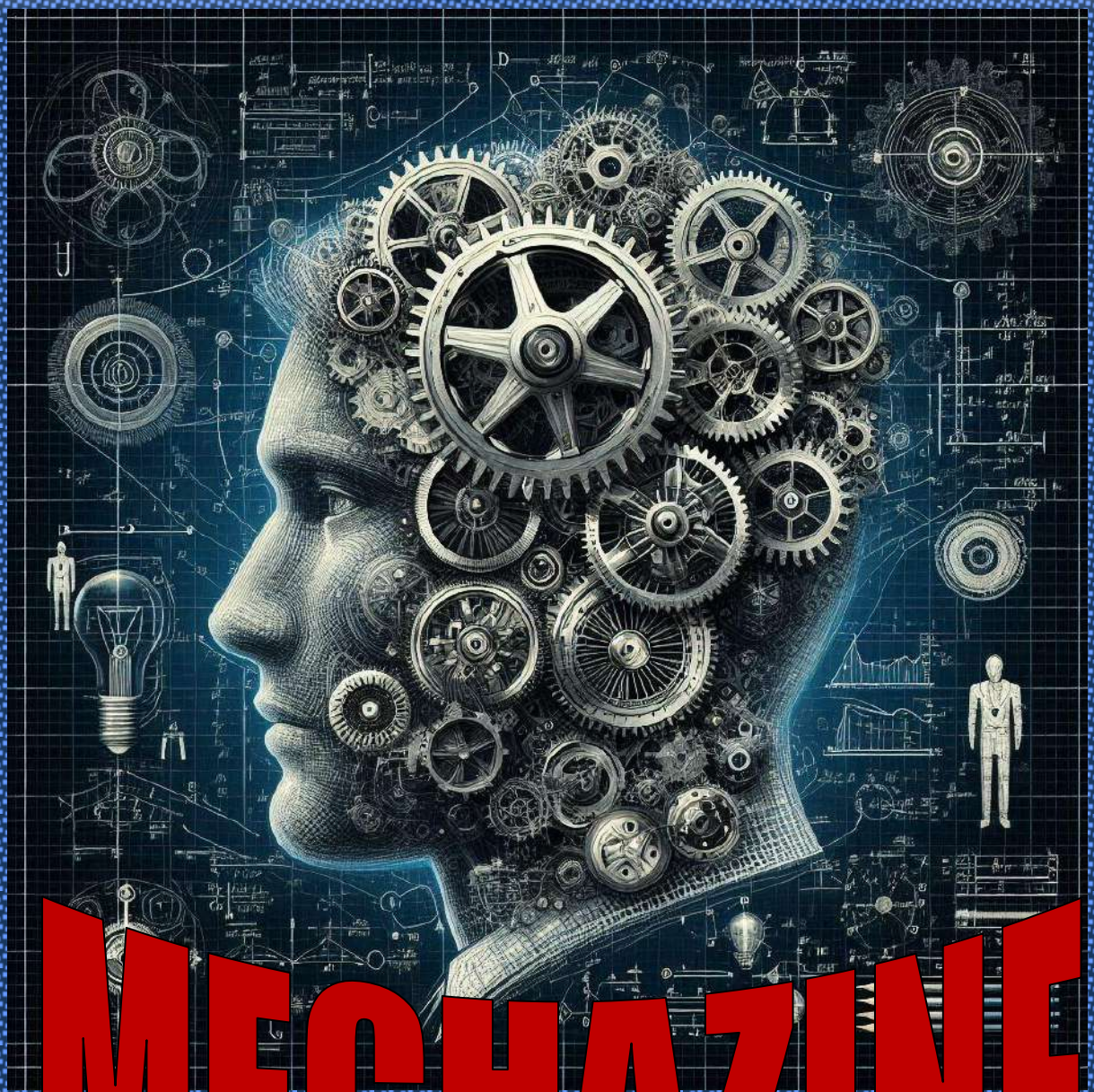
IPS Academy
INSTITUTE OF ENGINEERING & SCIENCE
Knowledge, skills and values



MECHAZINE

Department of Mechanical Engineering
Annual Magazine
2021-22

Letter from the Editors

Dear Readers,

It gives us great pleasure to present the 2021–2022 edition of the Department of Mechanical Engineering Magazine, ***Mechazine***. This magazine serves as a platform to showcase the creativity, technical knowledge, research interests, and achievements of our students, reflecting the academic excellence, innovation, and continuous learning culture of the department.

Mechanical engineering plays a vital role in modern technological development, contributing to fields such as manufacturing, energy systems, robotics, aerospace, and advanced materials. Through this magazine, we aim to highlight diverse knowledge areas and emerging technologies in mechanical engineering.

This edition includes student articles on topics such as the importance of mathematics in mechanical engineering, advanced composite materials in manufacturing, and the role of mechanical engineering in space exploration. It also presents departmental achievements, academic performances, research publications, placements, and higher education accomplishments, reflecting the hard work and dedication of our students.

We hope this magazine inspires students to enhance their technical knowledge, develop innovative ideas, and participate actively in research, technical writing, and innovative projects. We sincerely thank our respected **Principal Dr. Archana Keerti Chowdhary**, **HOD Dr. Amit Chandak**, faculty members, students, and all contributors for their support in making this magazine successful. We look forward to many more achievements and contributions in future editions of ***Mechazine.***

Editors…

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Editorial Board

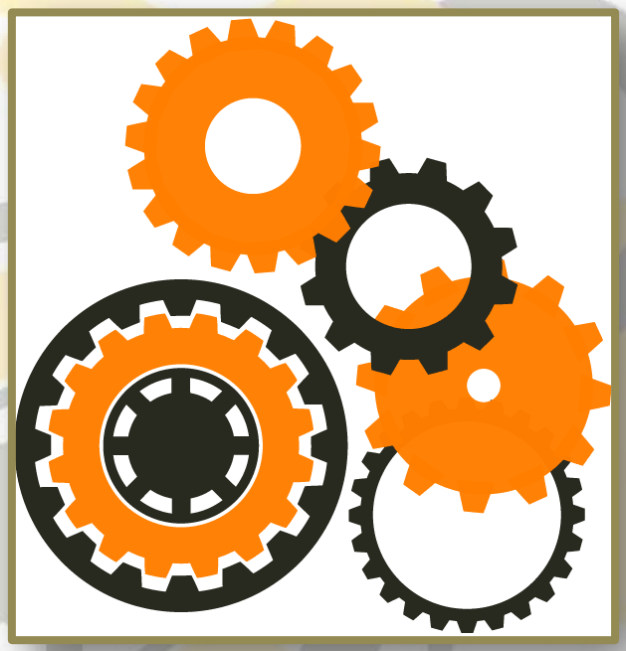
S. No.	Name of Student	Year
1.	Mr. Alex Louis	Final Year
2.	Mr. Gourav Undhaliya	Third Year
3.	Mr. Anirudh Mishra	Second Year
4.	Mr. Roshik Vyas	Second Year

Faculty Coordinators

1.	Mr. Kapil Patodi	Assistant Professor
2.	Mr. Pradeep Singh Hada	Assistant Professor

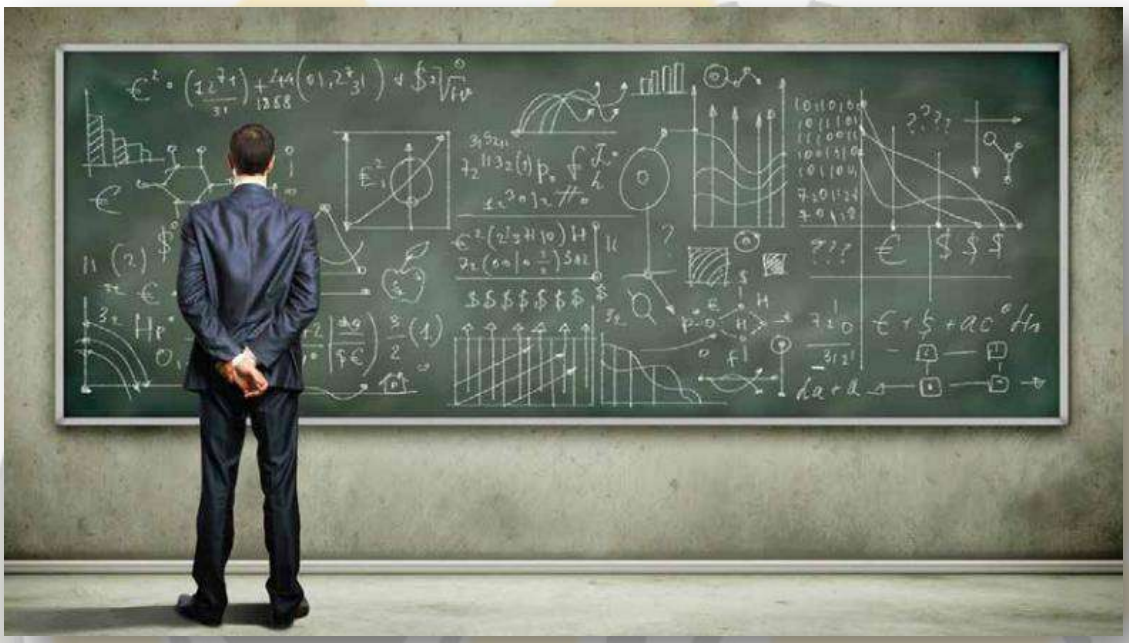
Content

STUDENTS ARTICLES



IMPORTANCE OF MATHEMATICS IN MECHANICAL ENGINEERING

When pursuing mechanical engineering courses, mathematics plays a major role in developing mathematical models, implementing solution algorithms for the models, and arriving at the solution. As a result, all mechanical engineering curricula require that students complete a significant number of mathematical courses before they start taking the engineering science and engineering courses. It is common knowledge that engineers must be proficient in many topics of mathematics such as linear algebra, numerical methods, and differential equations in order to tackle and solve real world engineering problems in their daily work.



In mechanical engineering there is vibrational mechanics which is the application of calculus for figuring out the velocity and acceleration of the vibrating object, while simultaneous linear and differential equations are used to find out the solution for the displacement of nodes in vibrations.

Engineering thermodynamics and heat transfer involve concepts on heat waves and gradients as explained by Laplacian operator, divergence and geometrical concepts for analyzing shape factors. Concept of logarithm is used for heat and temperature calculation, while ratios and proportion is used for ideal gas laws.

Now we come to the most important part - the fear of maths, which is faced by the majority of students. Be it Mechanical

engineering or any other science field, there will always be a topic or subject in which there is either the use of maths or problem solving skills. So to all students reading this article, whether you have taken up mechanical engineering either by choice or by chance, you will have to face the fear of maths and problem solving in this course. What I would suggest, going by personal experience, is that we must first get our basics strong. This step is even more important than actually solving the given problem.

Once we get our basics right, then we require these 3 P's: "Practice, Prepare and Produce"

Yes, Practice as much as you can. Because as the saying goes, "practice makes a man perfect". Prepare the topic well and Produce the desired results. In the end all I can say is that maths is not a subject which one can master in a day or two by reading. It is a subject that requires consistent effort. Practice every day, think every day, revise everyday and within 5–6 months, you will start loving maths to the core.

ASMIT JOSHI (II Year)

ADVANCED COMPOSITE MATERIALS IN MANUFACTURING

What Are Advanced Composite Materials? Composite materials are engineered combinations of two or more constituent materials with significantly different physical or chemical properties. The goal is to produce a material that exhibits superior characteristics than the individual components.

Advanced composites, often reinforced with high-performance fibers such as carbon, aramid (Kevlar), or glass in a polymer matrix, offer exceptional strength-to-weight ratios, corrosion resistance, thermal stability, and design flexibility.

Why Composites in Manufacturing? Conventional materials such as steel and aluminum have long dominated the manufacturing sector. However, industries today demand lightweight, high-performance, and sustainable solutions, especially in sectors like aerospace, automotive, marine, sports equipment, and renewable energy. Here's where advanced composites stand out:

- **Weight Reduction:**

Composite components can be up to 50% lighter than their metal counterparts, improving fuel efficiency and reducing emissions in vehicles and aircraft.

- **Strength and Durability:**

Despite being lightweight, these materials offer exceptional tensile strength, fatigue resistance, and longevity.

- **Corrosion and Environmental Resistance:**

Unlike metals, composites do not rust, making them ideal for marine, chemical, and outdoor applications.

- **Complex Geometry and Customization:**

Composites can be molded into intricate shapes, enabling innovative product designs without compromising performance. Applications in Modern Manufacturing

- **Aerospace Industry:**

Aircraft such as the Boeing 787 Dreamliner utilize over 50% composite materials by weight to reduce overall mass and enhance performance.

- **Automotive Industry:**

High-end and electric vehicles increasingly use carbon fiber composites for chassis and body panels to improve acceleration and efficiency.

- **Wind Energy:**

Wind turbine blades are primarily made from fiberglass and carbon fiber composites to withstand high-stress conditions.

- **Sports Equipment:**

Tennis rackets, bicycles, helmets, and even cricket bats are engineered with composites to enhance player performance and safety.

Challenges and the Road Ahead: Despite their advantages, composites come with challenges—such as high material costs, complex fabrication techniques, limited recyclability, and inspection difficulties. However, ongoing research is tackling these issues through innovations in additive manufacturing (3D printing of composites), bio-based resins, and automated lay-up processes.

Conclusion: Advanced composite materials are no longer futuristic—they are the present and the future of manufacturing. As industries evolve and demands for efficiency and sustainability increase, composites offer a promising pathway. For students and professionals in mechanical engineering, now is the time to embrace this exciting frontier and explore its full potential.

UTKARSH SHINDE (III Year)

ROLE OF MECHANICAL ENGINEERING IN SPACE EXPLORATION

Space exploration is one of the greatest achievements of modern science and engineering, and mechanical engineering plays a crucial role in making it possible. From the design of rockets and spacecraft to satellites, robotic systems, and thermal control systems, mechanical engineers contribute significantly to every stage of space missions. Mechanical engineering provides the fundamental knowledge required for designing, manufacturing, and

maintaining space systems that operate in extreme environments.

- **Rocket and Propulsion Systems:**

One of the most important contributions of mechanical engineering in space exploration is rocket propulsion. Mechanical engineers design rocket engines, fuel systems, combustion chambers, and nozzles. They study thermodynamics, fluid mechanics, and heat transfer to improve fuel efficiency and thrust generation. The success of any space mission depends on the performance and reliability of the propulsion system.

- **Spacecraft Structure and Materials**

Mechanical engineers are responsible for designing the structure of spacecraft and satellites. The spacecraft structure must be lightweight yet strong enough to withstand launch vibrations, aerodynamic forces, and extreme temperature variations in space. Engineers use advanced materials such as aluminum alloys, titanium alloys, and composite materials to achieve high strength-to-weight ratios.

"Mechanical engineers don't just build machines on Earth; they build machines that explore the universe."

- **Thermal Control Systems**

Temperature control is one of the biggest challenges in space because space has no atmosphere. Spacecraft are exposed to extremely high temperatures in sunlight and extremely low temperatures in shadow

regions. Mechanical engineers design thermal control systems such as heat pipes, radiators, and thermal insulation to maintain safe operating temperatures for equipment and instruments inside spacecraft.

- **Robotics and Space Mechanisms**

Mechanical engineers also design robotic arms, space rovers, and various deployment mechanisms used in satellites and space stations. These systems include gears, linkages, actuators, motors, and suspension systems. Space robotics plays a very important role in planetary exploration and space station operations where human presence is difficult or risky.

- **Manufacturing and Modern Technologies**

Modern space systems require high precision manufacturing and advanced technologies such as CNC machining, additive manufacturing (3D printing), and composite material fabrication. Mechanical engineers are involved in manufacturing complex components with high accuracy and reliability required for space missions.

- **Future Scope**

The future of space exploration includes reusable rockets, space tourism, Moon and Mars missions, space stations, and asteroid mining. Mechanical engineers will play a major role in designing space habitats, life support systems, interplanetary vehicles, and robotic exploration systems.

- **Conclusion**

Mechanical engineering is the backbone of space exploration. Mechanical engineers contribute to propulsion systems, spacecraft structures, thermal systems, robotics, and manufacturing technologies. As space exploration continues to expand, mechanical engineers will continue to play a vital role in exploring space and advancing technology for the benefit of humanity.

VISHESH LUHADIYA (IV Year)

IPS ACADEMY,

Institute of Engineering & Science, Indore

Department of Mechanical Engineering

Industrial Visit Report on

Air Cooled & Water Cooled Screw Chillers, Air Cooled Scroll Chillers, Air to Air & Water to Water Heat Pumps, Air to Air Scroll Heat Pumps, Thermal Energy Storage (TES) system

@ Kehems Technologies Pvt. Ltd. Indore

Date: -12/02/2022

Objectives of Activity:

1. To provide an exposure to students about practical working environment.
2. To develop skills in the application of theory to practical work situations.
3. To build a good communication skill with group of workers and learn to learn proper behavior of corporate life in industrial sector.
4. To study overall plant layout of HVAC system.

Outcomes of Activity:

1. To apply fundamental principles of engineering in industry.
2. To understand the use of contemporary techniques used in HVAC system.
3. To recognized all lead components and their functions comprising HVAC system.
4. To understand general plant starting and operating procedures.

Introduction: - A **chiller** is a machine that removes heat from a liquid via a vapor-compression or absorption refrigeration cycle. This liquid can then be circulated through a heat exchanger to cool equipment, or another process stream (such as air or process water). As a necessary by-product, refrigeration creates waste heat that must be exhausted to ambience, or for greater efficiency, recovered for heating purposes.

Kehems Technologies Pvt. Ltd. is an ISO 9001:2015 certified, professional Engineering Group that manufactures a comprehensive range of HVACR products in India.

Kehems began its journey as an engineering and contracting firm in the field of HVAC and Thermal Engineering in 1994 under the able leadership of its former Managing Director, Mr. D. K. Kemkar.

Kehems Technologies is a privately owned & managed engineering group with proficiency of Heating, Cooling & Energy Efficient Solutions in HVACR and allied industrial applications.

Founded with the commitment of providing continued customer satisfaction, the organization's consistent high performance over the years has earned it a reputation of being the nation's leading provider of customized, integrated, cost-saving energy solutions. With unmatched engineering strength and extensive experience in diverse areas of Thermal

Engineering, Kehems' team of highly qualified engineers utilize project-specific management and execution techniques to arrive at solutions of the highest quality, efficiency and reliability, in the shortest possible time.

Kehems' product range includes some of the finest best-in-class products in the HVAC industry, such as KRISCOOL Air Cooled & Water Cooled Screw Chillers, Air Cooled Scroll Chillers, KRISTHERM Air to Air & Water to Water Heat Pumps, Air to Air Scroll Heat Pumps, Thermal Energy Storage (TES) system and more.

Kehems believes '**Energy Saving is Responsible and Rewarding'** and on a daily basis with single-minded focus, puts into practice the idea of serving our clients better.

About Visit:-

ISHRAE Indore Chapter, IPS Academy, Institute of Engineering & Science, Mechanical Engineering Department, organized an Industrial visit at "**Air Cooled & Water Cooled Screw Chillers, Air Cooled Scroll Chillers, Air to Air & Water to Water Heat Pumps, Air to Air Scroll Heat Pumps, Thermal Energy Storage (TES) system @ Kehems Technologies Pvt. Ltd. Indore**", on February 12, 2022.

Thirty Two Mechanical Engineering Students from II, III and IV year and Five Faculty Members of Mechanical Engineering Department visited to industry to interact with the professionals working there along with having an interactive informative session with Ms. Kshama Jain Managing Director Kehems Technologies Pvt Ltd. and Mr. Deepak Singh HR Kehems Technologies who has great experience working in the field of HVAC (Heating, Ventilation & Air Conditioning) Manufacturer of Air Conditioning and Heating Equipments. The expert expresses their knowledge about the Heat Pumps and Screw Chillers and their working principle.

The session was concluded with Question-Answer session. Many of the students asked different questions based on working and manufacturing of chillers and pumps, the expert cleared all the doubts and myths, which was in students mind about the technologies in HVAC sector. All students were satisfied after the session.

At the last Mr. Sharad Shukla (Student Chair) invited for the vote of thank to ISHRAE Indore for organizing such a nice activity.

Visit Picks:-

Departmental News & Updates

Students Achievements

1) Paper Published in Journals International

S. No.	Name	Topic / Title of the Paper	Name of Journal (refereed)	Year of publish (with month)
1	Rohit Singh Baghel	Prototype of Teleoperated Unmanned Ground Vehicles for Military Applications	International Journal of Mechanical Engineering	June 2022
2	Rohit Singh Baghel	Review of Research: Unmanned Ground Vehicles	Journal of Xi'an University of Architecture & Technology	2022

2) List of Students Who Got First/Second Position (Academics) (UG)

S. No	Name of Student	Year	Position	Percentage
1	Shiv Sen	I	First	9.05
2	Goutam Goswami	I	Second	8.75
3	Roshik Vyas	II	First	9.31
4	Anirudh Mishra	II	Second	9.08
5	Utkarsh Shinde	III	First	9.43
6	Gourav Undhaliya	III	Second	9.17
7	Rahul Kumar Lakshkar	IV	First	8.49
8	Ritesh Singh	VII/IV	Second	8.47

3) List of Students Who Got First/Second Position (Academics) (PG)

S. No	Name of Student	Year	Position	Percentage
1	Muskan Joshi	II	First	9.28
2	Rohit Singh Baghel	II	Second	9.13
3	Abhishek Malviya	I	First	7.80
4	Manish Kumar Bharti	I	Second	7.55

4) Placement Details (2017-2021 Batch)

S.No	Name of Student	Company	Package
1	Akshat Gupta	Liu Gong India	2.4 LPA
2	Ujjawal Chhatri		
3	Pushpendra Gupta		
4	Prajjwal Sharma		
5	Tushar Dange	Acade Craft	3.00 LPA
6	Rahul Jha		
7	Kaushal Ahirwar	Motherson Sumi	
8	Vaibhav Ghosh		
9	Arun Paliwal		
10	Tanmay Sharma	Accanture	4.5 LPA
11	Aayam Rai	TCS	3.6 LPA

5) Higher Education Details

S. No	Name of Student	Specialization	College / University
1	Akash Singh	M.Tech.	IIT Kanpur