Mechanizer 2.0

Department of Mechanical Engineering

Dream Institute of Technology

Volume

2

Session 2022-23

Editors: Mr. Sk. Sabir (Asst. Prof.)

Mr. Shaibal Sahoo (Asst. Prof.)

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EDITOR’S DESK

We are honored to be a part of this as the editorial team of our departmental magazine, ***"MECHANIZER 2.0."*** Every member enjoys and feels responsible for creating the departmental newsletter, which is unmatched. One of the issues we've faced is regularly reinventing the magazine to appeal to a wider range of professors and students. We are pleased to be a part of the newly formed "Literature Society of Mechanical (LSM)" with which the magazine is now affiliated. We'll be making some exciting news, but more importantly, you may participate in the LSM events by contributing essays, artwork, paintings, photographs, and other creative works. In order to recognize and develop the brilliance of the kids, we will be making some exciting announcements. We also ask that you actively participate in the LSM activities at this time of warming. We value your input much because the goal of both Mechanizer 2.0 and LSM's project has been to enhance students' abilities and knowledge. Come to us if you want assistance if you want to change the department and the lives of the students. Many young aspirants who have the capacity to benefit our society as entrepreneurs, businessmen, technical wizards, and creative scientists are concealed within our department but have yet to reach their full potential. Your soft talents are what LSM is here to help you with. Your abilities and confidence are certain to increase as a result of the scheduled activities, events, and workshops. We feel obligated to express our gratitude to our beloved Chairman, **Ms. Susmita Sarkar**, our esteemed Principal, ***Dr. Dipankar Sarkar***, our Department Head, ***Dr. Priti Shukla***, faculty members ***Mr. Sk Sabir*** and ***Mr. Shaibal Sahoo,*** and advisors who have been extremely supportive throughout this journey and many more to come. Their ongoing assistance has increased our expectations, which has in fact given us incentive. Additionally, we would like to thank our alumni ***Mr. Sandip Hati*** and ***Mr. Pritam Mandal*** for putting up ***Mechanizer 2.0*** the first time and inspiring us to continue it to this point.

FOUNDER'S SPEECH

Late Shri Shankar Prosad Sarkar

I founded this research-driven engineering institute as a result of my 50 years of experience in equipment research and development for reputable engineering colleges around the nation. We founded Dream Institute of Technology in 2006 with the vision of building an academic foundation for social, cultural, scientific, economic, and technical advancement.

We promote uniqueness, imagination, and innovation and work to instill these principles in ambitious professionals. Our philosophy is centered on the student and emphasizes project-based learning and inquiry.

My recommendation for students who want to succeed is to pick up skills geared toward the workplace and learn how to take advantage of the tools and possibilities offered by the college.

At Dream Institute of Technology, we take great pleasure in the fact that our students obtain a top-notch education by adhering to highly strict teaching and learning standards. Our excellence extends beyond the classroom, as we also play a significant role in organizing conferences, workshops, seminars, guest lectures, and other extracurricular activities.

The state-of-the-art DIT infrastructure creates the ideal environment for a top-notch teaching and learning environment when combined with the newest technology best practices. The "Dream Institute of Technology" is now one of the top universities in the state of West Bengal thanks to all of your desires. Dedication, research, education, advancement, and motivation are the pillars of our success.

Chairperson's Message

Ms. Susmita Sarkar

The goal of Dream Institute of Technology is to give students studying engineering a solid technological foundation. Over and above the university-defined curriculum, we convey information that is skill-based and industry-driven. The wide technical perspective that students need to thrive in this cutthroat industry will be developed as a result.

We always promote student-faculty collaboration, student reciprocity and cooperation, active learning, rapid feedback, and experiential learning outside of the classroom. Dream Institute of Technology teaches students effective learning techniques that enable them to retain knowledge accurately, recall it when needed, and apply it successfully in a range of contexts.

In order to develop the habit of arriving on time for work, we encourage students to routinely attend their college classes. In addition to information, discipline is crucial for everyone to thrive professionally. Maintaining discipline on the college campus is a top goal at Dream Institute of Technology.

Every student at our institution is taught that there is no quick path to success. With the help of the committed faculty members at our institute, I feel honored to be a part of this organization and aim to ignite the intellectual passions of all of our students.

PRINCIPAL'S MESSAGE

Prof. (Dr.) Dipankar Sarkar

Modern R&D is increasingly being conducted in India. In 2020, India will need a substantial skill pool for a variety of fields, including manufacturing, agricultural science, and nanotechnology in addition to information technology. Our students must be equipped to handle these new challenges. The "Dream Institute of Technology" is one of India's finest engineering institutions, and it is now situated in West Bengal.

By offering attractive employment prospects with prestigious employers like TCS, Capgemini, Infosys, Reliance, Accenture, Wipro-Spectra Mind, Satyam Computers, and Cognizant, among others, the institute has quickly established a place for itself. Our well-equipped computer labs, central computer center, and departmental labs prepare students to become top engineers in both the core industries and the field of software engineering.

Dream Institute of Technology, a state-of-the-art engineering institute provides well-equipped workshops and advanced learning resources. From a modest beginning in July 2006, the Dream Institute of Technology made a pledge to create the ideal environment for young, fresh, talents to realize and optimize their potentials. We facilitate students to develop a symbiotic relationship between the community, society, and the institution.

India is quickly becoming a popular location for cutting-edge R&D. India will require a sizable talent pool in 2020, not just in information technology but also in other industries like manufacturing, agricultural science, and nanotechnology. Our pupils need to be prepared to take on these new difficulties. One of India's top engineering schools, "Dream Institute of Technology" is now located in West Bengal.

FROM HOD'S DESK

Mechanizer 2.0, the official megazine of the Mechanical department of Dream Institute of Technology, initiated first by our prodigious alumni, is now carried by the vigor of the Literature Society, **LSM.** Sincere congratulations to the student members to have taken it intriguingly, keeping in view, the prospects of the fresher's.

To articulate on the department, we have ten faculty, 2 doctorates with different specializations, one experienced professors. Amongst this, two faculty are pursuing Ph.D.

The department's consistent placement record has been so evident. It is felicitous that the department has an official MoU signed with EEQUATE, which provide training to faculty member regarding upgraded teaching skills.

Also, training for the GATE exam is carried out and guidance towards career development is thrown light on. Apart from this, Keeping in view the importance of profile building and research oriented guidance for the students, we have a team of enthusiastic faculty members:

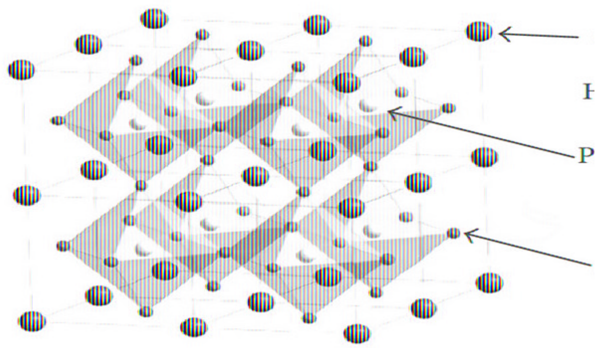
Dr. N. C. Das (Prof.)
Dr. Priti Shukla (Asso. Prof. and Head)
Mr. Abhijit Bhowmik
Mr. Sourav Saha
Mr. Akarshan Mukherjee
Mr. Shaibal Sahoo
Mr. Milan Maity
Mr. Farid Hussain
Mr. Sk. Sabir
Mr. Mofijul Islam

- Dr. PRITI SHUKLA
ASSOCIATE PROFESSOR AND HEAD
DEPT. OF MECHANICAL ENGINEERING

Perovskite Solar Cell

Pervoskite Solar Cell (PSCs) based on organic and inorganic hybrid halide.

Perovskite materials used in solar cells are a kind of organic-inorganic metal halide compound with the perovskite structure, in which Group A (methylammonium, CH_3 , MA^+, or formamidinium, , FA^+) is located in the vertex of the face-centred cubic lattice, and the metal cation B



Halide perovskites are a family of materials that have shown potential for excellent light absorption, charge-carrier mobilities, high performance and low production costs in solar cells. The name “perovskite” comes from the diminutive for their crystal structure.

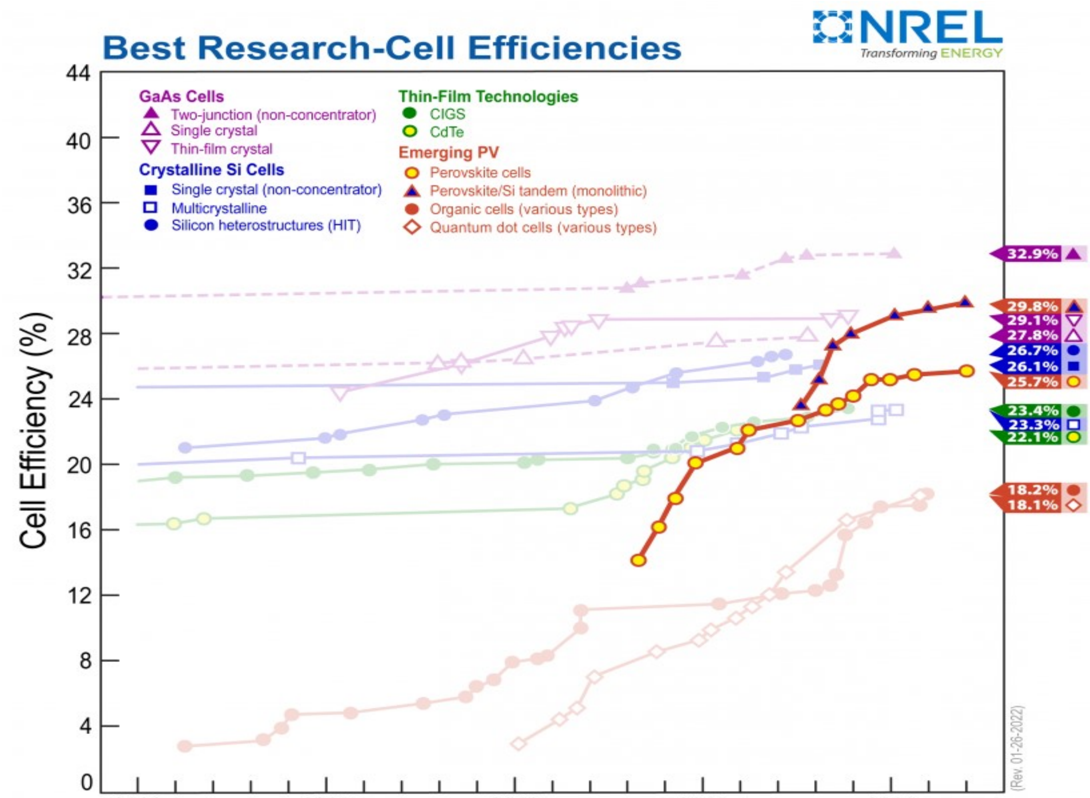
Perovskite solar cells have shown significant progress in recent years with rapid increases in efficiency, from reports of about 3% in 2009 to over 25% today. While perovskite solar cells have become highly efficient in a very little time, a number of challenges continue before they can become a competitive commercial technology.

STABILITY AND DURABILITY

Perovskite solar cells have verified competitive power conversion efficiencies (PCE) with potential for higher performance, but their stability is limited compared to leading photovoltaic (PV) technologies. Perovskites can decompose when they react with moisture and oxygen or when they spend extended time exposed to light, heat, or applied voltage. To rise stability, researchers are studying degradation in both the perovskite material itself and the surrounding device layers. Enhanced cell durability is critical for the development of commercial perovskite solar products.

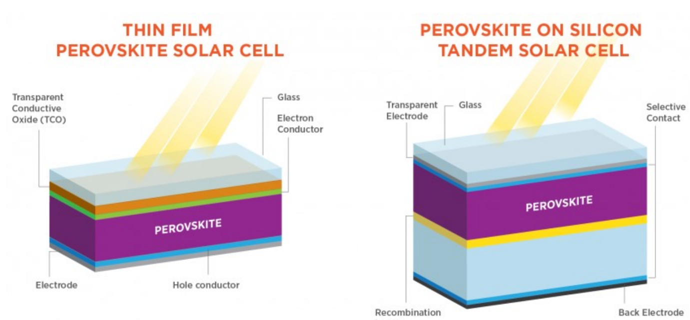
POWER CONVERSION EFFICIENCY AT SCALE

In small-area lab devices, perovskite PV cells have exceeded almost all thin-film technologies (except III-V technologies) in power conversion efficiency, showing rapid improvements over the past five years. For widespread deployment of perovskites, maintaining these high efficiencies while achieving stability in large-area modules will be necessary. Continued improvement in efficiency in medium-area modules could be valuable for mobile, disaster response, or operational energy markets where lightweight, high-power devices are critical.



Efficiency records for perovskite PV cells compared to other PV technologies, with current records of 25.7% for single junction perovskite devices and 29.8% for tandem perovskite-silicon devices (as of January 26, 2022).
National Renewable Energy Laboratory

Perovskites can be modified to respond to different colours in the solar spectrum by changing the material composition, and a variety of formulations have validated high performance. This flexibility allows perovskites to be combined with another, differently altered absorber material to deliver more power from the same device. This is known as a tandem device architecture. Using multiple PV materials enables tandem devices to have potential power conversion efficiencies over 33%, the theoretical limit of a single junction PV cell. It is also possible to combine two perovskite solar cells of different composition to produce a perovskite-perovskite tandem. Perovskite-perovskite tandems could be particularly competitive in the mobile, disaster response, and defense operations sectors, as they can be made into flexible, lightweight devices with high power-to-weight ratios.

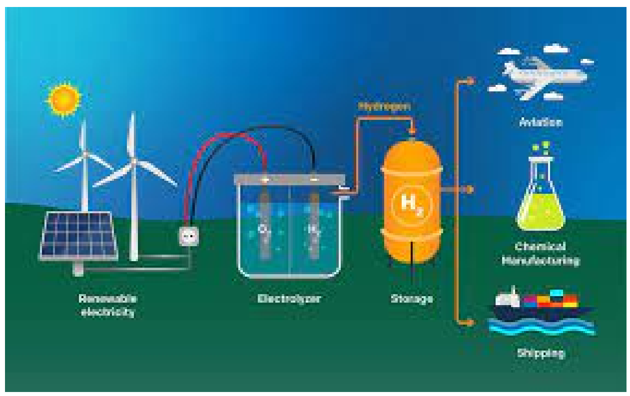


Compiled by
Dr. Priti Shukla
Head of Mechanical Department

Harnessing Green Hydrogen Fuel: A Sustainable Shift in Mechanical Engineering

In an era where sustainability takes center stage, the mechanical engineering field is witnessing a transformative shift towards the utilization of green hydrogen fuel. As a zero-emission energy carrier, green hydrogen is poised to revolutionize industries, and its application holds profound implications for mechanical engineering.

Green hydrogen, produced through electrolysis powered by renewable energy sources, presents an eco-friendly alternative to traditional fossil fuels. Mechanical engineers are at the forefront of this transition, leveraging their expertise to develop hydrogen fuel cells and combustion technologies that efficiently convert green hydrogen into mechanical work.



From powering industrial machinery to fueling transportation systems, green hydrogen demonstrates its versatility in meeting diverse energy demands. Mechanical engineers are tasked with designing and optimizing hydrogen storage and delivery systems, ensuring seamless integration into existing infrastructures.

Embracing green hydrogen also bolsters the circular economy by utilizing excess renewable energy for hydrogen production, mitigating energy waste. As mechanical engineering aligns with sustainable practices, engineers are pioneering advancements that minimize environmental impact while maximizing efficiency.

Incorporating green hydrogen fuel into mechanical engineering not only addresses environmental concerns but also opens doors to innovative research, design, and implementation. This transition underscores the pivotal role that mechanical engineers play in shaping a greener, more sustainable future.

Compiled By
Mr. Sk Sabir
Assistant Professor
Department of Mechanical Engineering

Precision Unveiled: Exploring the Realm of Micro-Machining in Mechanical Engineering

In the world of mechanical engineering, where precision reigns supreme, the emergence of micro-machining has carved a niche that speaks volumes about the field's evolution. Micro-machining, the art of fabricating intricate structures on a minuscule scale, has transcended boundaries and opened up a realm of possibilities that were once considered beyond reach.

At its core, micro-machining involves the use of advanced techniques, tools, and technologies to produce components with dimensions in the micrometer range. This precision-driven approach finds applications in diverse industries, from electronics and medical devices to aerospace and automotive sectors.

The heart of micro-machining lies in its capacity to generate complex geometries and features on materials with exceptional accuracy. Mechanical engineers, armed with expertise in materials science, mechanics, and cutting-edge software, push the boundaries to design micro-components that exhibit exceptional performance characteristics.

One of the notable achievements of micro-machining is its contribution to the development of micro-electromechanical systems (MEMS) and nano-electromechanical systems (NEMS). These systems are integral to various devices, from sensors and actuators to accelerometers and inkjet print heads, ushering in a new era of miniaturization and efficiency.

However, the challenges in micro-machining are as intricate as the components themselves. Dealing with the inherent fragility of micro-scale structures, managing thermal effects, and overcoming tool wear are just a few hurdles that mechanical engineers adeptly tackle through innovative methodologies and materials.

In conclusion, micro-machining is a testament to the ingenuity of mechanical engineers who navigate the complexities of the small scale to create solutions that drive progress in countless industries. As technology continues to evolve, so does the field of micro-machining, promising a future where precision knows no bounds. Mechanical engineering, through the lens of micro-machining, is etching its mark on the world, one meticulously crafted micro-component at a time.

By MD Farid Hossain
Assistant Professor
Department of Mechanical Engineering

BEST PROJECTS

Project Title: Advancement of Abrasive Jet Machining

Project Members: Soumyadip Dutta, Pritam Mandal, Ektiyer Rahaman Mollick and Bhaskar Bhaumick

Guide: Mr. Sourav Saha

Abstract: The AJM Will Chiefly Be Used To Cut Shapes, Drill Holes And De-Burr In Hard And Brittle Materials Like Glass, Ceramics Etc. In This Project, A Model Of The Abrasive Jet Machine Was Designed Using CAD Packages Like Autocad And CATIA.

Description: Abrasive Jet Machining (AJM) is the process of material removal from a work piece by the application of a high speed stream of abrasive particles suspended in a gas medium from a nozzle. The material removal process is mainly caused by brittle fracture by impingement and then by erosion. The machine was fabricated in the institute workshop with convectional machine tools like arc welding machine, hand drill, grinding machine using commonly available materials like mild steel sheet and rod, aluminum sheet, glue, polythene sheet ,glass fiber which are commonly available in the local market.

Project Title: "Mechanical Scissor Lift"

Project Members: SANDIP HATI (UNIVERSITY ROLL NO-20900719003)

SAHIL DOPTARY (UNIVERSITY ROLL NO-20900719004)

Guide: MR. ABHIJIT BHOWMIK; MR. SOURAV SAHA

Abstract: The design and study of a scissor lift mechanism for effective vertical transportation in commercial and industrial applications are presented in this thesis. In many different industries, including construction, warehousing, and maintenance, the scissor lift mechanism is essential for the safe and controlled elevation of heavy items. The goal of the research is to improve the mechanical design of the scissor lift by taking into account elements like load capacity, stability, operating efficiency, and safety. The study examines the implications of several characteristics, such as material choice, geometry, and actuation methods, on the overall performance of the lift system through in-depth analysis and simulations. The outcomes show that a reliable scissor lift mechanism that satisfies industry standards has been successfully developed. The results of this study help improve the ergonomics, safety, and productivity of scissor lifts, which benefits the workplace in general. The outcomes show that a reliable scissor lift mechanism that satisfies industry standards has been successfully developed.

Description: The use of mechanical scissor lifts has become increasingly prevalent in various industries due to their ability to efficiently lift and transport heavy loads. These lifts offer a safer and more controlled alternative to traditional lifting methods. Understanding the design principles and performance characteristics of scissor lifts is crucial for optimizing their functionality and ensuring workplace safety. The capacity of mechanical scissor lifts to effectively lift and carry heavy items in a regulated manner has led to an increase in their application across a variety of industries. These lifts provide improved maneuverability and stability over conventional lifting techniques while being safer and more flexible.

COMPILED BY
SANDIP HATI
III MECHANICAL

REVOLUTION IN ENGINEERING MATERIALS - COMPOSITE MATERIALS

A composite material (or just composite) is a mixture of two or more materials with properties superior to the materials of which it is made. Many common examples of composite materials can be found in the world around us. Wood and bone are examples of natural composites. Wood consists of cellulose fibers embedded in a compound called lignin. The cellulose fibers give wood its ability to bend without breaking, while the lignin makes wood stiff. Bone is a combination of a soft form of protein known as collagen and a strong but brittle mineral called apatite. Humans have been using composite materials for centuries, long before they fully understood the structures of such composites. The important building material concrete, for example, is a mixture of rocks, sand, and Portland cement. Concrete is a valuable building material because it is much stronger than any one of the individual components of which it is made. Interestingly enough, two of those components are themselves natural composites. Rock is a mixture of stony materials of various sizes, and sand is a composite of small-grained materials. Cutting wheels designed for use with very hard materials are also composites. They are made by combining fine particles of tungsten carbide with cobalt powder. Tungsten carbide is one of the hardest materials known, so the composite formed by this method can be used to cut through almost any natural or synthetic material.

High-performance composites are composites that perform better than conventional structural materials such as steel and aluminium alloys. They are almost all fiber-reinforced composites with polymer (plastic like) matrices. The fibers used in high-performance composites are made of a wide variety of materials, including glass, carbon, boron, silicon carbide, aluminium oxide, and certain types of polymers. These fibers are generally interwoven to form larger filaments or bundles. Thus, if one fiber or a few individual fibers break, the structural unit as a whole—the filament or bundle—remains intact. Fibers usually provide composites with the special properties, such as strength and stiffness, for which they are designed. In contrast, the purpose of the matrix in a high-performance composite is to hold the fibers together and protect them from damage from the outside environment (such as heat or moisture) and from rough handling. The matrix also transfers the load placed on a composite from one fiber bundle to the next. Most matrices consist of polymers such as polyesters, epoxy vinyl, and bismaleimide and polyimide resins. The physical properties of any given matrix determine the ultimate uses of the composite itself.

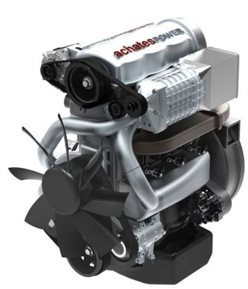
Mr. ABHIJIT BHOWMIK
ASSISTANT PROFESSOR
MECHANICAL DEPARTMENT

POLAR BEARS GOING STEALTHY

Polar bears keep warm due to a thick layer of blubber under the skin. Thermal cameras detect the heat lost by a subject as infrared, but polar bears are experts at conserving heat. The bears keep warm due to a thick layer of blubber under the skin. Add to this a dense fur coat and they can endure the chilliest Arctic day. Thus, polar bears are nearly undetectable by infrared cameras.

ACHATES POWER
FUNDAMENTALLY BETTER ENGINES

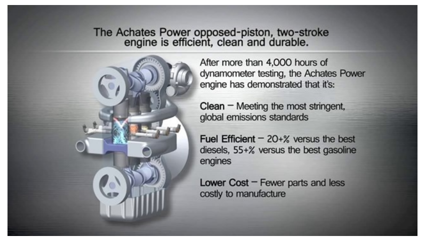
Internal Combustion Engines in cars may be on their way out, but experts agree it will take few decades before electric-powered vehicles become dominant. Meanwhile, the existing gas and diesel engines can be made more efficient and less polluting. With a $9 million grant from the U.S. Department of Energy, a U.S. –based company is using an old technological concept to build a power train that is 50 percent more fuel –efficient and just as powerful as conventional engines. This engine looks like it has only three pistons; but in fact, it has six, sharing only three cylinders. With the help of modern technology California-based Achates Power has given new life to the concept of opposed –piston engine, mostly abandoned after the Second World War.



Achates Engine

"With the opposed piston engine, you're able to achieve the efficiency of a much larger engine in a much smaller package," said Fabien Redon of Achates Power. An opposed piston moves against each other in the cylinder, compressing the fuel-air mixture, which self-ignites, pushing the piston apart, generating power. Exhaust gases escape through ports in the cylinder walls. Stripped of many conventional engine parts, the opposed –piston engine is inexpensive and simple to manufacture.

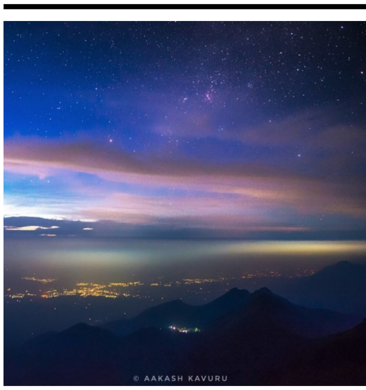
"We make sure that we do not over scavenge and achieve a very good efficiency, so that unburned hydro-carbons and the emissions are reduced to a great extent. This combustion strategy has some difficulties and weaknesses at low loads, because it

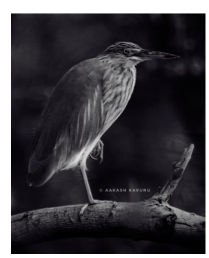


needs a certain level of temperature inside the combustion chamber to make sure that the gasoline gets ignited," said Redon. Larger opposed –piston engines have long been used for military and other applications. But developing them for consumer vehicles was not easy. Achates Power, together with Argonne National Laboratory and Delphi Automotive, say they are sure they will overcome the obstacles, and by 2018 will have a 50 percent more efficient three-liter three-cylinder engine that will be suitable for passenger cars and trucks

PRITAM MANDAL

IV MECHANICAL





Photography by Aakash Kavuru

List Of Industry Internship/Summer Training

Pass out Batch-2021-22

Department Of Mechanical Engineering

Dream Institute of Technology, Kolkata.

Sl. No.	Training Organization Name	No of Students Attended
1	AUTO DESK	25
2	NATIONAL INSTITUTE OF INDUSTRIAL TRAINING	6
3	FORCE MOTOR LTD.	1
4	MSME	1
5	KISWOK INDUSTRIES PVT. LTD.	1
6	KEERTIKA TRAINING ACADEMY	1
7	MARAICA INDUSTRIES	1
8	MAURYA MOTOR PVT LTD	1
9	WEST BENGAL TRANSPORT COOPORATION	1
10	SOUTHEASTERN RAILWAY	3
11	APOLLO ENGINEERING	1
12	BANGIYA INDUSTRY INSTITUTE COLLABORATION ASSOCIATION	2
13	WEBSOL ENERGY SYSTEM LTD	1
14	ABS FUJITSU GENERAL PVT LTD	1
15	RE ACADEMY	1
16	MCTI PVT LTD	1
17	SIMPLEX INFRASTRUCTURE LTD	1
18	EXIDE INDUDTRIES LTD	1
19	KGN REFRIGERATION	1
20	BIRLA JUTE CORPORATION	1
21	TATA STEEL LTD.	1
22	RESHMI GROUP	1
23	BIG BULL TRADER PRIVATE LIMITED	1
24	CRESCENT FOUNDRY	1

STAFF COORDINATOR

Mr. Sk Sabir
Asst. Prof. (ME Deptt.)

Mr. Shaibal Sahoo
Asst. Prof. (ME Deptt.)

Associate Editors:

1. Sandip Hati
2. Sahil Daptary
3. Sanju Dey
4. Debnarayan Parua

THE CREW

"The innate knowledge intertwined with one's wisdom and skills, differentiates an engineer from everyone else. Let us be ambitious to emerge as true engineers."

SANDIP HATI (Fourth YEAR)

"The space between the mouth and the power of the nib, is ever omnipotent and can make wonders. There we go."

SAHIL DOPTARY (Fourth YEAR)

"Team work- that is the key. Learn and let learn. The cognizance you achieve is extraordinary "

SANJU DEY (THIRD YEAR)

"Work fervently and smartly. Never compromise for scruples. When you turn back– you will feel a self-satiation. It's an achievement indeed. "

DEBNARAYAN PARUA (THIRD YEAR)