



# CHANDIGARH ENGINEERING COLLEGE CGC, LANDRAN, MOHALI

Building Careers. *Transforming lives.*



## MECHNOTIMES

**Department of Mechanical Engineering**  
NEWSLETTER

**VOLUME-8**

**ISSUE-IV**

**(APRIL-JUNE 2024)**

# **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 conducive environment for 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 reflects the vision and mission of a department. It also showcases events, activities, and academic accomplishments. The field of mechanical engineering is a continuous pursuit to improve the world. By embracing innovation and sustainability, we can bring about positive change and make a lasting impact on society. While we are proud of our past achievements, we also look to the future with excitement. The possibilities for mechanical engineering are boundless, and we are committed to preparing the next generation of engineers to meet the demands of tomorrow. As readers and contributors to this publication, you are integral to this transformative journey, and we eagerly anticipate the exciting advancements that await us. We are delighted to share glimpses of the activities undertaken by our enthusiastic students under the guidance of their faculty as they navigate through this period. We trust that this culture of disseminating the newsletter will endure indefinitely and serve as a model for others to emulate.



AISHNA MAHAJAN

EDITOR-IN-CHIEF

MECHNOTIMES

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## **FROM EDITORIAL'S BOARD**

Welcome to our latest edition of Mechnotimes of Mechanical Department Newsletter of Chandigarh Engineering College-CGC, Landran for APRIL-JUNE 2024. As we venture into the realm of engineering and technology, we are reminded of the vast opportunities and responsibilities that lie ahead. In this editorial, we underscore the significance of embracing innovation and sustainability to propel progress in the mechanical world. Innovation is the lifeblood of the engineering discipline. From the advent of the steam engine to the contemporary electric vehicle, innovation has moulded the way we live, work, and interact with the world. As budding mechanical engineers, we are at the forefront of this dynamic metamorphosis, constantly pushing the limits of what is achievable.

**ANURAAG GILHOTRA (2102424), SEM VI**

**VAISHNAVI SHARMA (2237674), SEM IV**

**SHRESTHA PRATAP SINGH (2237670), SEM IV**



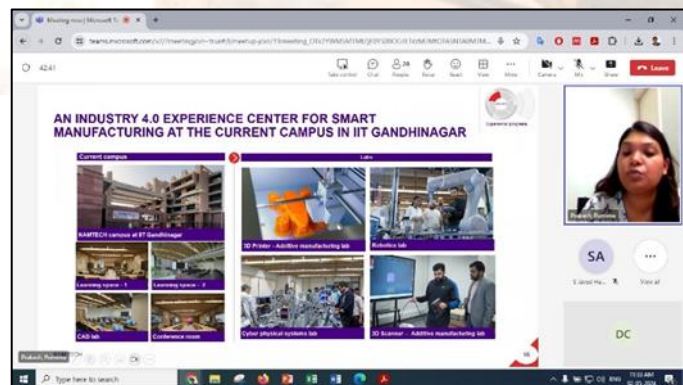
# Industrial Visit to Sangam Engineering Enterprises

The Department of Mechanical Engineering organized an industrial visit to Sangam Engineering Enterprises, Mohali, on April 03, 2024. The visit aimed to provide mechanical engineering students with firsthand exposure to industrial processes and CNC technology, bridging the gap between theory and practice. Students observed the operation of advanced CNC metal cutting machines and various manufacturing processes used in automobile component production, gaining insights into the complexities of the automotive industry. The visit also familiarized students with different types of machinery, offering practical applications of mechanical engineering principles. It provided hands-on experience and a deeper understanding of the operations and mechanisms involved in automotive manufacturing, enhancing their overall learning experience.



# Webinar on Reimagine Learning for Future India

The Department of Mechanical Engineering, CEC-CGC, Landran, in association with NAMTECH, Research Park, IIT Gandhinagar, successfully organized a webinar titled "Reimagine Learning for Future India." on 02<sup>nd</sup> May 2024. The event aimed to spearhead India's educational evolution and workforce readiness for the Industry 4.0 era, with a central focus on Industry 4.0 concepts and careers in Smart Manufacturing. Students learned how innovative educational approaches can equip India's workforce with the skills and knowledge vital for success in tomorrow's industrial landscape. This technical session provided participants with valuable insights into transformative technologies, preparing them for future challenges and opportunities in the industrial sector.



# Wearable Exoskeletons for Industrial Applications

Wearable exoskeletons are poised to revolutionize industrial environments, offering a powerful blend of technology and human capability. Initially developed for medical rehabilitation, these advanced devices have evolved into essential tools for physically demanding jobs, where they augment human strength and endurance. In sectors such as manufacturing, logistics, and construction, where manual labour often involves repetitive lifting, bending, and prolonged standing, exoskeletons significantly reduce the physical strain on workers. By providing mechanical support to key areas like the lower back, shoulders, and legs, exoskeletons help prevent common musculoskeletal disorders, which are a leading cause of workplace injuries. This not only enhances worker safety but also increases productivity, as employees can perform tasks more efficiently and with less fatigue.



Moreover, as the global workforce ages, wearable exoskeletons offer a solution to extending the working lives of older employees, enabling them to continue contributing their experience and skills without the physical toll that such jobs typically demand. This has the added benefit of reducing turnover and the costs associated with hiring and training new workers. Despite these advantages, the

widespread adoption of exoskeletons in industry faces several challenges. The high cost of these devices can be a barrier, particularly for small and medium-sized enterprises. Additionally, ensuring that exoskeletons are ergonomically designed to fit a diverse range of body types and sizes is crucial to their effectiveness. Poorly designed exoskeletons could lead to discomfort or even new health issues, negating their intended benefits.

Furthermore, integrating exoskeletons into existing workflows requires careful planning. Companies must consider how these devices will impact productivity, employee training, and safety protocols. Workers may need time to adapt to using exoskeletons, necessitating additional support during the transition period. Regulatory and safety standards also need to be established to ensure that the introduction of exoskeletons does not introduce new risks or exacerbate existing ones.



Looking ahead, the future of wearable exoskeletons in industrial applications is highly promising. As technology continues to advance, we can expect exoskeletons to become more affordable, lightweight, and versatile. Innovations in materials science, artificial intelligence, and robotics are likely to lead to the development of more responsive exoskeletons that can be tailored to a wider range of tasks and environments. Additionally, the integration of exoskeletons with smart manufacturing systems and the Internet of Things (IoT) could further enhance their functionality. For instance, exoskeletons equipped with sensors could monitor worker health and performance in real-time, providing valuable data to optimize productivity and safety. As these devices become more integrated into industrial practices, they are set to become a standard tool in enhancing the efficiency, safety, and sustainability of industrial operations, marking a significant step forward in the future of work.

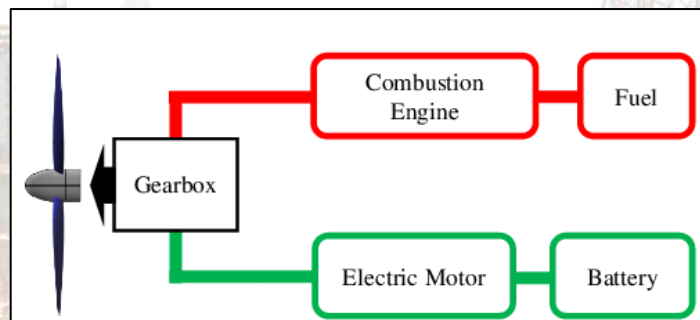
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**Written by: Arshdeep Singh (2102425), Sem VI**

# Hybrid Electric Propulsion Systems

Hybrid electric propulsion systems are increasingly becoming a cornerstone in the evolution of transportation, offering a promising solution to the global challenge of reducing carbon emissions while maintaining or even enhancing vehicle performance. These systems combine traditional internal combustion engines (ICE) with electric motors, allowing vehicles to operate more efficiently by optimizing the use of fuel and energy. In a typical hybrid setup, the electric motor can assist the engine during acceleration, power the vehicle at low speeds, or even operate independently for short distances, while the ICE provides power at higher speeds or when additional energy is needed. This combination results in lower fuel consumption and reduced greenhouse gas emissions, making hybrid systems an attractive option in the transition towards greener transportation.



The development of hybrid electric propulsion systems is driven by the urgent need to address environmental concerns, particularly in the automotive and aerospace industries. In automobiles, hybrid technology has matured significantly, with advancements in battery technology, energy management systems, and regenerative braking contributing to greater efficiency and extended range. Regenerative braking, for instance, captures kinetic energy during braking and converts it into electrical energy, which is then stored in the battery for later use. This not only improves fuel efficiency but also reduces wear and tear on brake components. In aviation, hybrid electric propulsion is gaining traction as a viable means to reduce the environmental impact of air travel. By incorporating electric motors with traditional jet engines, aircraft can reduce fuel consumption during critical phases of flight, such as take-off and landing, where energy demands are highest. This approach is particularly relevant as the aviation industry seeks to meet increasingly stringent emissions regulations and public demand for more sustainable travel options.

However, the widespread adoption of hybrid electric propulsion systems faces several challenges. The most significant of these is the current limitations of battery technology, particularly in terms of energy density, weight, and cost. Batteries that are lightweight and capable of storing large amounts of energy are crucial for the efficiency and practicality of hybrid systems, especially in aerospace applications where weight is a critical factor. Additionally, the infrastructure for supporting hybrid electric vehicles, such as charging stations and maintenance facilities, is still developing, particularly in less urbanized areas. Despite these challenges, ongoing research and development are driving significant advancements in hybrid technology. Innovations in materials science, such as the development of solid-state batteries, and improvements in energy management algorithms are expected to overcome many of the current limitations, paving the way for more widespread adoption.



The future of hybrid electric propulsion systems is bright, with the potential to transform not only the automotive and aerospace industries but also other sectors such as marine and rail transportation. As

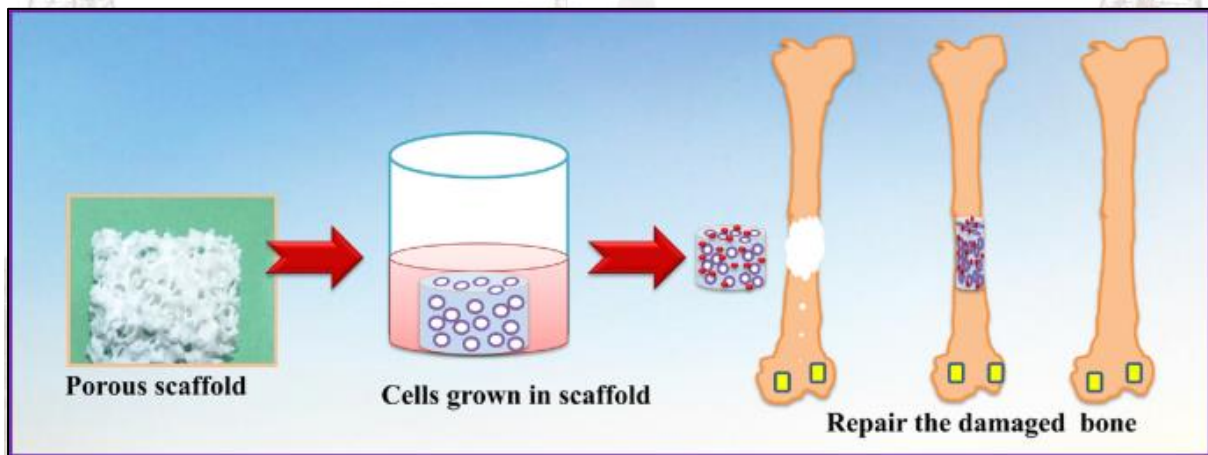
governments and industries around the world increasingly commit to reducing carbon emissions and achieving sustainability goals, hybrid technology offers a practical and achievable pathway. In addition to environmental benefits, hybrid systems also offer economic advantages, including reduced operating costs over the lifetime of the vehicle and less dependency on fossil fuels. As the technology continues to evolve and mature, hybrid electric propulsion is set to play a crucial role in the global transition towards more sustainable and efficient modes of transportation.

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**Written by: Jeshua Tomy (2237646), Sem IV**

## Polymer Based Bone Scaffolds

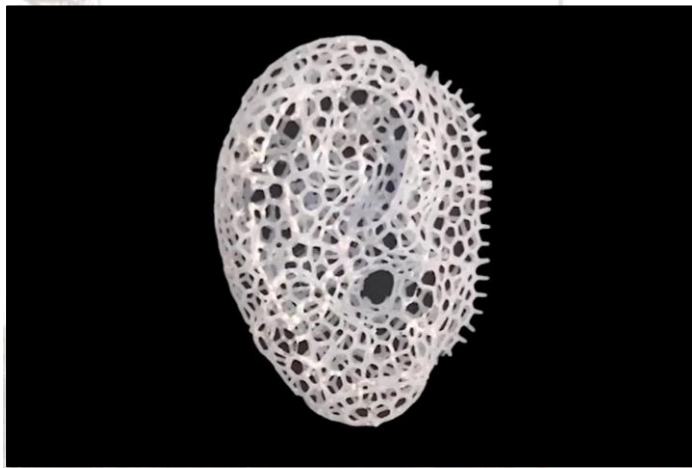
Deep Polymer-based bone scaffolds using polylactic acid (PLA) have emerged as a revolutionary approach in the field of biomedical engineering, particularly in the development of advanced materials for bone regeneration and tissue engineering. PLA, a biodegradable and biocompatible polymer, is derived from renewable resources such as corn starch or sugarcane, making it an environmentally friendly option. Its use in bone scaffolding is driven by the need for materials that can support the healing and regeneration of bone tissue while gradually degrading and being absorbed by the body, reducing the need for additional surgeries to remove implants.



Bone scaffolds are designed to mimic the extracellular matrix of natural bone, providing a three-dimensional structure that supports the growth of new bone cells. The ideal scaffold material should be biocompatible, have suitable mechanical properties to support the load-bearing functions of bone, and be able to degrade at a controlled rate that matches the pace of new bone formation. PLA meets these criteria, making it an excellent choice for bone scaffold applications. Its ability to be processed into various forms, such as porous structures, fibers, or films, allows for the customization of scaffolds to meet specific clinical requirements. The porosity of PLA scaffolds is particularly important, as it enables the infiltration of cells and nutrients, promoting the formation of vascular networks that are essential for bone tissue growth and healing.

One of the key advantages of PLA-based bone scaffolds is their tunable degradation rate. The degradation of PLA occurs through hydrolysis, where the

polymer chains break down into lactic acid, a naturally occurring metabolite in the human body. By adjusting the molecular weight of PLA or blending it with other materials, researchers can tailor the degradation rate to match the needs of different types of bone injuries or defects. This ensures that the scaffold provides mechanical support until the new bone tissue is strong enough to take over, after which the scaffold gradually disappears, leaving behind only the regenerated bone. This feature is particularly valuable in applications such as craniofacial reconstruction, spinal fusion, and the repair of large bone defects, where precise control over scaffold degradation and bone regeneration is crucial.

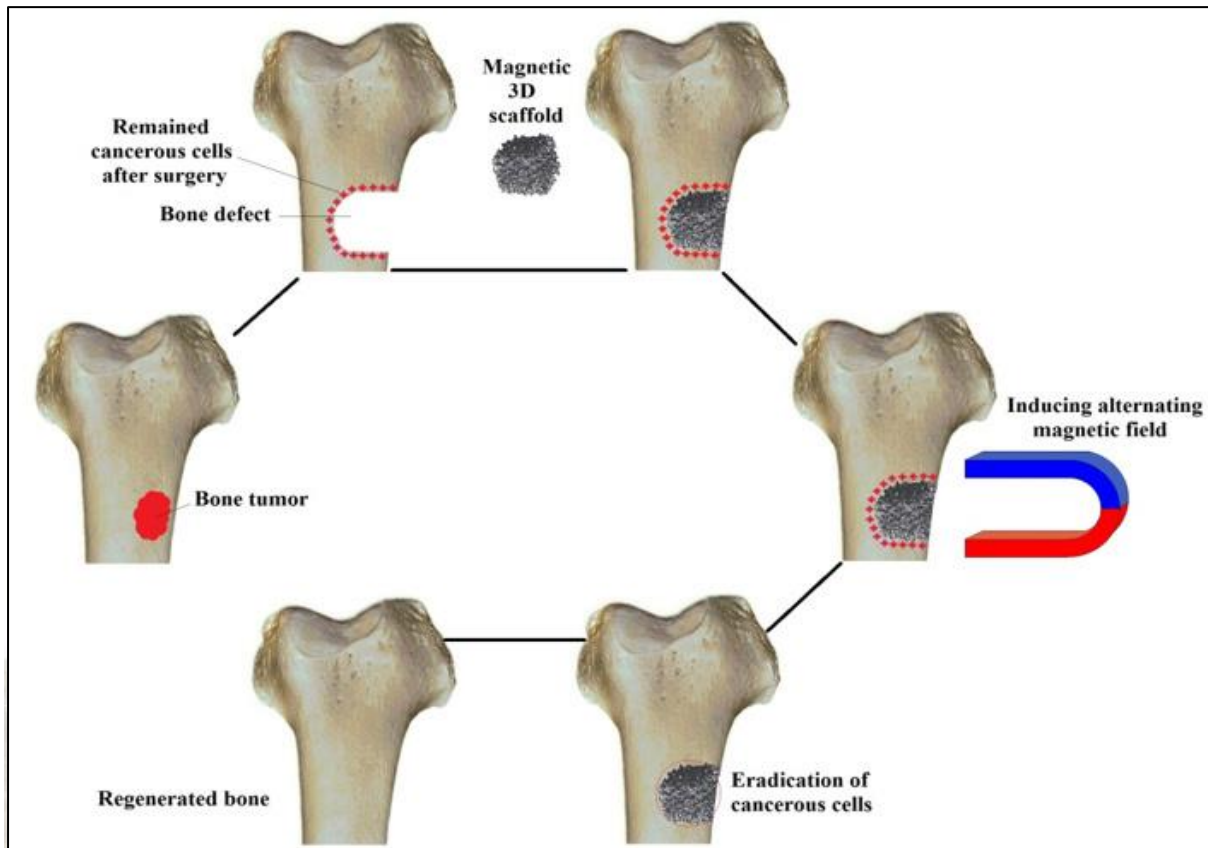


In addition to its biodegradability and biocompatibility, PLA also offers significant advantages in terms of manufacturability. Techniques such as 3D printing, electrospinning, and freeze-drying can be used to fabricate PLA scaffolds with complex geometries and controlled

porosity. 3D printing, in particular, has revolutionized the field by allowing for the creation of patient-specific scaffolds that are tailored to the exact shape and size of the bone defect. This personalized approach not only enhances the effectiveness of the treatment but also reduces the risk of complications and improves patient outcomes. Moreover, PLA can be functionalized with bioactive molecules, such as growth factors, peptides, or antibiotics, to further enhance its osteogenic potential and reduce the risk of infection.

However, despite its many advantages, the use of PLA in bone scaffolding is not without challenges. One of the main limitations is its relatively low mechanical strength compared to natural bone, which can limit its use in load-bearing applications. To address this, researchers are exploring strategies such as reinforcing PLA scaffolds with other materials, such as hydroxyapatite, a naturally occurring mineral in bone, or blending PLA with other polymers to improve its mechanical properties. Additionally, while PLA's degradation products are generally well-tolerated by the body, the accumulation of lactic acid can lead to

localized acidity, which may cause inflammation or impede cell growth in some cases. Efforts are underway to develop PLA composites or coatings that can neutralize the acidic by-products or to use PLA in combination with other materials that degrade more slowly and release neutral or alkaline by-products.



The future of PLA-based bone scaffolds is promising, with ongoing research focused on overcoming current limitations and expanding the range of applications. Advances in material science, coupled with innovations in manufacturing techniques, are expected to lead to the development of next-generation scaffolds that offer improved mechanical strength, controlled degradation, and enhanced biological functionality. These developments hold the potential to significantly impact the field of bone tissue engineering, offering new hope for patients with complex bone injuries or defects. As the technology continues to evolve, PLA-based scaffolds are likely to become a standard tool in the orthopedic surgeon's arsenal, providing a reliable and effective solution for promoting bone regeneration and healing.

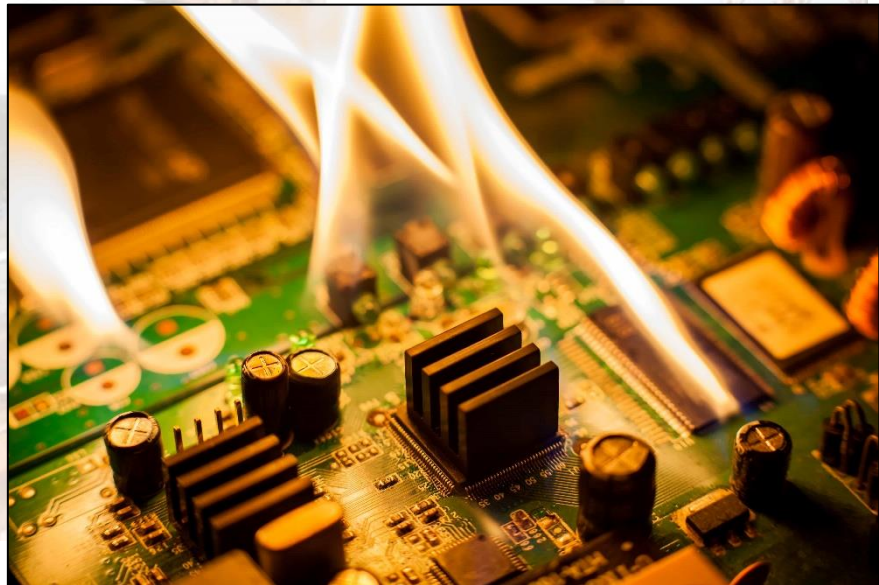
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**Written by: Anuraag Gilhotra (2102424), Sem VI**

# Thermal Management in Electronics

Thermal management in electronics is a critical aspect of modern device design, playing a vital role in ensuring the reliability, performance, and longevity of electronic systems. As electronic devices become increasingly powerful and compact, they generate more heat, which can lead to overheating if not properly managed. Overheating can degrade the performance of electronic components, shorten their lifespan, and even cause catastrophic failures. Effective thermal management involves the use of materials, technologies, and design strategies to dissipate heat away from sensitive components and maintain optimal operating temperatures. This is particularly important in high-performance applications such as computing, telecommunications, and automotive electronics, where maintaining a stable thermal environment is essential for the consistent performance of complex systems.

One of the primary methods of thermal management is the use of heat sinks, which are designed to increase the surface area available for heat dissipation. Heat sinks are typically made from materials with high thermal



conductivity, such as aluminum or copper, and are attached to heat-generating components to draw heat away and dissipate it into the surrounding air. In addition to heat sinks, thermal management also often involves the use of fans or other active cooling systems to enhance airflow and remove heat from the system. These cooling methods are commonly used in devices like computers, where central processing units (CPUs) and graphics processing units (GPUs) generate significant amounts of heat during operation.

Another important aspect of thermal management is the use of thermal interface materials (TIMs), which are applied between components and heat sinks to improve thermal conductivity. TIMs fill the microscopic gaps between surfaces, reducing thermal resistance and enhancing heat transfer. Materials such as thermal pastes, pads, and adhesives are commonly used as TIMs to ensure efficient heat dissipation. In more advanced systems, liquid cooling solutions are employed, where a liquid coolant circulates through the system to absorb heat and then passes through a radiator to release it into the air. Liquid cooling is particularly effective in applications where traditional air cooling is insufficient, such as in high-performance computing or overclocked gaming systems.

Moreover, advances in materials science are driving the development of new thermal management solutions. For example, graphene, a material known for its exceptional thermal conductivity, is being investigated for use in electronic cooling applications. Graphene-based thermal films and coatings have the potential to provide highly efficient heat dissipation in a variety of electronic devices, potentially revolutionizing the way heat is managed in the future. Additionally, research into nanotechnology and microfluidics is opening up new possibilities for cooling at the micro and nanoscale, which could be particularly beneficial in the next generation of miniaturized electronic devices.

The importance of thermal management extends beyond just individual components to the system level, where the arrangement of components, airflow design, and overall system architecture play crucial roles in heat dissipation.

In conclusion, thermal management in electronics is an essential discipline that underpins the performance, reliability, and safety of modern electronic systems. As electronic devices continue to evolve, the need for innovative and effective thermal management solutions will only grow. Advances in materials, cooling technologies, and system design are expected to drive the development of new approaches to heat dissipation, ensuring that electronic devices can operate at peak efficiency while maintaining safe operating temperatures. Whether in consumer electronics, high-performance computing, or large-scale data centers, effective thermal management will remain a key factor in the successful deployment of increasingly powerful and compact electronic systems.

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**Written by: Satish Verma (2237666), Sem IV**