CHANDIGARH ENGINEERING COLLEGE CGC, LANDRAN, MOHALI

Building Careers. Transforming lives.

Mechnotimes

NEWSLETTER

Department of Mechanical Engineering

Volume IX

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VISION OF CHANDIGARH ENGINEERING COLLEGE-CGC, LANDRAN

To become a leading institute of the country for providing quality technical education in a research-based environment for developing competent professionals and successful entrepreneurs.

MISSION OF CHANDIGARH ENGINEERING COLLEGE-CGC, LANDRAN

1. To provide state of the art infrastructure and engage proficient faculty for enhancing the teaching learning process to deliver quality education.
2. To give a conductive environment foe utilising the research abilities to attain new learning for solving industrial problems and societal issues.
3. To collaborate with prominent industries for establishing advanced labs and using their expertise to give contemporary industry exposure to the student and faculty.
4. To cater opportunities for global exposure through association with foreign universities.
5. To extend choice-based career options for students in campus placements, entrepreneurship and higher studies through career development program.

DEPARTMENT OF MECHANICAL ENGINEERING

Vision of the Department

To emerge as centre of quality education for creating competent mechanical engineers catering to the ever-changing needs of industry and society.

Mission of the Department

M1: To provide quality education by constantly updating departmental resources and using effective teaching learning methodology.

M2: To promote research practices in the field of mechanical engineering in pursuit of academic excellence and for the benefit of society.

M3: To establish industrial collaborations for imparting contemporary knowledge to keep pace with the technological challenges in the interdisciplinary and core areas of mechanical engineering.

M4: To provide opportunities to the students for global exposure through international collaborations.

M5: To nurture students through pre-placement training programs to succeed in campus placements and to provide guidance for entrepreneurship and higher studies.

EDITOR'S COLUMN

A newsletter stands as a testament to the vision and mission of a department, serving as a platform to highlight key events, innovative activities, and notable academic achievements. In the ever-evolving field of mechanical engineering, the pursuit of innovation and sustainability remains at the forefront, driving progress to shape a better world and leave a meaningful impact on society. While we honour our past accomplishments, our focus is firmly set on the future, brimming with opportunities and boundless possibilities. The discipline of mechanical engineering holds immense potential to redefine the boundaries of technology and human ingenuity. With unwavering commitment, we aim to prepare the next generation of engineers to tackle the challenges of tomorrow with competence and creativity. This newsletter not only celebrates the remarkable contributions of our students and faculty but also serves as a window into their inspiring journey of growth and discovery. As valued readers and contributors, you are integral to this transformative journey. Your engagement fuels the spirit of progress and innovation that defines our community. We take great pride in sharing these glimpses of our department's dynamic endeavours and trust that this culture of knowledge-sharing will endure, inspiring others to follow in our footsteps. Let this publication be a beacon of excellence and a testament to the unwavering commitment to advancing the field of mechanical engineering.

AISHNA MAHAJAN

EDITOR-IN-CHIEF

MECHNOTIMES

FROM EDITORIAL'S BOARD

Welcome to the latest edition of *Mechnotimes*, the official newsletter of the Mechanical Engineering Department at Chandigarh Engineering College - CGC, Landran, covering the period from October to December 2024. As we navigate the ever-expanding horizons of engineering and technology, we are reminded of the immense opportunities and responsibilities that come with this journey. This editorial highlights the critical importance of innovation and sustainability as the driving forces shaping the future of the mechanical engineering landscape. Innovation lies at the heart of engineering, acting as the catalyst for progress. From the revolutionary invention of the steam engine to the cutting-edge advancements in electric vehicles, innovation has continually transformed the way we live, work, and interact with our environment. As aspiring mechanical engineers, we stand at the forefront of this exciting evolution, constantly challenging boundaries and redefining possibilities. Through this edition of *Mechnotimes*, we celebrate the spirit of ingenuity and dedication that propels our students and faculty towards excellence, inspiring them to make meaningful contributions to the world.

ANURAAG GILHOTRA (2102424), SEM VII

HARSHIT RANA (2422072), SEM III

Peer Mentoring Session on "Exploring Technical Sales in Engineering"

On October 5, 2024, the Department of Mechanical Engineering, hosted a peer mentoring session titled "Exploring Technical Sales in Engineering." The event featured Ms. Kanishka Birla, an Alumna from the 2019-2023 batch and a Technical Sales Engineer at SMS Group India, Gurugram. The session bridged academic learning with industry applications, focusing on the skills required for success in technical sales. Ms. Birla shared her experiences, emphasizing the importance of combining technical knowledge with effective communication and problem-solving skills. She also highlighted the role of co-curricular activities in enhancing employability and career growth.

Figure: Ms. Kanishka Birla interacting with the students during the session

Alumni Talk on "Career Opportunities in the Oil and Gas Industry"

The Department of Mechanical Engineering organized an alumni talk titled "Career Opportunities in the Oil and Gas Industry", on October 11, 2024. The session was conducted by Mr. Shubham Mahajan, an alumnus from the 2014-2018 batch and Deputy Manager at British Petroleum. The session aimed to connect academic learning with industry practices. Mr. Mahajan shared his journey from college to a managerial role, offering insights into career opportunities in the oil and gas sector. He highlighted essential skills like adaptability, communication, and problem-solving, along with the technical and environmental challenges unique to the industry. The session provided students with an understanding of various career paths, industry expectations, and the importance of professional networking.

Figure: Mr. Shubham Mahajan interacting with the students during the session

Expert Talk on "Career Avenues in Merchant Navy"

The Mechnorobs Club of the Department of Mechanical Engineering organized an expert talk titled "Career Avenues in Merchant Navy" on October 17, 2024. Mr. Parkash from CMC Maritime Academy, Chennai, as the speaker, conducted the session. The talk aimed to enlighten students about the diverse career opportunities in the Merchant Navy, providing insights into the necessary skills, qualifications, and industry demands.

The session covered various technical aspects, including the operational and engineering competencies required in maritime roles, such as navigation, ship machinery handling, cargo management, and emergency protocols. Mr. Parkash also discussed the training processes, certifications, and career progression in the Merchant Navy, emphasizing discipline and adaptability as crucial traits for success in this global profession. The session concluded with an interactive discussion, leaving the participants inspired and informed about this challenging yet rewarding field.

Figure: Mr. Parkash interacting with the students

Cryogenic Engineering: Unlocking Extreme Conditions

Cryogenic engineering is a specialized branch of mechanical engineering that deals with the behaviour of materials and systems at extremely low temperatures, typically below -150°C (-238°F). This fascinating field plays a pivotal role in various industries, pushing the boundaries of what is possible in extreme conditions. At such low temperatures, materials exhibit unique properties, such as superconductivity, superfluidity, and increased strength, which can be harnessed for groundbreaking applications.

One of the most notable uses of cryogenics is in space exploration, where liquid hydrogen and liquid oxygen are used as rocket propellants due to their high energy density. Cryogenic cooling systems are also critical for preserving biological samples, including organs, tissues, and vaccines, enabling advancements in medical research and transplantation. Furthermore, cryogenic technology is at the heart of modern scientific instruments like MRI machines and particle accelerators, where maintaining superconducting magnets is essential for their operation.

In the energy sector, cryogenics facilitates the storage and transportation of liquefied natural gas (LNG), making it possible to efficiently transport energy across the globe. The emerging field of quantum computing also relies heavily on cryogenics to maintain the ultra-cold environments necessary for qubits to function. Despite its numerous advantages, cryogenic engineering faces challenges, including the high cost of equipment and the need for precise insulation to minimize heat transfer.

As industries continue to demand solutions for extreme environments, cryogenic engineering is poised to unlock new possibilities, from revolutionizing healthcare to enabling sustainable energy storage and even advancing our understanding of the universe. This field exemplifies how mastering the extremes can lead to remarkable technological progress.

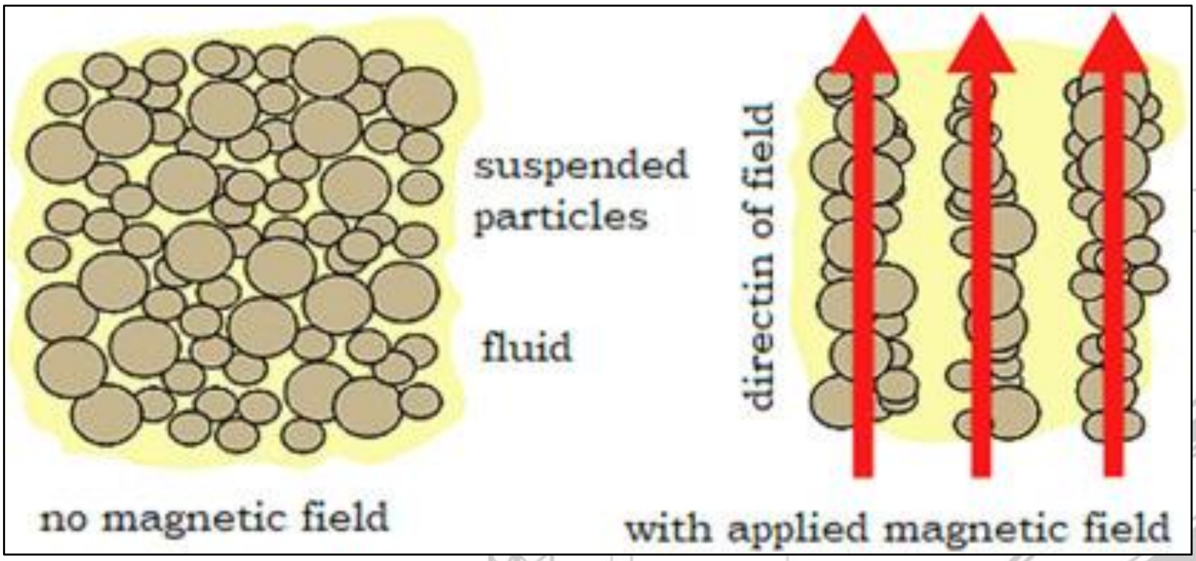
In addition to its industrial applications, cryogenics is paving the way for groundbreaking research in physics and material science. For instance, the study of Bose-Einstein condensates, a state of matter achieved at near-absolute zero, has opened new doors in understanding quantum mechanics. Cryogenics also plays a vital role in preserving biodiversity by storing seeds and genetic material in seed banks, safeguarding the future of endangered species and crops.

Another emerging area is the use of cryogenics in food processing and preservation. Rapid freezing at cryogenic temperatures ensures better texture, flavor, and nutritional value, making it a game-changer for the food industry. Moreover, cryotherapy, which involves exposing the body to extremely cold temperatures, is gaining popularity in sports medicine and wellness for its benefits in reducing inflammation and enhancing recovery.

Written by: Jasmeet Singh (2337672), Sem III

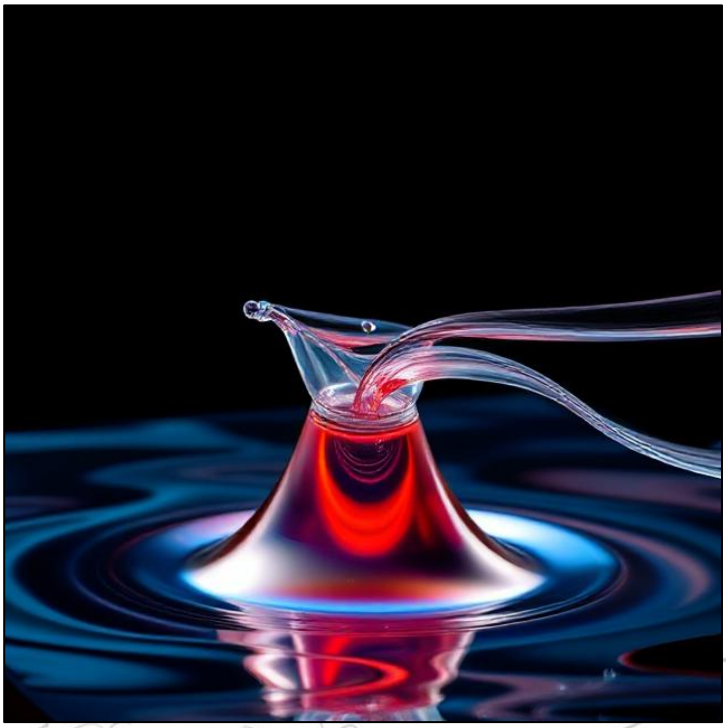
Magnetorheological Fluids in Smart Systems

Magnetorheological (MR) fluids are a fascinating class of smart materials that have revolutionized the way mechanical systems adapt to dynamic conditions. These fluids consist of microscopic ferromagnetic particles suspended in a non-magnetic carrier fluid, such as silicone oil or water. When exposed to a magnetic field, the particles form a structured network, dramatically altering the fluid's rheological properties, such as viscosity and shear strength. This transformation is both rapid and reversible, making MR fluids ideal for applications requiring precise and real-time control.



A key area where MR fluids have made a significant impact is in the automotive industry, particularly in semi-active suspension systems. These systems use MR dampers to provide variable damping forces, enabling vehicles to adapt to road conditions instantly. This not only enhances ride comfort but also improves safety by optimizing traction and stability. Similarly, MR brakes and clutches are used in industrial applications, offering efficient torque transmission with minimal wear and tear.

In the healthcare sector, MR fluids are integral to advanced prosthetics and rehabilitation devices. For instance, they allow for customizable resistance in artificial limbs, enabling smoother and more natural movements. MR-based haptic devices are also being developed for virtual reality and telemedicine, providing users with tactile feedback for a more immersive experience.



MR fluids are finding increasing use in seismic protection systems for buildings and bridges. By adjusting the magnetic field, these systems can dynamically absorb and dissipate energy during earthquakes, reducing structural damage. Additionally, MR fluids are being employed in robotics, where they improve the precision and adaptability of actuators, grippers, and exoskeletons.

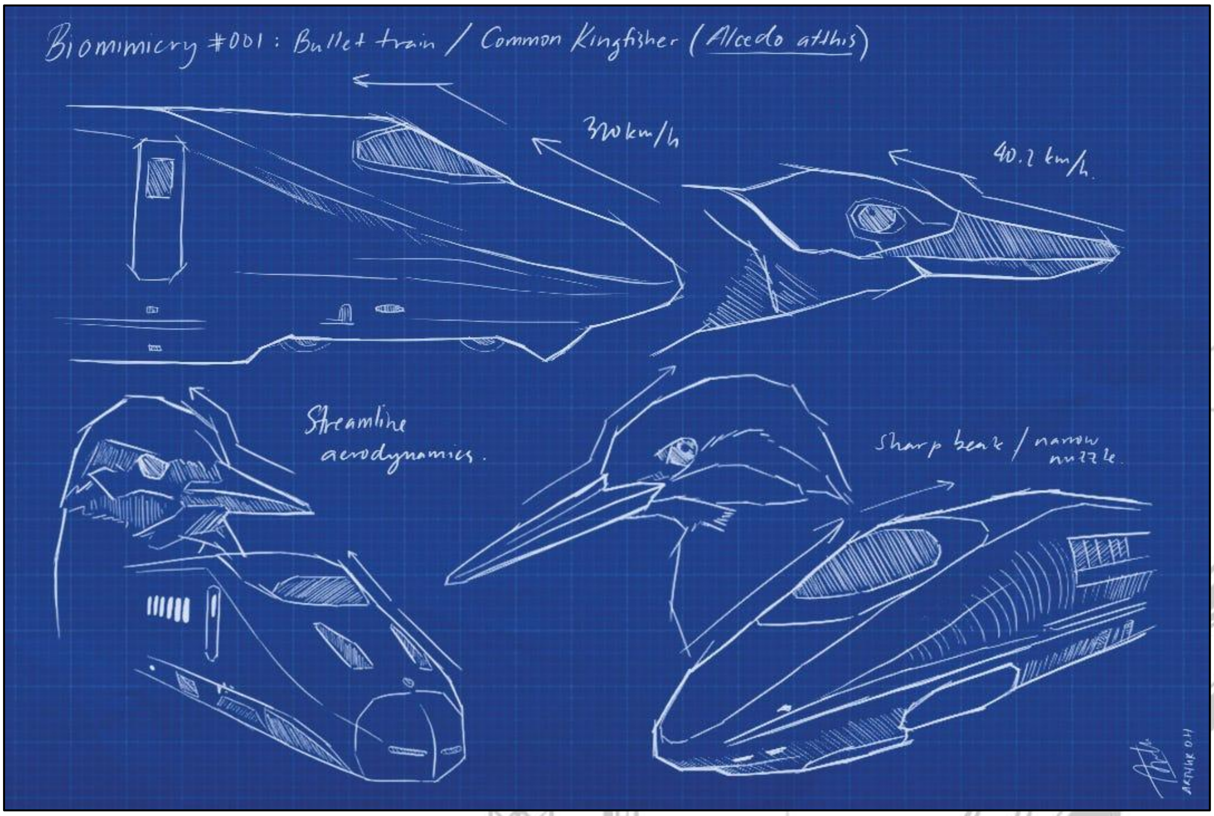
Despite their potential, MR fluids face challenges such as sedimentation of particles, which can affect performance over time, and the relatively high cost of production. Researchers are working to overcome these issues by developing new formulations and additives that enhance the stability and durability of MR fluids. As advancements in smart materials and magnetic field control technologies continue, the scope of MR fluids is expected to expand further, driving innovation in industries ranging from transportation and healthcare to construction and entertainment.

The versatility and responsiveness of MR fluids highlight their potential to transform conventional systems into intelligent, adaptive solutions, bridging the gap between mechanical and smart technologies. With ongoing research and development, MR fluids are poised to play a pivotal role in the future of engineering and design.

Written by: Rohit Kumar (2337687), Sem III

Biomimicry in Mechanical Design

Biomimicry, the art and science of emulating nature's time-tested strategies, has become a cornerstone of innovation in mechanical design. Engineers and designers are increasingly turning to the natural world for inspiration, leveraging the efficiency, adaptability, and sustainability inherent in biological systems. By mimicking these natural principles, they create solutions that are not only functional but also eco-friendly and cost-effective.



One fascinating example of biomimicry is the design of bullet trains inspired by the kingfisher bird's beak. The bird's streamlined shape allows it to dive into water with minimal splash, a feature that engineers adapted to reduce noise and energy consumption in high-speed trains. Similarly, the honeycomb structure found in beehives has influenced the development of lightweight yet strong materials used in aerospace, automotive, and construction industries.

In fluid mechanics, engineers have studied the grooves on shark skin, which reduce drag and prevent algae buildup, to design more efficient swimsuits, ship hulls, and even medical devices. Another example is the mimicry of dolphin echolocation systems, which has led to advancements in sonar technology and underwater navigation systems.

Biomimicry is also transforming the field of robotics. Snake-like robots designed for search-and-rescue operations can navigate through tight spaces, while quadruped robots inspired by cheetahs exhibit remarkable speed and agility.

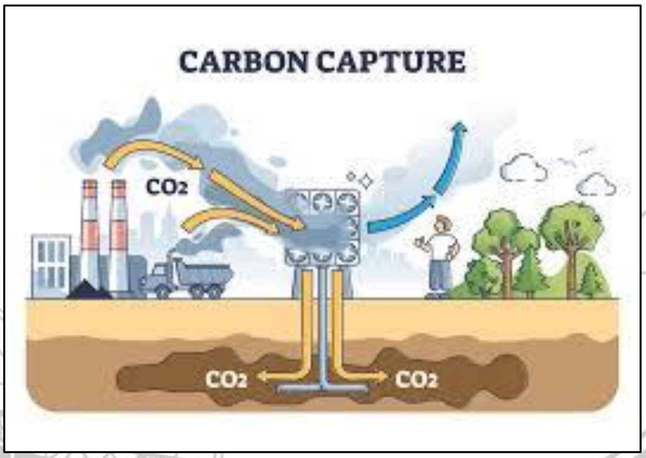
Beyond mechanical efficiency, biomimicry is addressing sustainability challenges. The concept of passive cooling in termite mounds has inspired architects to design buildings that maintain stable temperatures without relying heavily on air conditioning. Similarly, water collection systems based on the Namib desert beetle's ability to harvest moisture from the air are providing innovative solutions to water scarcity in arid regions.

The potential of biomimicry extends into nanotechnology and material science as well. Engineers are developing self-healing materials inspired by human skin and bone, as well as surfaces that mimic the anti-reflective properties of moth eyes for use in solar panels and optical devices. As the demand for sustainable and efficient technologies grows, biomimicry is poised to play an even larger role in shaping the future of mechanical design. By aligning engineering practices with nature's principles, we can create systems that are not only innovative but also in harmony with the environment. Biomimicry reminds us that the answers to many of our engineering challenges are already present in the natural world, waiting to be discovered and adapted. It is a testament to the endless possibilities that arise when science and nature work together.

Written by: Nikhil (2102436), Sem VII

Carbon Capture and Storage: Combating Climate Change with Engineering

Carbon capture and storage (CCS) has gained increasing attention as a vital tool in the fight against climate change. As global efforts intensify to reduce carbon emissions and limit global warming, CCS presents a promising solution to capture carbon dioxide (CO_2) emissions at their source and prevent them from contributing to the greenhouse effect. The technology has the potential to reduce CO_2 emissions from power plants, industrial facilities, and other major sources, significantly lowering the concentration of greenhouse gases in the atmosphere.



CCS is particularly important for industries that are difficult to decarbonize, such as cement, steel, and chemical manufacturing. These sectors produce large amounts of CO_2 as part of their production processes, and alternatives to these processes are often not readily available or economically feasible. By capturing CO_2 at the point of emission, CCS allows these industries to continue operating while minimizing their environmental impact.

One of the key benefits of CCS is its scalability. It can be implemented in existing power plants and industrial facilities, allowing for the reduction of emissions without the need to build entirely new infrastructure. This makes it a more cost-effective solution compared to other forms of carbon reduction, such as renewable energy adoption or energy efficiency improvements, which may require significant upfront investment.

However, the successful deployment of CCS requires significant investment in infrastructure, including pipelines for CO_2 transportation and storage sites for long-term sequestration. These infrastructure needs can make the implementation of CCS projects expensive, which has led to debates about the role of government subsidies and policies in supporting the development of the technology.

The long-term storage of CO_2 also presents challenges. While geological formations, such as depleted oil and gas fields or deep saline aquifers, are considered safe and stable storage options, there are concerns about the potential for leaks or other unforeseen consequences. To address these concerns, extensive monitoring and regulation are required to ensure the integrity of storage sites and prevent any harmful release of CO_2 into the atmosphere.

Despite these challenges, CCS has made significant strides in recent years. Large-scale CCS projects, such as the Boundary Dam project in Canada and the Sleipner project in Norway, have demonstrated the viability of the technology and its ability to capture and store millions of tons of CO_2. These projects have provided valuable insights into the practicalities of CCS and have helped refine the technology for future use.

Looking ahead, the role of CCS in combating climate change will continue to grow. As global emissions reduction targets become more ambitious, CCS is likely to become a cornerstone of strategies aimed at achieving net-zero emissions. When combined with other technologies such as renewable energy, energy efficiency improvements, and carbon offset programs, CCS can help pave the way for a sustainable, low-carbon future. By harnessing the power of engineering and innovation, we can reduce the impact of human activity on the planet and create a cleaner, healthier world for future generations.

Written by: Sachin Yadav (2102444), Sem VII