, the electric traction moto used the vehicle's momentum to recover energy lost while braking. This contrasts with the conventional braking system, where the excess kinetic energy gets converted to unwanted heat and is wasted due to friction in the brakes, or with dynamic brakes. In most of the regenerative braking system the energy is recovered by using electric motors as generators.

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