MECHANISTIC MARVEL

4th Edition

JUNE2023

BUILDERS ENGINEERING COLLEGE

An Entity of Kangeyam Group of Institutions

Approved by AICTE, New Delhi | Affiliated to Anna University, Chennai | ISO 9001:2015 Certified Institution | Accredited by NAAC | Recognized 2(f) status by UGC

EBET Knowledge Park, Nathakadaiyur, Kangeyam, Tirupur - 638 108, Tamil Nadu.

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PREFACE

The e-magazine is a quarterly magazine published by the mechanical department. In this edition poems from students, research papers from the faculty and articles on latest technological advancement are included. In addition to it magazine also provides space for the inclusion of various technical and cultural activities happened in the department during past three months.

The previous edition of this magazine was first initiative of the department towards publishing of department activities in electronic form and hence some typing /miscellaneous errors remained. This edition was far more crucially scrutinized and checked by some of the best faculties not of this department but also from through the college.

Hope this magazine becomes the reflection of mechanical department and will cater all the needs of readers.

Thank you!
Mr.C.SIVARAJ
Assistant Professor
Department of Mechanical Engineering
BEC.

CHAIRMAN’s MESSAGE

THIRU. N. RAMALINGAM
Chairman – BEC

Erode Builder Educational Trust (EBET) has been founded by a group of like-minded visionaries who felt the need for an apex academic and professional educational institution, committed to deliver through a number of institutes, schools and colleges, high standards of academic excellence for enriching lives through value based education. Builders Engineering College (Formerly Erode Builder Educational Trust’s Group of Institutions) was founded in the year 2009 by EBET.

As world evolves, all the people need to evolve for survival. To be evolved we provide a holistic environment and create opportunities. Our Institution attained the richest fame by the world-class Infrastructure, technological advancements, and human resources in a short span. The objective is to educate the rural young students to reach the dream destination. The tremendous support from all the stakeholders helped us to be successful in our vision.

CEO's MESSAGE

Dr. C. VENKATESH
Chief Executive Officer

Students learn through academic and experiential learning. As a teacher, instilling the passion for learning lies in our hands. Let us travel together to attain the pinnacle of success.

BEC is approved by AICTE, New Delhi and affiliated to Anna University, Chennai. It is accredited by NAAC with **A+ (CGPA 3.36)** . The campus is eco-friendly and equipped with excellent infrastructure, qualified and well experienced faculty members who strive hard to attain academic excellence in higher education by empowering students with knowledge, wisdom and experience.

PRINCIPAL's MESSAGE

Dr.S.RAMKUMAR
Principal

It gives me an immense pleasure in welcoming you to Builders Engineering College (BEC), Nathakadaiyur, Tirupur 638 108. BEC (Formerly Erode Builder Educational Trust's Group of Institutions) was founded in the year 2009 by Erode Builder Educational Trust (EBET) with a vision to impart quality higher education to rural aspirants through innumerable institutions. It has been promoted by a group of likeminded visionaries with the unique objective of offering value based education to the students for a prosperous career.

BEC is approved by AICTE, New Delhi and affiliated to Anna University, Chennai. It is accredited by NAAC with A+ (CGPA 3.36) . The campus is eco-friendly and equipped with excellent infrastructure, qualified and well experienced faculty members who strive hard to attain academic excellence in higher education by empowering students with knowledge, wisdom and experience.

HoD's MESSAGE

Mr.S.RAVI
Head of Mechanical Engineering Department

The Department of Mechanical Engineering was started in the year 2009 with an intake of 60 students in the UG programme. The department aims to develop mechanical engineers who are innovative, entrepreneurial and equipped to become global leaders in research and technology. The objective of the department is to graduate individuals who can design systems, components or processes to meet desired needs within the realistic constraints such as economic, environmental, social, health, safety and manufacturability.

EDITORS NOTE

D.GOPAL

II-year

S.BALAJIKARTHICK

II-year

P.VIGNESH

II-year

M.AKASH

II-year

DEPARTMENT VISION

- To be known for Leading Light and Renowned department for studies and research in Mechanical Engineering.

DEPARTMENT MISSION

- M1: Having state of the art facilities for enabling students' to learn, understand, apply and disseminate knowledge.

- M2: Improve employability through Industrial Interaction and Entrepreneurship.

- M3: Develop the Professional Ethics and Human Values for the benefit of society

PROGRAM SPECIFIC OUTCOMES (PSOs):

PSO1: Apply the knowledge gained in Mechanical Engineering for design and development and manufacture of multi-disciplinary engineering systems and projects.

PSO2: Use the knowledge acquired to investigate research problems in mechanical engineering with due consideration for environmental and social impacts.

PROGRAM EDUCATIONAL OBJECTIVES(PEO):

PEO1: Successful Professional Careers in Mechanical Engineering and Related Fields are Awaiting.

PEO2: Graduates who pursue further education will participate in technological advancements.

PEO3: Graduates will work in their fields with respectable leadership abilities and moral principles.

Salient features of our department:

- Exemplary Placement Record.
- Hands on Workshop on Trending Technology.
- Academic Incentives for Top Performers.
- Empowered Faculty Members and Grabbed National and International Awards.
- Strong Industry Tie-Ups.
- Smart Class Rooms & Learning Management Systems.
- Students are given Opportunity to Organize Major Events of the Department.
- National level Champions in Sports and Games.

MoU:

- Schwing Stetter India Pvt. Ltd., Chennai.
- Harita Techserv (TVS Group), Chennai.
- Trimble Solutions India Pvt. Ltd., Mumbai.
- Simem Constructions & Environmental Engineering Pvt . Ltd., Gujarat.

Program Outcomes:

- Apply the knowledge gained in Mechanical Engineering for design and development and manufacture of multi-disciplinary engineering systems and projects.
- Use the knowledge acquired to investigate research problems in mechanical engineering with due consideration for environmental and social impacts.

MECHANICAL ENGINEERING

GO-KART

E-KART

ELECTRIC SCOOTER

OBE RELATED TO AUTOMOBILE

The Vehicle On-Board Equipment (OBE) provides the vehicle-based processing, storage, and communications functions necessary to support connected vehicle operations.

The radio(s) supporting V2V and V2I communications are a key component of the Vehicle OBE. This communication platform is augmented with processing and data storage capability that supports the connected vehicle applications.

In CVRIA, the Vehicle OBE includes the functions and interfaces that support connected vehicle applications for passenger cars, trucks, and motorcycles. Many of these applications (e.g., V2V Safety applications) apply to all vehicle types including personal vehicles, commercial vehicles, emergency vehicles, transit vehicles, and maintenance vehicles. From this perspective, the Vehicle OBE includes the common interfaces and functions that apply to all motorized vehicles.

FACULTY ARTICLES

STANFORD RESEARCHERS STRETCH A THIN CRYSTAL TO GET BETTER SOLAR CELLS

-Mr.R.SENTHIL
Assistant Professor

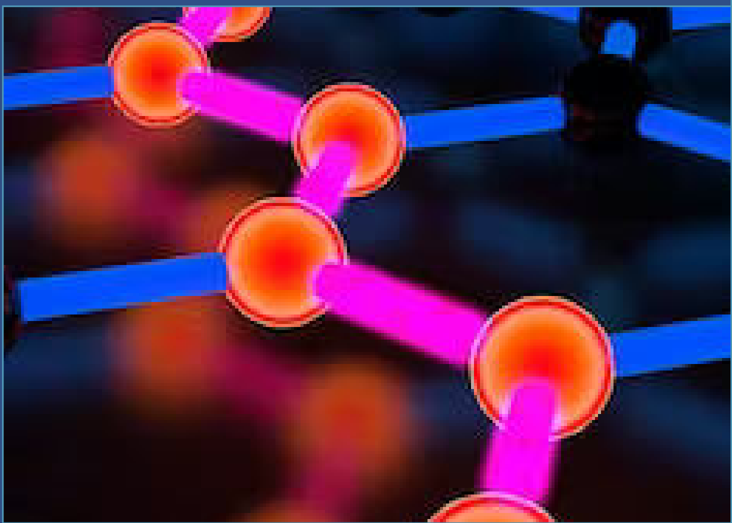
Crystalline semiconductors such as silicon can catch photons and convert their energy into electron flows. New research shows that a little stretching could give one of silicon's lesser-known cousins its own place in the sun. Nature loves crystals. Salt, snowflakes and quartz are three examples of crystals – materials characterized by the lattice-like arrangement of their atoms and molecules. Industry loves crystals, too. Electronics are based on a special family of crystals known as semiconductors, most famously silicon. To make semiconductors useful, engineers must tweak their crystalline lattice in subtle ways to start and stop the flow of electrons. Semiconductor engineers must know precisely how much energy it takes to move electrons in a crystal lattice. This energy measure is the band gap. Semiconductor materials such as silicon, gallium arsenide and germanium each have a band gap unique to their crystalline lattice.

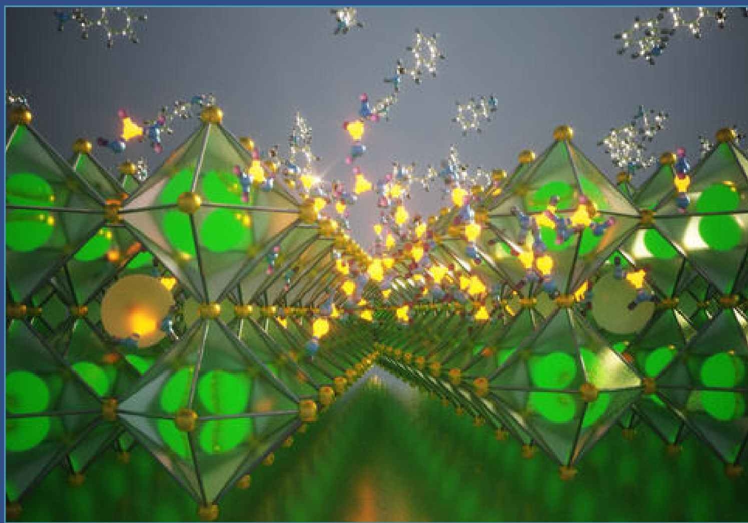
This energy measure helps determine which material is best for which electronic task. Now an interdisciplinary team at Stanford has made a semiconductor crystal with a variable band gap. Among other potential uses, this variable semiconductor could lead to solar cells that absorb more energy from the sun by being sensitive to a broader spectrum of light. A colorized image, enlarged 100,000 times, shows an ultrathin layer of molybdenum disulfide stretched over the peaks and valleys of part of an electronic device. Just 3 atoms thick, this semiconductor material is stretched in ways to enhance its electronic potential to catch solar energy.

The material itself is not new. Molybdenum disulfide, or MoS2, is a rocky crystal, like quartz, that is refined for use as a catalyst and a lubricant. But in Nature Communications, Stanford mechanical engineer Xiaolin Zheng and physicist Hari Manoharan proved that MoS2 has some useful and unique electronic properties that derive from how this crystal forms its lattice. Molybdenum disulfide is what scientists call a monolayer: A molybdenum atom links to two sulfurs in a triangular lattice that repeats sideways like a sheet of paper. The rock found in nature consists of many such monolayer's stacked like a ream of paper. Each MoS2 monolayer has semiconductor potential ."From a mechanical engineering standpoint, monolayer MoS2 is fascinating because its lattice can be greatly stretched without breaking," said Zheng, an associate professor. By stretching the lattice, the Stanford researchers were able to shift the atoms in the monolayer. Those shifts changed the energy required to move electrons. Stretching the monolayer made MoS2 something new to science and potentially useful in electronics: an artificial crystal with a variable band gap.

"With a single, atomically thin semiconductor material we can get a wide range of band gaps "Manoharan" said. "We think this will have broad ramifications in sensing, solar power and other electronics ."Scientists have been fascinated with monolayer's since the Nobel Prize-winning discovery of grapheme, a lattice made from a single layer of carbon atoms laid flat like a sheet of paper. In 2012, nuclear and materials scientists at Massachusetts Institute of Technology devised a theory that involved the semiconductor potential of monolayer MoS2. With any semiconductor, engineers must tweak its lattice in some way to switch electron flows on and off. With silicon, the tweak involves introducing slight chemical impurities into the lattice. In their simulation, the MIT researchers tweaked MoS2 by stretching its lattice. Using virtual pins, they poked a monolayer to create nanoscopic funnels, stretching the lattice and, theoretically, altering MoS2's band gap. Band gap measures how much energy it takes to move an electron. The simulation suggested the funnel would strain the lattice the most at the point of the pin, creating a variety of band gaps from the bottom to the top of the monolayer. The MIT researchers theorized that the funnel would be a great solar energy collector, capturing more sunlight across a wide swath of energy frequencies. When Stanford postdoctoral scholar Hong Li joined the Department of Mechanical Engineering in 2013, he brought this idea to Zheng. She led the

Instead of poking down with imaginary pins, the Stanford team stretched the MoS2 lattice by thrusting up from below. They did this – for real rather than in simulation – by creating an artificial landscape of hills and valleys underneath the monolayer. They created this artificial landscape on a silicon chip, a material they chose not for its electronic properties, but because engineers know how to sculpt it in exquisite detail. They etched hills and valleys onto the silicon. Then they bathed their nanoscape with an industrial fluid and laid a monolayer of MoS2 on top.





Evaporation did the rest, pulling the semiconductor lattice down into the valleys and stretching it over the hills. Alex Countryman, a PhD student in applied physics in Manoharan's lab, used scanning tunneling microscopy to determine the positions of the atoms in this artificial crystal. He also measured the variable band gap that resulted from straining the lattice this way. The MIT theorists and specialists from Rice University and Texas A&M University contributed to the Nature

Communications paper. Team members believe this experiment sets the stage for further innovation on artificial crystals. "One of the most exciting things about our process is that is scalable," Zheng said. "From an industrial standpoint, MoS2 is cheap to make."Added Manoharan: "It will be interesting to see where the community takes this."

PROBING MARS, CHARGING CARS

-Mr.A.THIRUMALAIKUMARAN
Assistant Professor

Engineers developing a drill for probing Mars, the Moon and asteroids have created the world's first portable charger to power up electric cars anywhere, anytime. Drawing on the same voltage as a vacuum cleaner, the charger can be plugged into any household socket without blowing a fuse.

The key lies in the tiny transformer, similar to the box on your laptop cable, which converts power from the grid to maintain a stable supply and cut charging times. Norwegian company Zaptec are also developing a space drill under ESA funding, with the transformer powering a plasma drill for slicing through rock.

"Rotary drills are inefficient in space," points out Zaptec's CEO, Brage Johansen. "They suffer friction in the borehole and require heavy equipment."ESA is funding Zaptec's feasibility study to assess if their plasma Zapdrill is more effective or will drill deeper in our search for life on other planets.

Right now we're scratching the surface," explains ESA's Sanjay Vijendran. "With today's technology we can go down about 2 m for missions such as our ExoMars rover. But we want to get to at least 10 m with the same size drill."We believe Mars might have underground water which could potentially harbor life, but so far we've not had the technology to explore deep enough."

Space scientists have been looking for a better way and the answer might lie in a flash of lightning. Plasma is the hot, electrically charged gas that powers the Sun and constitutes most of our Universe. On Earth it manifests as lightning, electrical sparks and the auroras over our poles. In its human-made form, plasma provides the light in fluorescent tubes and now the cutting edge of a space drill.

"The plasma drill is the closest thing to cutting rock with a lightsabre," smiles Brage. "Our drill head produces small bolts of lightning 1–5 cm long that pulverize the rock from within."This lightweight drill requires no weighted bits or heavy generators. "On Mars we have only 100 W available and we can run the whole system below that using solar power and small batteries."

Engineers have been crushing stone in laboratories with 'lightning' for half a century but only recently has progress in microelectronics enabled them to develop a drill.

Zaptec's innovation lies in the compact transformers that provide the voltage for the plasma spark, thanks to advanced cooling techniques and miniaturization."We realized that the same transformers we were developing for the space drill could also make the best chargers for electric cars," says Brage.

"Zaptecs reuse of their special space technology to power a plasma drill on Mars to charge electric car batteries is a good example of how developments in our European space programmes can help other industrial sectors," said Fredrik Fjellså from Prekubator TTO, the Norwegian partner of ESA's Technology Transfer Programme network of technology brokers."

ENGINES OF THE FUTURE

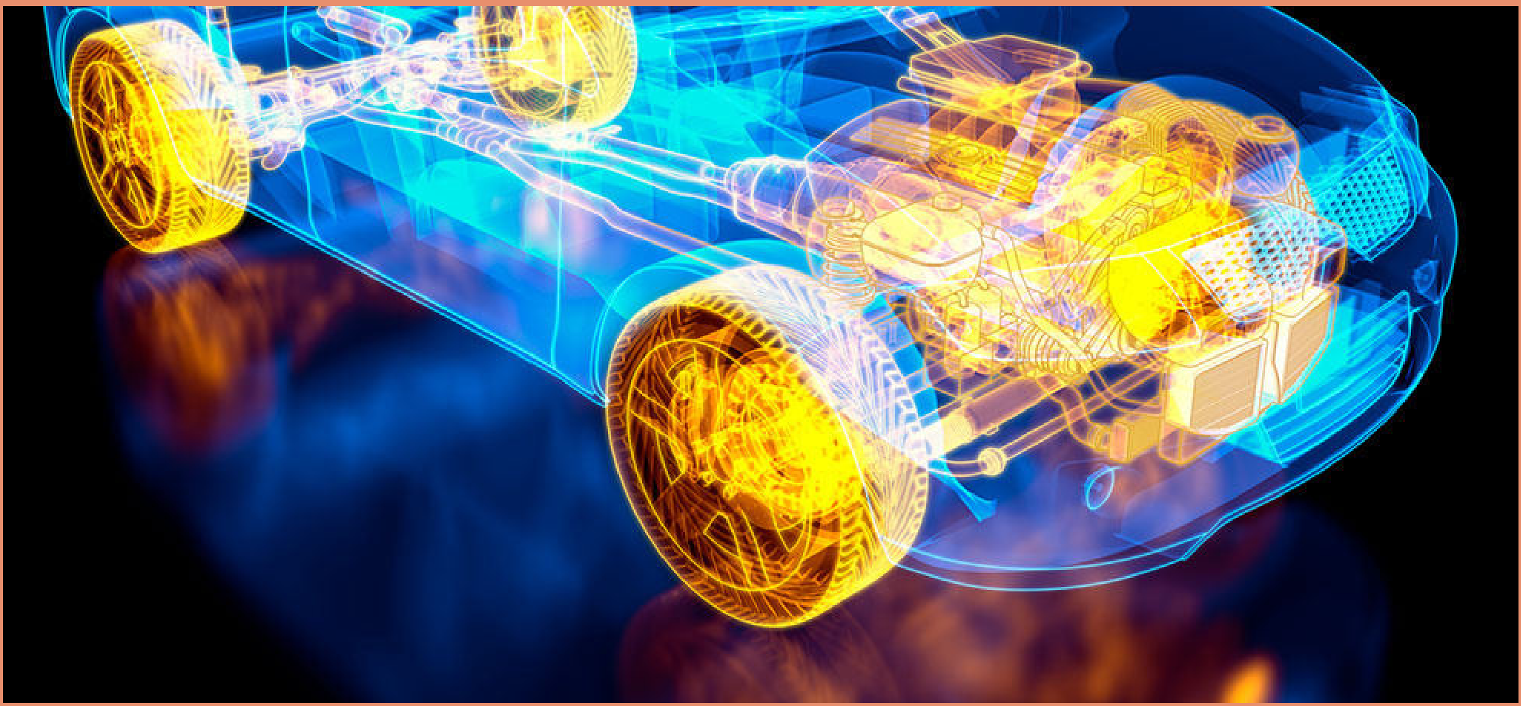
-Mr.C.SIVARAJ
Assistant Professor

Over the past several years, road transportation has seen some significant advances in what are considered alternative technologies. Energy storage, electric drive systems, and fuel cell technology all seem to be poised to find a significant place in the automotive marketplace. But it would be a mistake to believe that such technologies will completely sweep aside what has come before. Instead, the internal combustion engine will continue to be integral to the transportation of people and goods for the foreseeable future.

The internal combustion engine has seen a remarkable evolution over the past century. Before 1970 the evolution of engine design was driven by a quest for performance and an increase in octane in the fuel supply. Since then, however, the imperative was the need to meet new emissions and fuel economy regulations. Vitaly Prikhodko of ORNL's Fuels, Engines and Emissions Research studying advanced catalysts which are used to reduce vehicle pollution. Image: ORNL

As an example, the potential of technologies such as gasoline direct injection were known and attempted in production more than 50 years ago, but direct injection has only become widely available in production within the last decade and now makes up approximately 38 percent of new light-duty vehicle sales. Another example is low-temperature combustion modes such as homogeneous charge compression ignition combustion— in which fuel and air are injected during the intake stroke and then compressed until the entire mixture reacts spontaneously—which were demonstrated in a laboratory more than 30 years ago but are still many years away from market introduction.

Game-changing advances in recent years are improvements in engine technologies, sensors, and onboard computing power. This combination of technologies will enable unprecedented control of the combustion process, which in turn will enable real-world implementations of low-temperature combustion and other advanced strategies as well as improved robustness and fuel flexibility. In fact, technological advances are blurring our historical distinction between spark-ignition and compression-ignition engines; we will see new engine concepts that blend the best characteristics of both engine types to push the boundaries of efficiency while meeting stringent emissions regulations worldwide.



The push toward higher-efficiency engines will alter exhaust temperatures and chemistry and may create challenges for emission control technologies. For example, new higher-efficiency engines will have lower exhaust temperatures, due to more efficient work extraction at the piston. Lower exhaust temperatures will, in turn, require the development of new emission control technologies, which must not only be effective at low temperatures but also must survive high exhaust temperatures encountered under high load conditions.

NEW ARTIFICIAL PHOTOSYNTHETIC SYSTEM TO CAPTURE SOLAR ENERGY

-Mr.M.MOHANRAJU
Assistant Professor

Scientists have a novel artificial light-capturing system that imitates the process of photosynthesis to effectively capture light to conserve power. This technology addresses various challenges faced while replicating the complex process of photosynthesis as well as the problems associated with light absorbers and transmitters.

Scientists have long sought to mimic the process of photosynthesis (the process through which plants absorb sunlight and produce sugars) to be used in solar cells or artificial leaves. Many have tried to replicate the molecular and atomic structure of light-harvesting mechanism of plants in the laboratory environment. They have made use of polymeric structures, detergent-type molecules, vesicles, gels, and other bio-inspired structures to achieve this feat. Most common hurdle faced by these technologies is the aggregation or clumping of the molecules, which makes it difficult to effectively capture and conserve the light.

The new artificial photosynthetic system makes use of clusters of silver with a nanometer dimension, which is a hundred thousand times smaller than the width of human hair. These silver nanoclusters have complicated and exotic photophysical properties. The researchers were able to stabilize them with bulky ligands and entrap the entire ensemble inside another larger molecule called cyclodextrin. This is the first time that an atom-precise nanoclusters were used for this application. It provides 93 per cent effective energy transfer because of the presence of opposite charges on the surface and the matched electronic energy distribution.

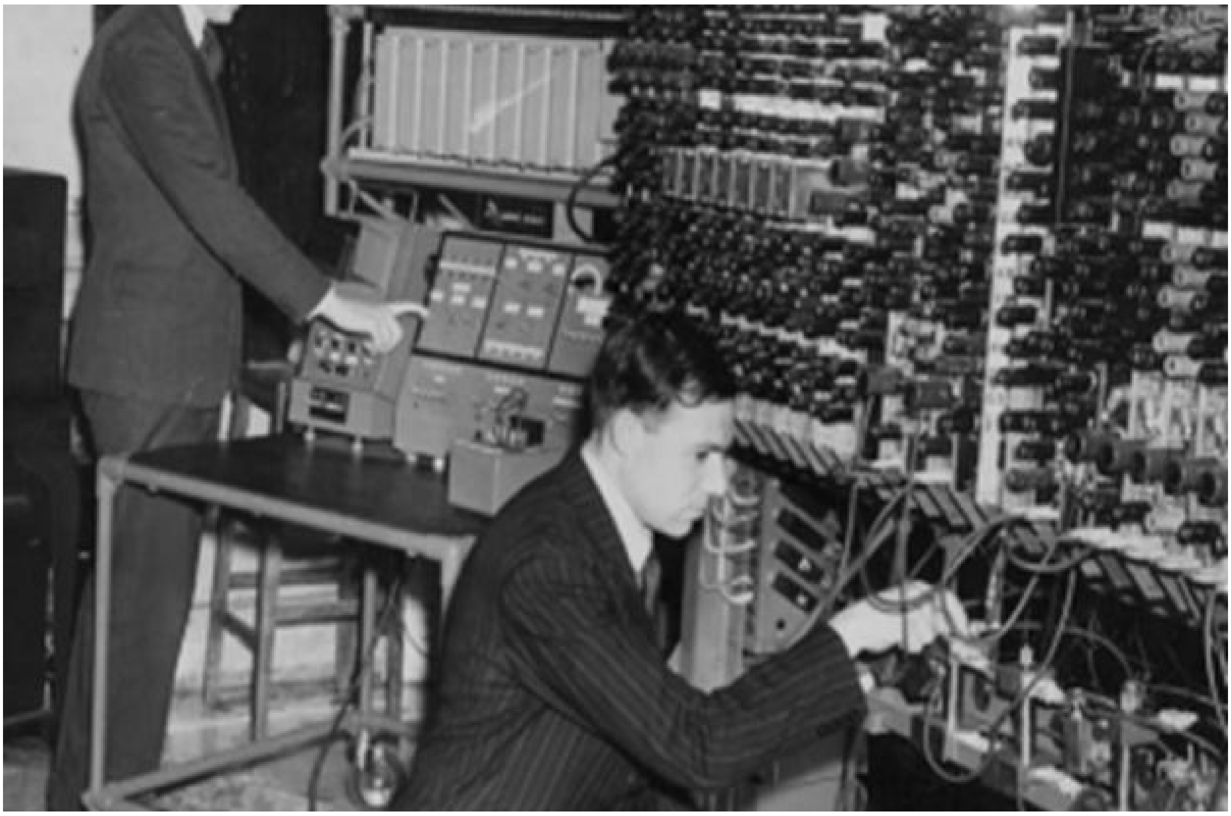
STUDENTS ARTICLES

ENIGMA

-J.Annamalai
Final year

ENIGMA “Sometimes it is the people no one can imagine anything of who do the things no one can imagine.” —Alan Turing War broke out. In 1939, Turing took a full-time role at Bletchley Park in Buckinghamshire. The main focus of Turing’s work was cracking the ‘Enigma’ code. The Enigma was a type of enciphering machine used by the German armed forces to send messages securely. Although Polish mathematicians had already figured out how to read Enigma messages and had shared this information with the British, the Germans increased its security by changing the cipher system daily. This made the task of understanding the code even more difficult. In order to overcome this obstacle, Turing invented, along with fellow code-breaker Gordon Welchman, a machine called the ‘Bombe’. This device helped to significantly reduce the work of the code-breakers. From mid-1940, German Air Force signals were being read at Bletchley and the intelligence gained from them helped the Allied forces in the war. However, the phenomenal legacy of Alan Turing’s life and work did not fully come to light until long after his death.

His impact on computer science was widely acknowledged through the annual 'Turing Award', which has been the highest accolade in the industry since 1966. But the work of Bletchley Park and Turing's role there in cracking the Enigma code was kept secret until the 1970s and the full story was not known until the 1990s. According to the estimations made, the efforts of Turing and his fellow code-breakers shortened the war by several years. They saved countless lives and helped to determine the course and outcome of the conflict. It is a sad reality but one's efforts and loyalty may not always ensure reciprocity. Such was the case of Alan Turing. After the war, arrested for his then unacceptable sexual orientation, Turing was forced to undergo hormonal therapy which severely affected his mental and physical health. In 1954, he was found dead from cyanide poisoning, an inquest ruled that it was suicide. Nevertheless, Alan Turing's genius should never be overlooked or underestimated for without him, millions of people would have perished and an entire scientific field might have failed to even exist. He theorized a universal machine that wouldn't just be "programmable but reprogrammable" (The Imitation Game). They used to be called Turing machines.



Computers and we use them for almost everything. This is an evident example of how it is never too late to give individuals the respect they deserve. We have all studied about the global war, World War II, which involved a vast majority of the world's countries including all of the great powers forming two opposing military alliances: the Allies and the Axis powers. The war ended with the victory of the Allied Powers. However, not many are aware of the efforts of the unsung hero, Alan Turing, who saved over 21 million lives. Until the release of the Oscar-nominated film The Imitation Game in 2014, the name 'Alan Turing' was not a popularly known name due to the nature of his work in the war. But now through the cinematic platform, people are finally learning how vital man was not just to win the war, but also to creating the technology we use every day. Alan Mathison Turing was an English mathematician, logician, cryptanalyst, and computer scientist. Incredibly influential in the development of computer science, he provided the formulation of concepts of algorithms and computation for the Turing Machine.

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NCC GIVES YOU LESSONS, LESSONS FOR LIFE

-S DHANUSH KUMAR
III-year

Interconnected machines, also known as Machine-to-Machine (M2M) communication, refers to the ability of machines to communicate and exchange data with each other directly, without human intervention. This technology has revolutionized various industries, from manufacturing and supply chain management to healthcare and smart homes.

Key Components of Interconnected Machines Interconnected machine systems typically consist of three main components:

1. Sensors and Actuators: Sensors collect data from the physical environment or from the machine itself, while actuators respond to commands from the system and control the machine's operations.
2. Communication Networks: These networks provide the infrastructure for data transmission between machines. Various communication protocols, such as Bluetooth, Wi-Fi, and cellular networks, can be employed.
3. Software and Applications: Software applications are responsible for interpreting the data received from sensors, making decisions based on that data, and sending commands to actuators.

Benefits of Interconnected Machines Interconnected machines offer a multitude of benefits, including:

1. Increased Efficiency and Productivity: By exchanging real-time data, machines can optimize their operations, reduce downtime, and improve overall efficiency.
2. Enhanced Decision-Making: Machine-to-machine communication enables data-driven decision-making, allowing machines to adapt to changing conditions and make informed choices.
3. Improved Resource Management: Interconnected machines can optimize resource utilization, reducing waste and minimizing environmental impact.
4. Predictive Maintenance: By monitoring machine performance and identifying potential issues early on, predictive maintenance can prevent costly breakdowns and downtime.

5. New Service Opportunities: Interconnected machines can provide new services and capabilities, such as remote monitoring, diagnostics, and over-the-air updates.

Applications of Interconnected Machines Interconnected machine technology has a wide range of applications across various industries, including:

1. Manufacturing: M2M communication enables predictive maintenance, automated production lines, and real-time inventory management.
2. Supply Chain Management: Interconnected machines track shipments, optimize delivery routes, and streamline logistics processes.
3. Healthcare: M2M devices monitor patient vitals, collect diagnostic data, and provide remote patient care.
4. Smart Homes: Interconnected appliances and devices automate home functions, enhance energy efficiency, and provide security and safety features.
5. Transportation: M2M communication enables connected vehicles, traffic management systems, and autonomous driving technologies.
6. Agriculture: Interconnected sensors monitor soil conditions, irrigation systems, and crop health, leading to precision agriculture practices.

Despite its significant benefits, interconnected machine technology also presents challenges:

1. Security and Privacy: Protecting sensitive data and ensuring secure communication among machines is crucial.
2. Standardization and Interoperability: Establishing common protocols and standards is essential for seamless communication across different devices and platforms.
3. Integration and Compatibility: Integrating M2M systems with existing infrastructure and ensuring compatibility with legacy systems can be complex.

WE, MECHANICAL ENGINEERS.

-A HARISH
III year

In realms of gears and cogs so grand,
Where metal shapes obey command,
Mechanical engineers reside,
With minds that see beyond the tide.

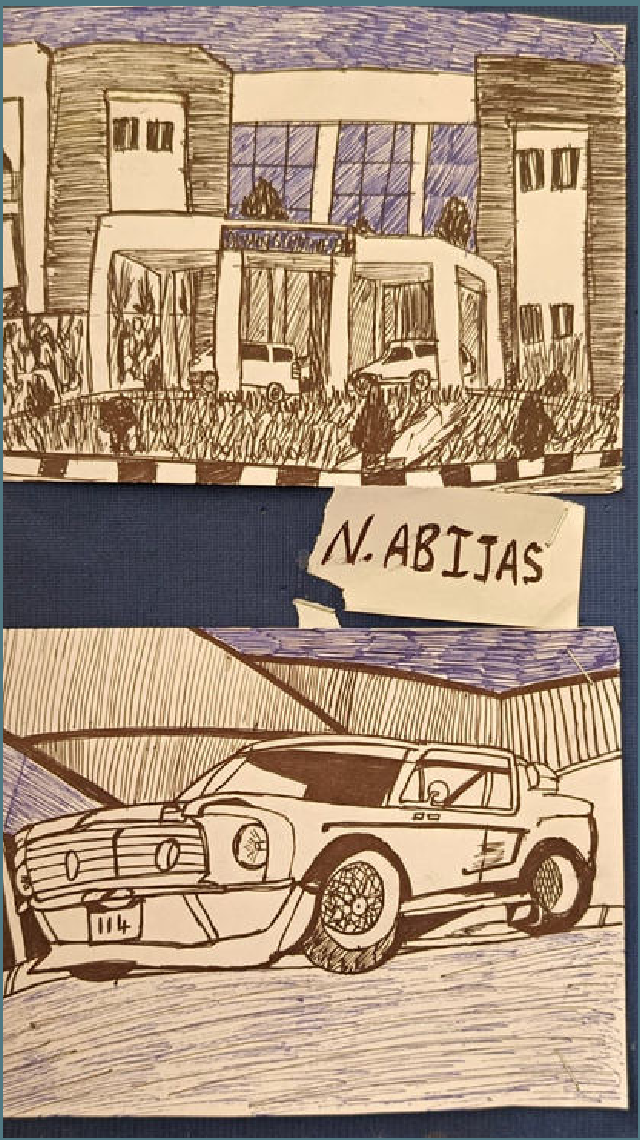
They craft the engines that ignite,
The structures that withstand the might,
Of nature's fury, storms and quakes,
Their creations, human feats they make.
Mechanical engineer working in a workshop Opens in a new window
Mechanical engineer working in a workshop

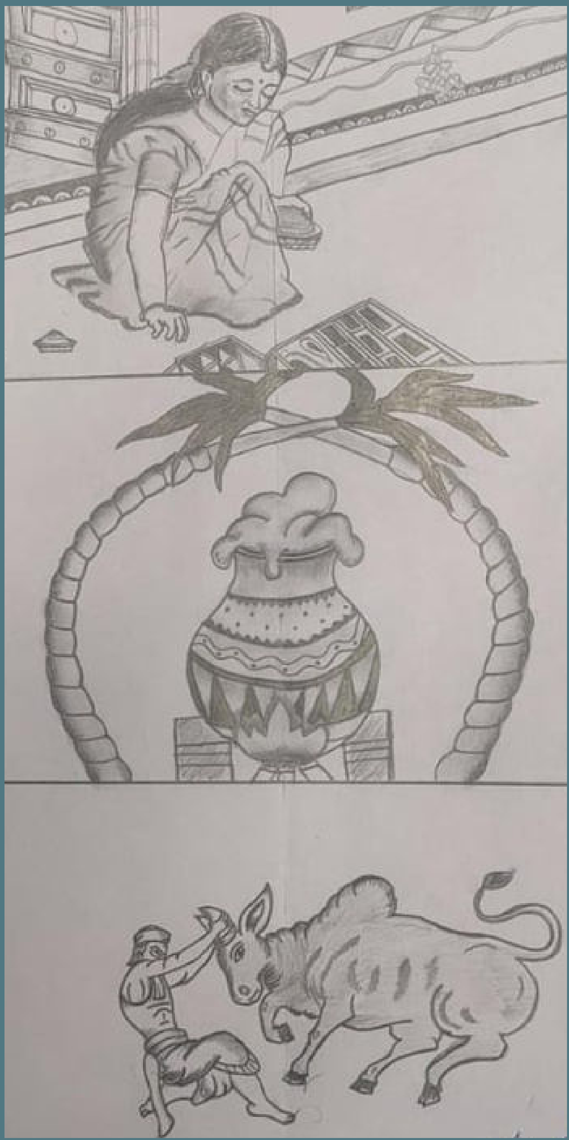
From bridges spanning rivers wide,
To turbines harnessing ocean's tide,
Their handiwork, a symphony,
Of innovation, setting spirits free.

With blueprints etched and calculations made,
They breathe life into forms decayed,
Transforming dreams to tangible art,
Where science meets the engineer's heart.

Oh, mechanical engineers so bright,
Your minds ignite the world with light,
Your passion fuels the engine's fire,
Driving progress ever higher.

STUDENTS ARTS



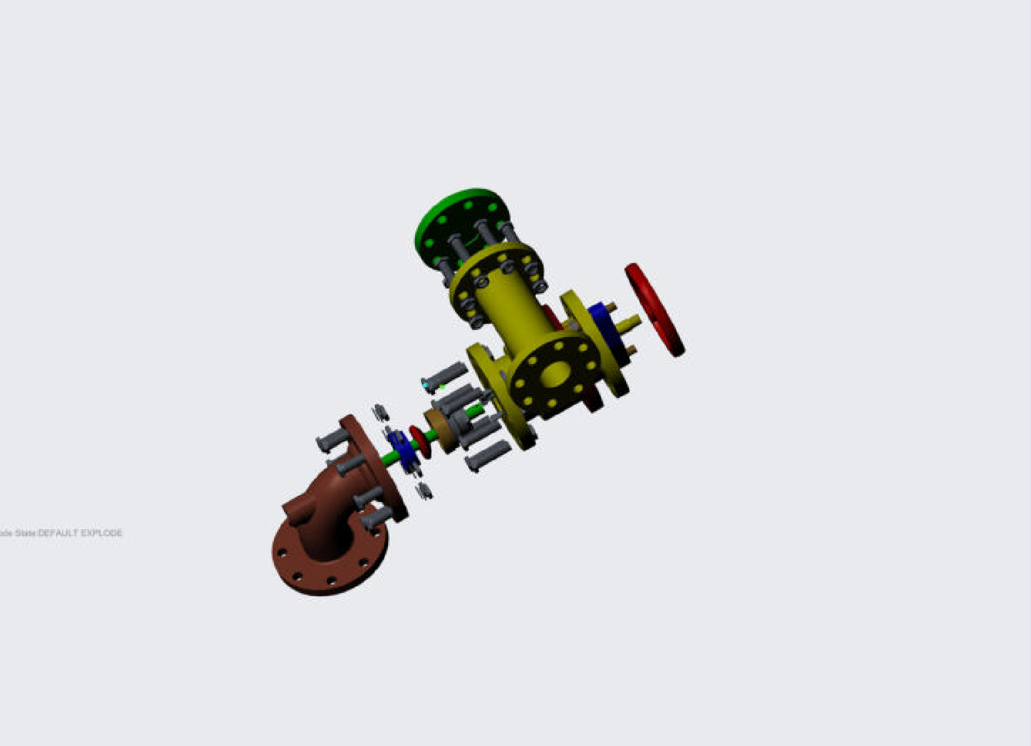


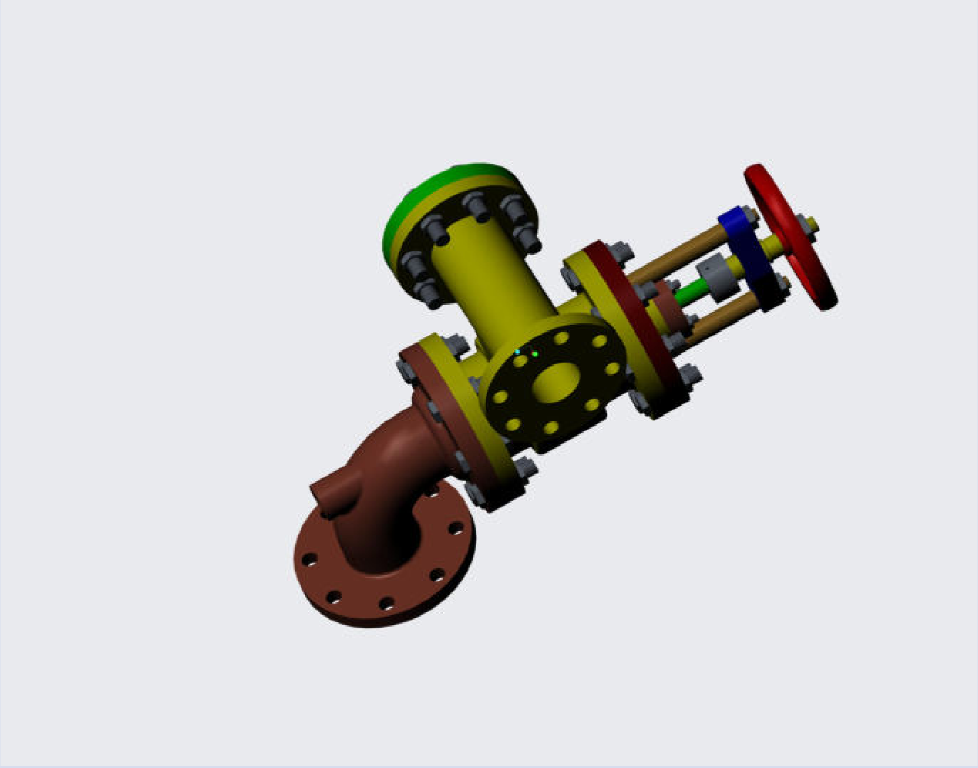
N Abijas
I year

A Bharani dharan
II year

CAD Models

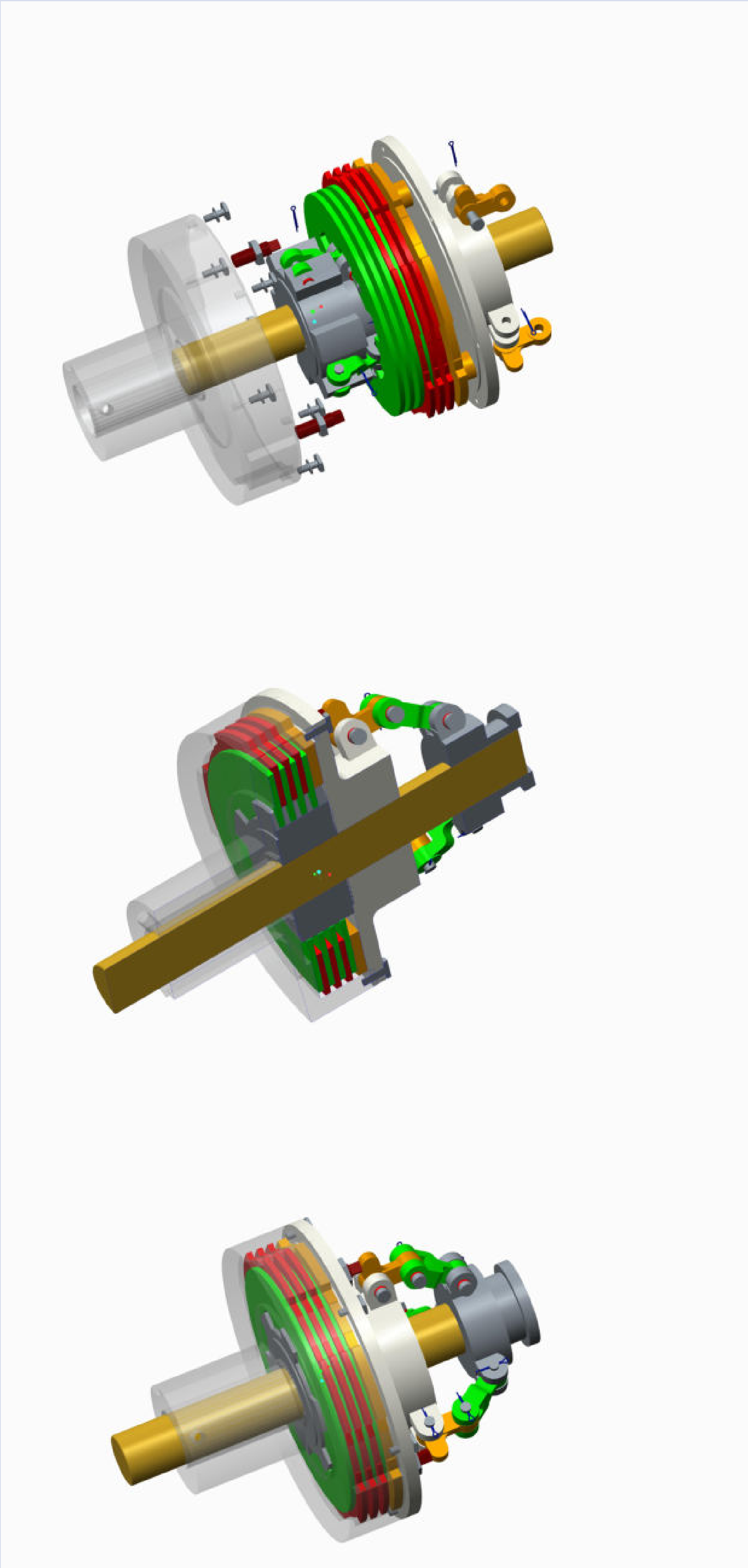
Boiler Feed Regulator





S.MATHANKUMAR
II year

Multiple Clutch Plate



-R.KRISHNAN
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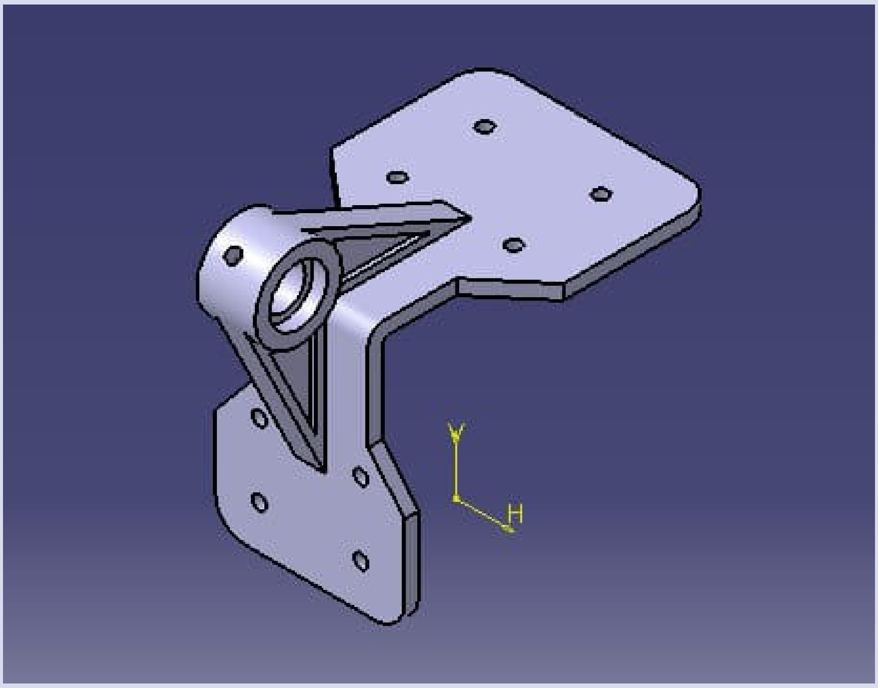

L.K.ADITIYA
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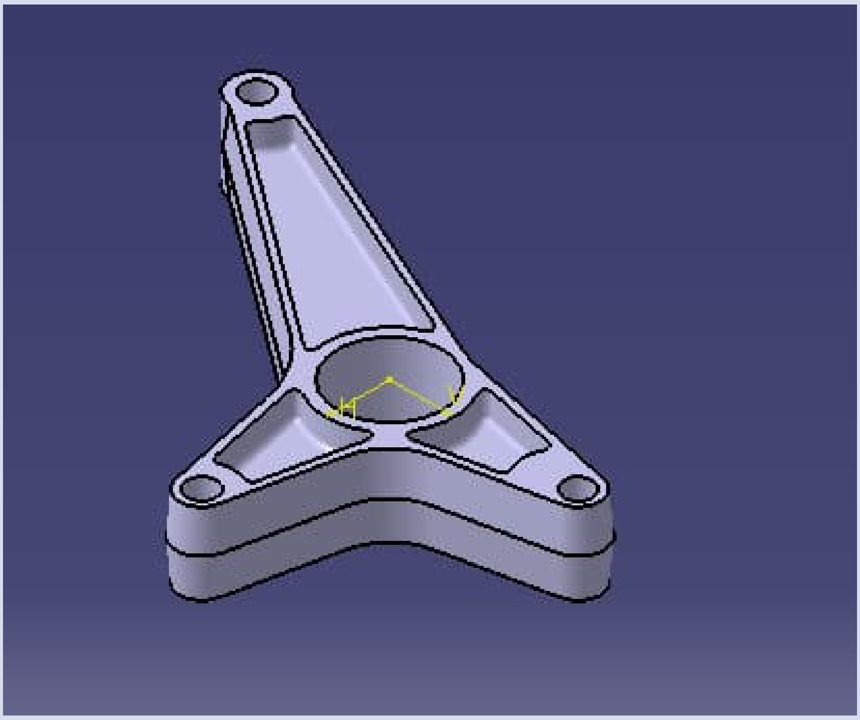

S.HARI KRISHNAN
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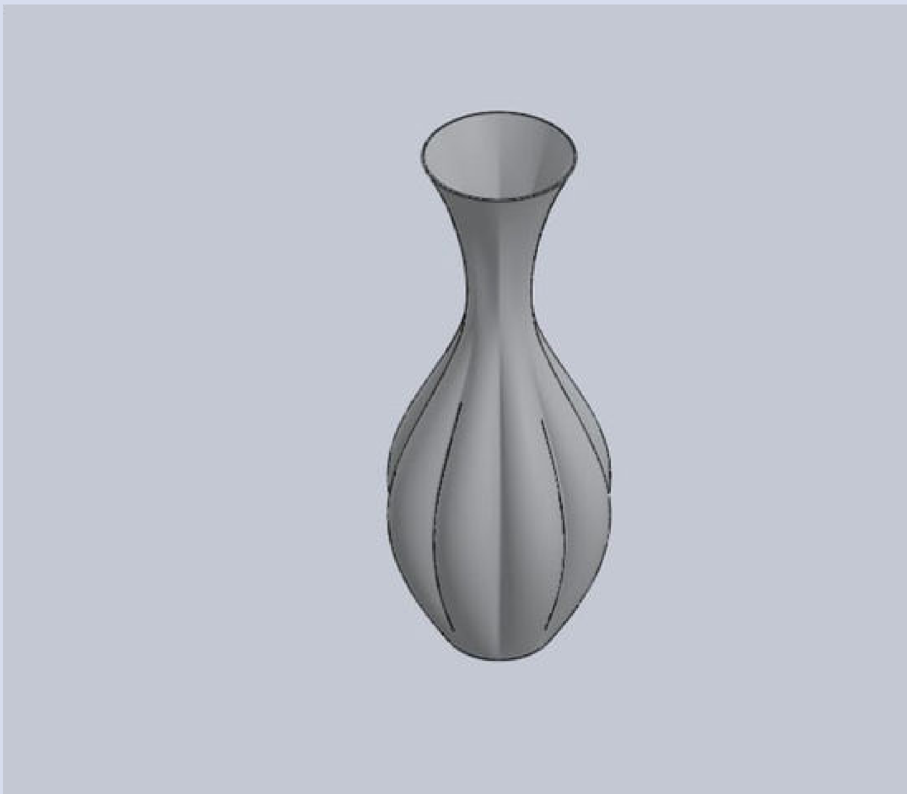
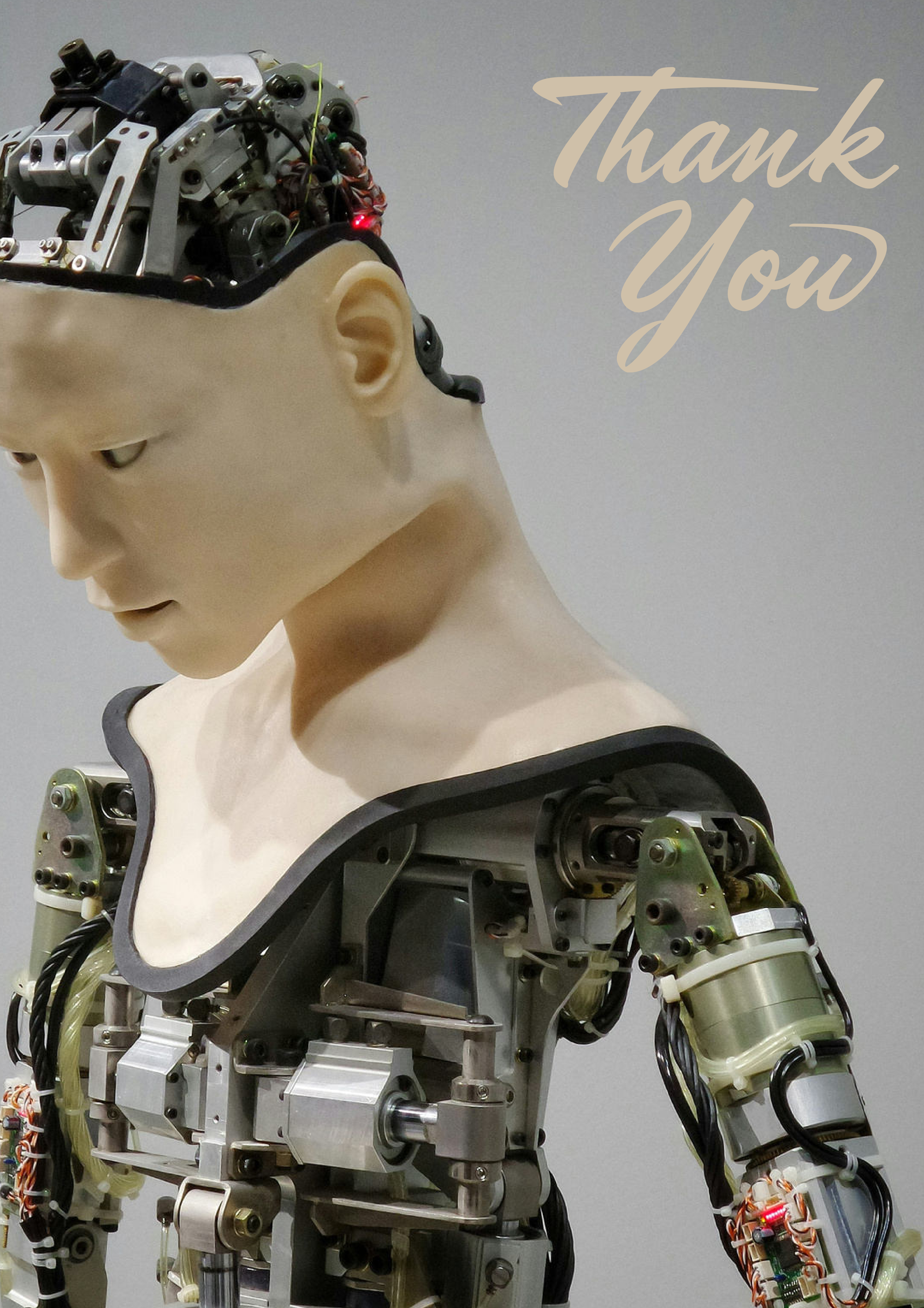


K.NITHARSAN MUTHU
II year


Thank You