MECHASM

ACADEMIC YEAR
2021 – 2022

MECHASM

Department of Mechanical Engineering

INSTITUTION VISION AND MISSION:

Vision

To be a beacon of academic excellence, empowering future innovators with technical mastery to harness technology for positive global change.

Mission

To Cultivate a vibrant learning environment where students delve into the frontiers of technical knowledge, hone their problem-solving skills, and embrace innovation to transform ideas into solutions that address global challenges.

To bridge the gap between technical brilliance and real-world impact by forging strong industry partnerships, fostering cutting-edge research, and nurturing entrepreneurial drive in our students, empowering them to build a better future through technology.

To ignite the spark of intellectual curiosity within every student, equip them with the tools and knowledge. To become pioneers in their chosen fields, and guide them towards ethical and responsible use of technology for the betterment of humanity.

DEPARTMENT VISION AND MISSION

Vision

To excel in Mechanical engineering by producing skilled, innovative engineers who address societal challenges and develop impactful solutions through research, collaboration, and practical applications.

Mission

M1: To equip students with the knowledge and skills necessary to become exceptional mechanical engineers, capable of solving complex problems and driving positive change through innovation and ethical leadership.

M2: To conduct innovative research, develop advanced technologies, and collaborate with industry partners to address critical engineering challenges and build a sustainable future.

M3: To apply engineering knowledge to enhance communities, inspire future generations, and protect the environment through safe and responsible practices.

Message from Chairman

MR.NAZERATH CHARLES,
STELLA MARYS COLLEGE OF ENGINEERING

It is with great pleasure that I extend my warm greetings to the faculty, students, and editorial team of the Mechanical Engineering Department on the successful publication of the department magazine for the academic year 2021–2022.

The past year has been a unique journey—marked by challenges, adaptation, and resilience. Despite the global uncertainties, our Mechanical Engineering Department has continued to thrive as a hub of innovation, technical excellence, and holistic learning. It is heartening to see how our students and faculty have embraced new ways of learning, explored emerging technologies, and upheld the spirit of engineering in every possible way.

This magazine serves as a window into the department's vibrant academic and co-curricular landscape. From student projects and research endeavors to workshops, achievements, and creative contributions—it beautifully showcases the hard work, talent, and commitment of the entire department.

Mechanical Engineering continues to be a field that drives transformation—from machines to materials, and from energy systems to automation. I am confident that the knowledge and values imparted here will empower our students to be leaders, innovators, and responsible contributors to society.

I congratulate the entire team behind this publication and wish the Department of Mechanical Engineering continued growth and excellence in the years to come.

MR.CAROL JUDESON,
STELLA MARYS COLLEGE OF ENGINEERING

Message by
CHIEF EXECUTIVE OFFICER

It brings me immense pleasure to convey my heartfelt congratulations to the Department of Mechanical Engineering on the release of its annual magazine for the academic year 2021–2022.

The academic year has been both challenging and transformative. It has tested our adaptability while also opening new avenues for innovation, collaboration, and growth. I am proud to see how the Mechanical Engineering Department has upheld its commitment to excellence, seamlessly blending traditional engineering fundamentals with modern-day advancements.

Mechanical Engineering continues to play a pivotal role in shaping industries, infrastructure, and technologies. At our institution, we strongly believe in nurturing a learning ecosystem that not only imparts knowledge but also instills creativity, critical thinking, and ethical values. The work of our students and faculty, as reflected in this magazine, exemplifies this philosophy.

This publication is more than a compilation of departmental activities—it is a celebration of ideas, achievements, and the spirit of engineering. It highlights the dedication of the faculty, the enthusiasm of our students, and the vibrant academic culture that drives the department forward.

I applaud the entire team for their efforts in putting together such an inspiring edition. I am confident that our Mechanical Engineering graduates will continue to make meaningful contributions to society and the global engineering community.

Wishing the department continued success in all its future endeavors.

DR.R. SURESH PREMIL KUMAR
STELLA MARYS COLLEGE OF ENGINEERING

MESSAGE BY PRINCIPAL

It gives me great pleasure to extend my warm greetings to the Department of Mechanical Engineering on the release of its annual magazine for the academic year 2021–2022.

This magazine reflects the vibrant academic culture, creative expression, and technical spirit that the department has consistently nurtured. Despite the unique challenges of recent times, the Mechanical Engineering Department has continued to demonstrate resilience, adaptability, and a steadfast commitment to excellence in teaching, learning, and research.

Mechanical Engineering remains one of the most fundamental and evolving branches of engineering, laying the foundation for innovation in manufacturing, energy systems, robotics, and sustainable technologies. It is heartening to see our students and faculty not only keeping pace with these developments but actively contributing through projects, publications, and community engagements.

This publication showcases a rich tapestry of student achievements, faculty initiatives, workshops, and co-curricular endeavors—each highlighting the department's dynamic growth over the past year. It is a testament to the dedication, teamwork, and passion that define this academic family.

I congratulate the editorial team, the faculty members, and the students for their efforts in bringing this magazine to life. I am confident that the Mechanical Engineering Department will continue to inspire, innovate, and impact in the years ahead.

DR.R. JENIX RINO.J
STELLA MARYS COLLEGE OF ENGINEERING

Message from head of the department

It is with great pride and pleasure that I present the annual magazine of the Mechanical Engineering Department for the academic year 2021–2022.

This magazine is a reflection of the creativity, innovation, and academic enthusiasm that thrives within our department. Over the past year, our students and faculty have continued to rise to challenges, explore new learning horizons, and contribute meaningfully to both academics and extracurricular activities. I am truly proud of their achievements and commitment.

Mechanical Engineering is a discipline that evolves continuously with technological advancements. From traditional design principles to smart manufacturing, from thermodynamics to robotics, our department strives to equip students with both foundational knowledge and future-ready skills. We emphasize practical exposure, research mindset, and holistic development to ensure our graduates are prepared to excel in the industry and beyond.

The 2021–2022 academic year has been a testimony to our adaptability, resilience, and shared vision. Through workshops, technical events, project exhibitions, internships, and collaborative initiatives, we have enriched the learning experience for our students. This magazine captures those moments and milestones.

I would like to extend my heartfelt appreciation to the editorial team, faculty coordinators, and all students who contributed to this publication. Let this magazine serve not only as a record of accomplishments but also as an inspiration for the journey ahead.

Wishing continued success and growth to our Mechanical Engineering fraternity.

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Department of Mechanical Engineering

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Department of Mechanical Engineering

Student Articles

Advanced Composite Materials in Manufacturing:

Shaping the Future of Engineerr ing

By JERLIN R IV MECHANICAL

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.

Underwater Turbine

by Akash M V III Mechanical

There are a lot of renewable energy resources sources which are used to obtain energy such as the solar energy obtained by placing solar panels, wind energy obtained by placing windmills on fields so that by wind energy it will give rise to rotation of blades and producing electricity further.

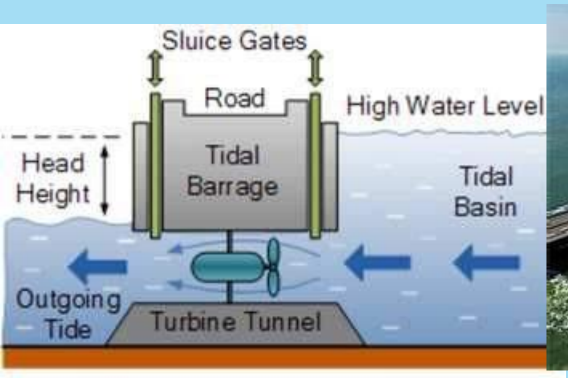
Similarly this new technique has been coming into practice to the coastal areas where the turbine blades which are used for the wind energy purpose are placed underwater near the coastal areas. Because the coastal area receives the high and low tides due to the gravitational effect by sun and moon and the rotation of earth.

Ocean currents have the tendency to produce more currents as oceans are more dense than air(they are 832 times more dense than air),due to which it applies greater force on turbines .

Tidal energy can be produced by many technologies, the major ones are:

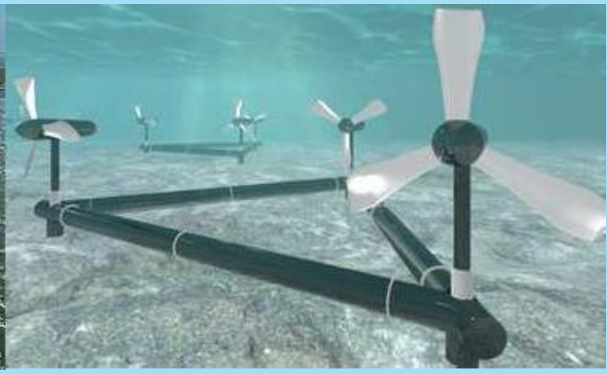
1) Tidal barrages
2) Tidal fences
3) Tidal turbines.

Hence tidal has one very distinct benefit it is virtually 100 predictable as unlike windmills which are criticized for spoiling the views on land. With underwater turbines you cannot hear it or see it and hence they are very environmentally beloved and does not produce any noise.



Tidal Barrages

Tidal fances



Underwater Turbines

IC Engine with 2-stroke/4-stroke switching during its operation

by CRUZ SANJU J M II Mechanical

Internal combustion engine with 2 and 4 strokes, switching during its operaton. The proposed improvements to conventional four-stroke internal combustion engine (ICE) accelerate its gas exchange and allow switching the ICE (especially Diesel) from four-stroke to two-stroke regime during engine operation.

Scavenging in four-stroke and two-stroke mode of operation is fulfilled through the same inlet and exhaust valves.

The engine with proposed improvements is capable of doubling the engine output power and of holding it up for a certain period (time depends on a type of the engine) without overheating. This feature allows increasing the vehicle power-to-weight ratio when it is necessary in accordance with the changing vehicle operation and road conditions.

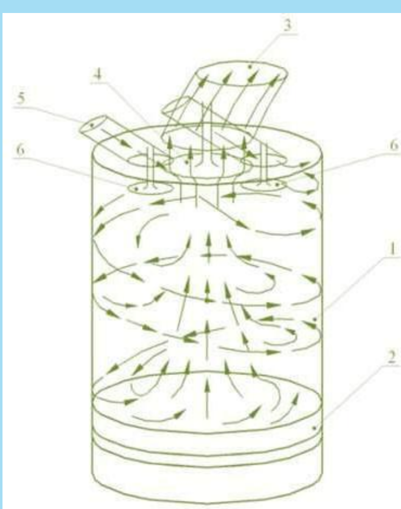
Eligible areas of activity for the proposed innovations are: (1) combat tank diesel engines, (2) combat vehicle and heavy army truck diesel engines, (3) heavy truck diesel engines, (4) special purpose vehicles diesel engines (emergency vehicles, fire trucks and others), and (5) engines in electrical generator sets.

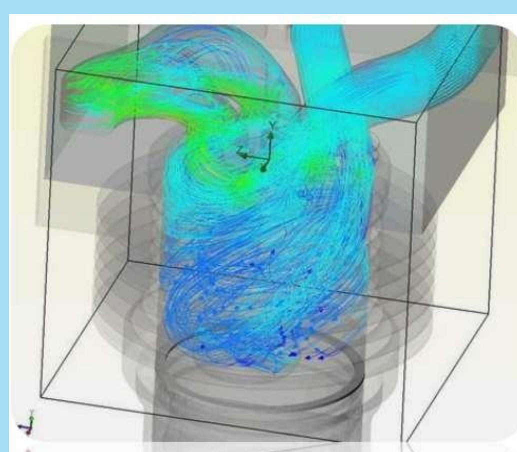
The essence of the innovation is to improve gas exchange during the two-stroke mode of engine operation. Four-stroke gas exchange is performed like in ordinary four-stroke diesel engine.

Two-stroke gas exchange is performed through the inlet and exhaust valve unlike scavenging ports in conventional two-stroke diesel engine.Inlet valves 6 are located on of the cylinder head; exhaust valve 4 is along the cylinder axle or with a small offset. The fresh air, preliminary compressed in the engine turbocharger and additionally compressed and cooled in the supercharger with inter- cooler, is supplied into the working cylinder 1 through tangential inlet passages 5 placed at a certain angle to the cylinder head surface. Then the fresh air starts swirling as a dense bed along cylinder walls and displacing to its center and wrings exhaust gases from the cylinder walls to its axle. When the fresh air stream reaches the bottom of piston 2 it turns and expels exhaust gases, concentrated along the cylinder axle, through exhaust valve 4 into the exhaust passage 3.

To lower residual gases ratio and to cool hot surfaces, cylinder scavenging, accompanied by the discharge of some amount of fresh air charge into the exhaust system, is performed. Phases of gas exchange are typical of two-stroke conventional IC engines. Supercharger of any appropriate type with inter-cooler is complemented to conventional IC engine, the arrangement of both the inlet valves and exhaust valve on the cylinder head as well as the valve-operating system are changed in order to provide a four-stroke and a two-stroke engine mode of operation.

1. Working cylinder
2. Piston
3. Exhaust Passage
4. Exhaust Valve
5. Inlet Passages
6. Inlet Valve





The fuel pump is selected and adjusted to provide fuel supply in correspondence with the number of working strokes.

Unlike the conventional two-stroke IC engine (especially two-stroke Diesel engine), there are no scavenging ports in the proposed design and no losses of burnt oil

through them. It provides the same harmful emission as the emission in conventional diesel engines.

Fields of implementation of the innovation in details

1. **Combat tanks**

Average characteristics of modern combat tanks: a vehicle with the weight ~60 tons; max speed 72 km/h; and acceleration 0-36 km/h for 6 sec. These travel parameters are provided by 1,500 hp power plant, which is either a diesel engine or a gas turbine . The inconsistency of a tank power plant is that the maximum power is required only for a short time of a combat tank life span – mainly during a combat or occasionally in other cases, while usually tank uses only 700-800 hp for a plain moving its weight at a constant speed and favorable moving conditions. The proposed innovation provides:

- The use of a suitable 1,000-1,500 hp diesel engine produced by any diesel engine manufacturers as a prototype for the power plant of a prospective combat tank. The engine prototype with proposed improvements produces 2,000-3,000 hp for a short time and doubles its power-to-weight ratio during a combat operation;

- The avoidance of designing the entirely new two-stroke diesel engine from scratch;

- Design a combat tank with the highest power-to-weight ratio and dominant maneuverability;

- The possibility of installing an additional fuel tanks inboard to increase the vehicle range without refueling

2. **Trucks**

It is possible to use the proposed improvements for civilian truck diesel engines. There is large market for the trucks with the “boosted” diesel engines like in Latin America, China, India and Southeast Asia (except Japan) countries.

The truck with “boosted” diesel engine gains the ability to reach the given speed 1.7 times faster than with the conventional one. This feature is mostly useful when the truck outstrips the up-front vehicle on a counter traffic lane as well as overcomes the rise without switching the gear and slowing down vehicle speed.

The technology background includes:

1. Patents applications (both PPA and FPA) ready for submission
2. System to compute main characteristics of a targeted engine after its modification.
3. Different Solid Works models of designs, Solid Works COSMOSFIoWorks results, etc.

Special purpose vehical

Tank

Military truck

The Kardashev Scale

by RAJA LINGAM G II Mechanical

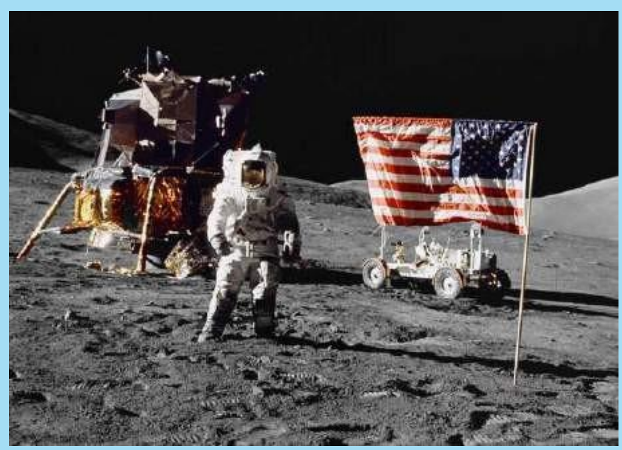
The ‘Kardashev scale’ was developed as a way of measuring a civilization’s technological advancement based upon how much usable energy it has at its disposal. Many leading researchers believe that as the population grows and expands outwards its energy requirements will increase dramatically, what with the requirements of its various technological machines. Originally, the scale was created to classify Extraterrestral Civilizations in the event of contact and compare their technological advancement to that of humans and hence some very extreme criterias were defined for each type of civilization. As of now we aren't even a Type I Civilization.

HISTORY:

The Kardashev was created by a Russian astrophysicist known as Nicolai Kardashev. In 1964, Kardashev came up with the idea that the status of a culture, as a whole, depends on two primary things: Energy and technology. He theorized that a civilization’s technical advancement runs parallel to the amount of energy that the civilization is able to harness and manipulate. Essentially, the more energy that a society can produce, the more technologically advanced they are (this was originally just tied to energy available for communications, but has since been expanded).

In other words, according to this theory, a culture’s development (in the very widest sense) is a product of energy and of technology: Through technology, energy is harnessed, and as social systems are expressions of this technology, the status of a culture rests upon (and is determined by) the amount of energy that is harnessed.

The scale has a number of different categories. In recent years, scientists have expanded this scale to measure hypothetical civilizations—civilizations that are galactic, intergalactic, and even multiverse in nature.



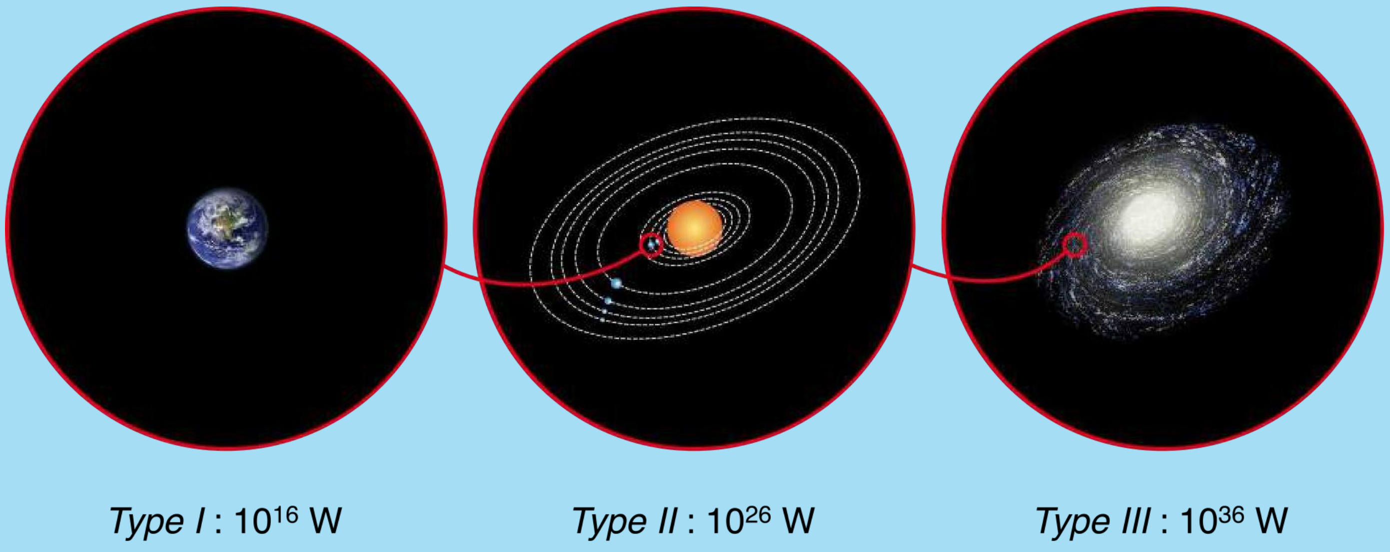
The discovery of Nuclear Power and space exploration, especially the moon landing of 1969 are huge milestones that stand as a testimony to humanity's advancement in technology. Yet we remain at the bottom of the Kardashev Scale.

• Type 0- Subglobal Culture: This civilization extracts its energy and raw-materials from crude organic-based sources such as wood, coal, and oil. Any rockets utilized by such a civilization would necessarily depend on chemical propulsion. Since such travel is very slow, a civilization at this level would be (for the most part) confined to its home planet. Unfortunately, this is where humanity stands now.

• Type I- Planetary Culture: This civilization would be capable of utilizing all available resources on their home planet, skillfully harnessing the energy output of an entire world (10^16 watts). With any luck, we will reach this stage in 100-200 years if we are able avoid catastrophic man-made or natural disasters. Large scale use of nuclear power and renewable sources of energy such as solar and hydroelectric power will be the primary sources of energy used by this civilization. Use of Anitmatter to produce energy might also be possible.

• Type II- Stellar Culture: This civilization would be far more advanced than we are (a few thousand years beyond our stage of evolution). Such a society would be able to harnesses all the energy of its star (in our case, about 10^26 watts). For example, this culture might resemble the Federation of Planets, as seen on Star Trek; or the civilization might be like a majority of the humanoids in the Mass Effect universe. This civilization would use the same means of energy production as that of a Type I Civilization but on a much larger scale. The construction of Dyson Spheres around a star to collect all or most of its radiated energy would be possible for this civilization

• Type III- Galactic Culture: This civilization would be able to harnesses the energy output of a galaxy (about 10 billion times the energy output of a Type II civilization, and about 100,000 to 1 million years more advanced than we are). They would have colonized the galaxy itself, extracting energy from hundreds of billions of stars, traveling across interstellar space, and populating innumerable worlds. Such civilizations would have mastered interstellar travel and might use the same methods to produce energy as that of a Type II Civilization but applied to a number of galaxies which would greatly increase output. They will also most likely be able to generate energy from Black Holes and White Holes and also from Quasar emissions.



Energy consumption of Type I, II & III Civilizations

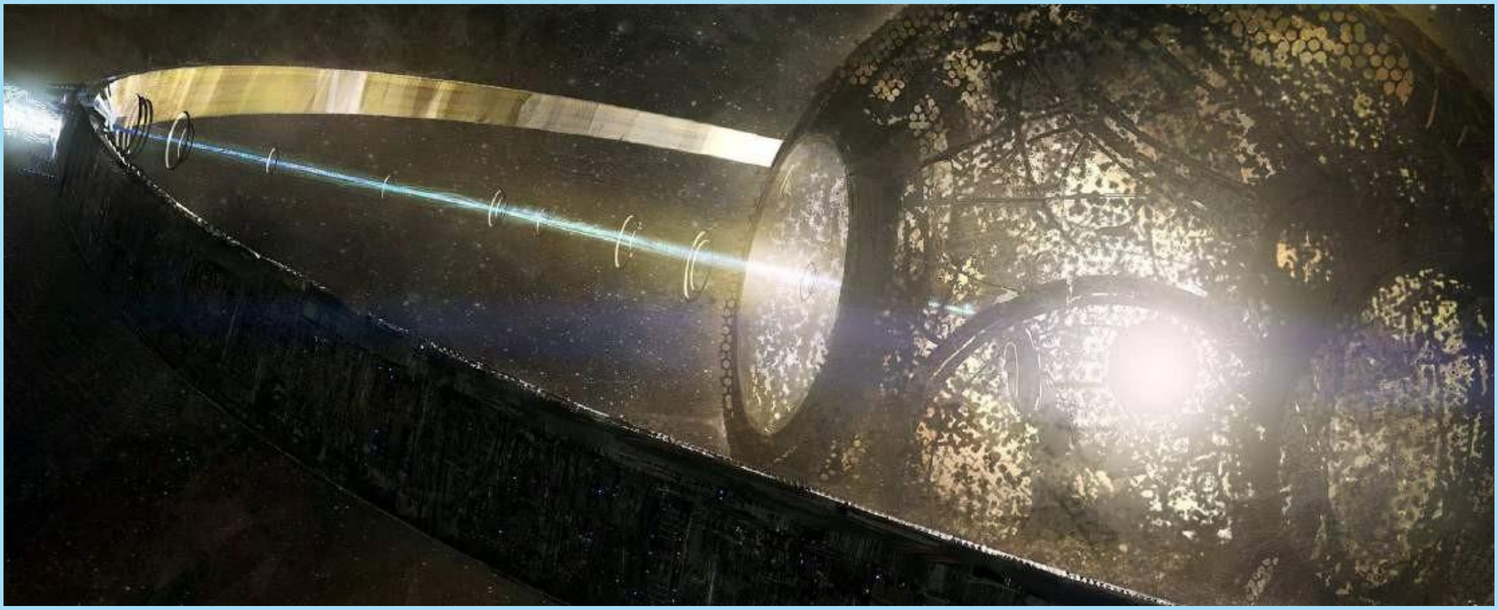
• **Type IV- Universal Culture:** This civilization would be an intergalactic culture, spanning the breadth and width of the Universe. They would travel across the cosmos, commanding the power of a billion trillion suns. These societies would be capable of attempting projects of gargantuan, superhuman proportions, such as changing the structure of space-time or the deliberate slowing of entropy (or even its reversal) to achieve ultimate immortality. For humanity, such accomplishments might be forever beyond our reach.

• **Type V- Multiverse Culture:** This civilization will have transcended their universe of origin. It would be capable of universe-scale manipulation (jumping between multiverses that contain varied forms of matter, physics, and space-time). A civilization such as this would be home to beings of unimaginable power and ability.

Carl Sagan suggested defining intermediate values (not considered in Kardashev's original scale) by interpolating and extrapolating the values given above for types I (10^16 W), II (10^26 W) and III (10^36 W), which would produce the formula:

$$K = \frac{\log_{10} P - 6}{10}$$

where value K is a civilization's Kardashev rating and P is the power it uses, in watts.



An artist's rendering of a Dyson Sphere constructed around a star to harness its energy.
A feat possible for a Type II Civilization

Ultra Efficient Jet Engines

by ROY BHEVAN M IV Mechanical

Pollution by aviation is one of the major causes of global temperature increase and Ocean acidification caused by the release of carbon dioxide and other greenhouse gases into the upper part of Earth's atmosphere. Globally around 8.3 million people fly daily, twice the total in 1999, burning almost 500,000 metric tons per day. With no much advancement in the alternate fuel research currently same old gasoline is being used causing ever increasing pollution, and many in industry believe the pathway to cleaner jets is through advances in engine technology rather than cleaner fuel.

That's the main idea behind tomorrow's aircrafts with engines that are much lighter, quiter, durable and more energy efficient than the conventional turbofan engines used today in commercial airliners today. Pratt & Whitney is an aerospace manufacturer which has introduced a new series of engines called 'Pure Power' which uses an internal gearbox to slowdown the speed of the fan. The technology effectively saves 16% on fuel consumption compared to the airliners with conventional engines. Meanwhile CFM International aviation mogul which is a joint venture between GE Aviation and Safron Aircraft Engines has introduced its own advanced engine, called the 'Leap', which could achieve similar improvements without a huge break from existing technology. Both new engines have been deployed on different versions of Airbus's new jet the A320neo.

Pratt & Whitney first attempted to build a geared turbofan starting around 1998 with PW800. Soon afterwards Advanced Technology Fan Integrator (ATFI) project commenced using the engine PW308 at the core but along with a new gear box and a single stage fan.

It had it's first run on March 16, 2001. This led to the geared Turbofan program which was developed with German MTU Aero Engines. In addition to Turbofan, initial design included variable area fan nozzle which allows improvements in propulsive efficiency across a range of flight. GTF was then renamed as PW1000G, the first in new line of "PurePower" engines.

In the PurePower 1000G engine family, a state of the art gear system separates the engine fan from the low Pressure compressor and turbine, allowing each of the modules to operate at their optimum speeds. This enables the fan to rotate slower and while the low pressure compressor and turbine operate at high speed, increasing engine efficiency and delivering significantly lower fuel consumption, emissions and noise. This increased efficiency also translates to fewer engine stages and parts for lower weight and reduced maintenance costs. This high-bypass geared turbo fan engine is 16% more fuel efficient as well as being up to 75% quieter. It has a 3:1 gearbox between the fan and the low pressure spool, each spinning at its optimal speed of 4000-5000 rpm for the fan and 12,000-15,000 rpm for spool, the high pressure spool is spinning at more than 20,000 rpm. The 30,000 hp gearbox is designed to run lifelong with no scheduled maintenance other than changing oil.

CFM International introduced their LEAP engine intended to compete with Pratt & Whitney PW1000 engine. This engine basically makes use of advanced material composites and different cool air mixing cycles modulating the amount of air flow to the internal passages inside its high pressure turbine to keep the temperature under control. The fan used in the engine has flexible blades manufactured by a resin transfer molding process, which are deigned to untwist as the fans rotational speed increases.

Currently proposed for the LEAP is a greater use of composite materials, a turbine fan in the compressor, a second generation Twin annular Pre Swirl combustor that cuts the nitrous oxide emissions in half, and a bypass ratio around 10:1. The company is using ceramic matrix composite to build the turbine shrouds.

CFM developed a new carbon-fiber blade whose design involves weaving individual carbon-fiber strands on gigantic Jacquard looms into a complex, three dimensional laminate and infusing epoxy resin into the structure by means of a proprietary transfer molding technique. .

Each individual blade consists of 7 kilometers of carbon-fiber and after being cured in autoclave the finished blade is strong enough that an entire Airbus A350 could be suspended fromit without the blade breaking

CFM uses a ceramic composite matrix (CMC) material consisting of silicon carbide-and-graphite matrix. Each shroud is a ring of 36 tightly fitting white colored CMC parts forming a ring round he inside of the HTP casing outside the circumference of the first HTP rotating stage. Combining all the material advantages these engines are saving fuel by almost 15%.

To sum up these new technologies competing each other for the ultra-high efficiencies has made it possible to look into future jet engines or at least bridge the gap between todays and tomorrows engines providing a durable, low maintenance, highly efficient, cleaner, less noisy and advanced engine indicating a reliable future of aircraft industry.

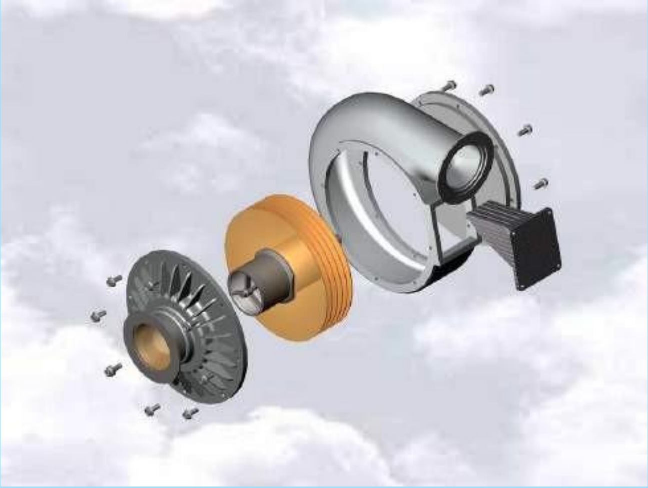
Tesla Turbines

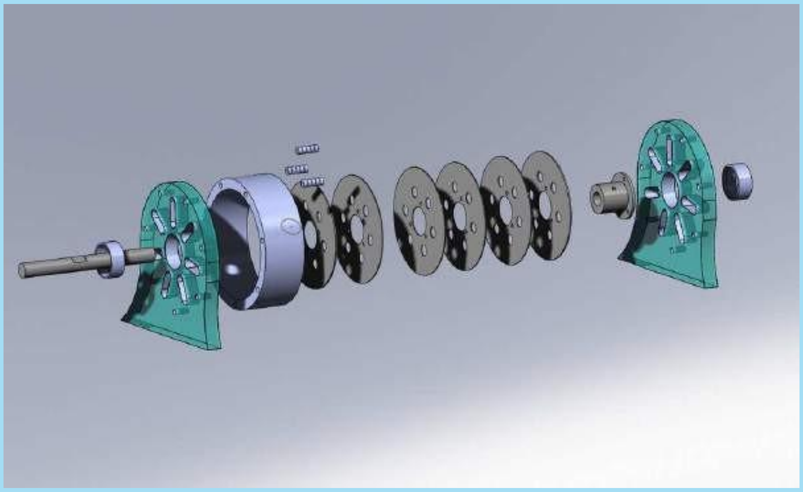
By SARTHIKA M III Mechanical

ABSTRACT: The Tesla turbine is a non-conventional bladeless turbine which works on the principle of boundary layer. It consists of a number of parallel discs fixed on a shaft with gaps between the discs. The fluid is made to flow tangential to the discs inside a casing. Momentum is transferred from the fluid to the discs due to viscous and adhesive forces.

INTRODUCTION Turbomachines are machines which convert fluid energy into rotational motion. Tesla turbine, also called as Prandtl turbine and boundary layer turbine, is a nonconventional turbomachine which operates on the principle of boundary layer. It does not use friction for its working, instead it uses adhesion and viscosity for its functioning. Energy is transferred from fluid to the rotor by dragging discs mounted on the shaft due to boundary layer effect. Fluid flows tangentially towards the discs, follows a spiral path towards the center and exits axially.

The fluid loses its kinetic energy to the discs, thus causing the rotation of rotor. Both compressible and incompressible fluids can be used. The manufacturing of Tesla turbine is much easier compared to the conventional turbines. Also, the turbine is unaffected by the quality of the fluid, thus can be used with fluids containing particulates. A tesla turbine is a reversible turbomachine therefore it can be used as pump. In a pump configuration, the fluid enters axially near the center. The discs provide energy to the fluid, following a spiral path and thereby exiting from the periphery.





CONSTRUCTION AND WORKING: The Tesla turbine consists of a number of discs mounted parallel to each other on a shaft. Nozzles are located at the periphery of cylindrical casing and tangential to the shaft, pointing toward the inside. The discs are separated by thin gaps for the fluid to pass through it. Exhaust ports are located near the center of the turbine.

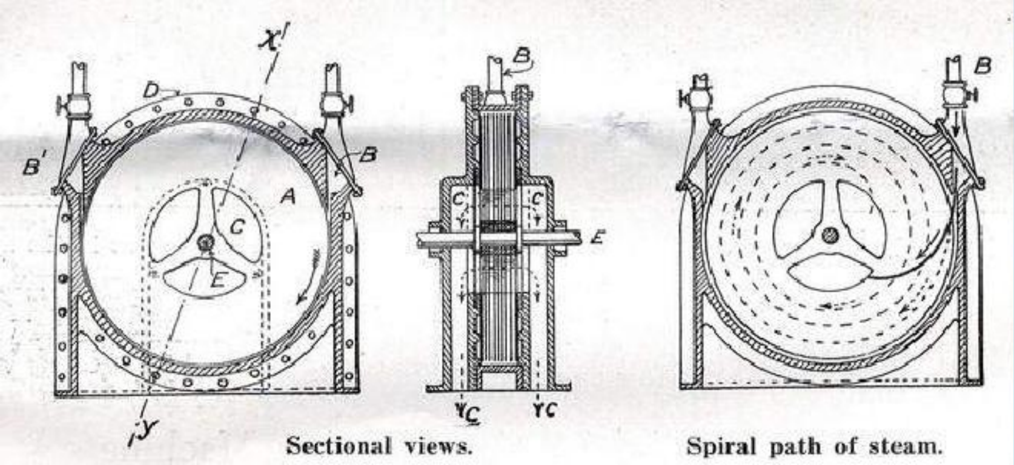
Fluid enters tangentially into the turbine from the periphery. It is made to enter the gap between the discs. The moving fluid drags the discs in the direction of the flow. Due to this there is a transfer of kinetic energy from the fluid to the discs. This transferred energy causes the discs to rotate with the shaft. The fluid thus slows down as it moves towards the centre in a spiral path exiting from the exhaust ports.

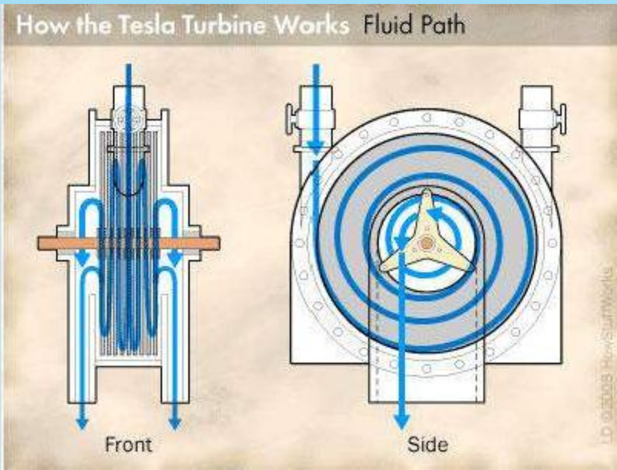
FACTORS AFFECTING PERFORMANCE: Performance of tesla turbine is affected by various parameters. Few of them are:

- Number of discs: The number of discs can be increased to increase the torque obtained.
- Dimension of the discs: The inner and outer radius determine the length of the spiral path followed by the fluid. The more the area of the discs the longer path will be travelled by the fluid.
- Size of the gaps between the discs: The thickness of the gap should be equal to twice the boundary layer thickness.
- Number of nozzles: The torque obtained will be increased if the number of nozzles are increased.
- Reynolds number: The laminar boundary layer thickness depends upon the Reynolds number.
- Velocity of the flow: The velocity of the fluid causes the kinetic energy which is transferred in the turbine.

APPLICATIONS: Tesla turbine was designed to use fluids as motive agents to rotate the rotors. It is found to be useful in low power applications but lacks in performance in high power applications. Many experiments have conducted using tesla turbines for various applications such as steam turbines, turbo for automobiles. One of the most important applications of Tesla turbine is that it can be used where the working fluid contains particulates such as salt water or impure water. It also has applications when working with low and high viscous fluids. Though Tesla turbine has not been successful in finding commercial utilization since its inception, Tesla pump on the other hand has been widely used in applications which require pumping abrasive fluids such as industrial waste etc. Tesla pumps for blood transfusion have become widespread.

CONCLUSION: The tesla turbine is a nonconventional promising technology that is yet to be fully researched and optimized. More applications are yet to be studied and developed. Complete optimization of tesla turbine performance is beyond the scope of this paper.

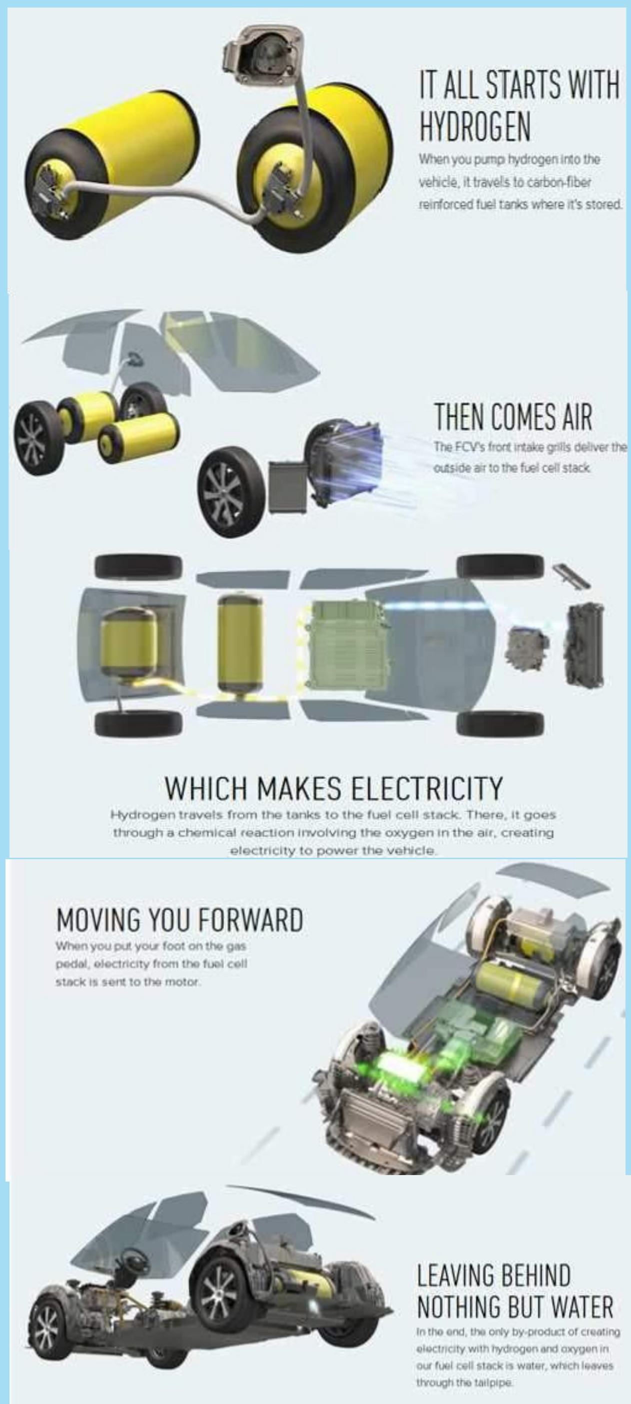




Hydrogen : Future's Fuel

by AJIN P II Mechanical

Hydrogen is one of the most abundant and promising fuel source available in the air.it is lighter then air and incredibly pure.when used in the fuel cell it is highly efficient and leaves no carbon emission behind.And best of air it is virtually everywhere.it is found everywhere in the plants, water,manure etc.
But the Problem arises before it can be used it has to be separated.



There are a lot of ways to produce hydrogen:-

I. Steam reforming:
Steamreforming of methane Is the most common method for the hydrogen production. It combines methane with the high temperature steam to trigger a recation and separate the hydrogen. At high temperatures (700 – 1100 °C) and in the presence of a metal-based catalyst (nickel), steam reacts with methane to yield carbon monoxide and hydrogen.

$$CH_4 + H_2O \rightleftharpoons CO + 3\ H_2$$

II. Gasification:
Gasification is a process that converts organic or fossil fuel based carbonaceous materials into carbon monoxide, hydrogen and carbon dioxide. This is achieved by reacting the material at high temperatures (>700 °C), without combustion, with a controlled amount of oxygen and/or steam.

III. Electrolysis:
Hydrogen can also be produced by separating water into its two primary elements—hydrogen (H_2) and oxygen (O_2). This process, known as electrolysis, passes an electrical current through the water to extract hydrogen. The electricity can be sourced from clean, renewable energy such as wind, solar, or hydro.

$$2\ NaCl + 2\ H_2O \rightarrow 2\ NaOH + H_2 + Cl_2$$

FCV concept (using hydrogen):

One such FCV (Fuel Cell Vehicle) concept car is Toyota mirai. The unveiled FCV concept was a bright blue sedan shaped like a drop of water "to emphasize that water is the only substance that hydrogen-powered cars emit from their tailpipes. The FCV uses Toyota's proprietary, small, light-weight fuel cell stack and two 70 MPa high-pressure hydrogen tanks placed beneath the specially designed body. The Toyota FCV concept can accommodate up to four occupants.

The FCV concept also uses portions of Toyota's Hybrid Synergy Drive technology including the electric motor, power control unit and other parts and components from its hybrid vehicles to improve reliability and minimize cost. [18] The hybrid technology is also used to work together with the fuel cell. At low speeds such as city driving, the FCV runs just like any all-electric car by using the energy stored in its battery, which is charged through regenerative braking. At higher speeds, the hydrogen fuel cell alone powers the electric motor. When more power is needed, for example during sudden acceleration, the battery supports the fuel cell system as both work together to provide propulsion

High-pressure hydrogen tanks

The Mirai has two hydrogen tanks with a three-layer structure made of carbon fiber-reinforced plastic consisting of nylon 6 from Ube Industries and other materials.

The tanks store hydrogen at 70 MPa (10,000 psi). The tanks have a combined weight 87.5 kg (193 lb) and 5 kg capacity.

Safety features:

1. multi-patented, carbon-fiber-wrapped, polymer-lined tanks are built in a three-layer structure and absorb five times the crash energy of steel.
2. In a high-speed collision, sensors stop the flow of hydrogen.
3. Any leaked hydrogen is quickly dispersed. Since the gas is lighter than air, it rapidly disperses, reducing the time window to cause damage in the event of an ignition.

Thus with the help of scientific studies and curious minds if we can create and store this hydrogen easily then it would be revolution in the field of technology. As we would get efficient and pollution free energy for the future. Thus encouraging the concept of sustainable development.

Students Achievements

LIST OF STUDENTS PRESENTED IN THE INTERNATIONAL/NATIONAL CONFERENCES

Sl.No.	Authors	Title	Conference	Conducted By	Date
1.	Hari Hara Mani	Synthesis and Characterization of Bio-oil from biomass by means of Thermochemical Method	National Conference NCRTP-2022	Noorul Islam Centre for Higher Education	12-05-2022
2.	J.Monish	Synthesis and Characterization of Bio-oil from biomass by means of Thermochemical Method	National Conference NCRTP-2022	Noorul Islam Centre for Higher Education	12-05-2022
3.	G.Ajish	Synthesis and Characterization of Bio-oil from biomass by means of Thermochemical Method	National Conference NCRTP-2022	Noorul Islam Centre for Higher Education	12-05-2022
4.	F.Akash	Synthesis and Characterization of Bio-oil from biomass by means of Thermochemical Method	National Conference NCRTP-2022	Noorul Islam Centre for Higher Education	12-05-2022
5.	Abishek	Flow Performance analysis of Vortex generators on Hatch back and Sedan Cars	National Conference NCRTP-2022	Noorul Islam Centre for Higher Education	12-05-2022
6.	Anish R	Flow Performance analysis of Vortex generators on Hatch back and Sedan Cars	National Conference NCRTP-2022	Noorul Islam Centre for Higher Education	12-05-2022
7.	R.Braphakaran	Flow Performance analysis of Vortex generators on Hatch back and Sedan Cars	National Conference NCRTP-2022	Noorul Islam Centre for Higher Education	12-05-2022
8.	J. Jerson	Flow Performance analysis of Vortex generators on Hatch back and Sedan Cars	National Conference NCRTP-2022	Noorul Islam Centre for Higher Education	12-05-2022
9.	M.G.Mugesh Aravinth	Bio fuel from Areca Shredded leaves	National Conference NCRTP-2022	Noorul Islam Centre for Higher Education	12-05-2022
10.	N.Nabin	Development of Insitu TiB_2 Reinforced Aluminum metal composites	National Conference NCRTP-2022	Noorul Islam Centre for Higher Education	12-05-2022
11.	V.S.Jason	Development of Insitu TiB_2 Reinforced Aluminum metal composites	National Conference NCRTP-2022	Noorul Islam Centre for Higher Education	12-05-2022
12.	J,Jerin	Development of Insitu TiB_2 Reinforced Aluminum metal composites	National Conference NCRTP-2022	Noorul Islam Centre for Higher Education	12-05-2022
13.	John Ferads	Development of Insitu TiB_2 Reinforced Aluminum metal composites	National Conference NCRTP-2022	Noorul Islam Centre for Higher Education	12-05-2022

LIST OF STUDENTS PARTICIPATED IN VARIOUS EVENTS CONDUCTED BY VARIOUS COLLEGES

Sl. No.	Name	EVENT	Held At	Competition	Date
1.	Sarthika M	MECHFORT 2K22	Ponjesly College of Engineering	Paper Presentation	30-04-2022
2.	Raveen R	MECHFORT 2K22	Ponjesly College of Engineering	Paper Presentation	30-04-2022
3.	Ajin Kumar R	MECHFORT 2K22	Ponjesly College of Engineering	Paper Presentation	30-04-2022
4.	Vignesh N	MECHFORT 2K22	Ponjesly College of Engineering	CAD Master	30-04-2022
5.	Suresh A	MECHFORT 2K22	Ponjesly College of Engineering	CAD Master	30-04-2022
6.	Akshan Prian	MECHFORT 2K22	Ponjesly College of Engineering	CAD Master	30-04-2022
7.	Nishanth V	ASTRA-2K22	DMI Engineering College	CAD Modeling	12-05-2022
8.	Kamalesh	ASTRA-2K22	DMI Engineering College	CAD Modeling	12-05-2022
9.	Vignesh N	ASTRA-2K22	DMI Engineering College	CAD Modeling	12-05-2022
10.	Suresh A	ASTRA-2K22	DMI Engineering College	CAD Modeling	12-05-2022
11.	Astil Reju A	ASTRA-2K22	DMI Engineering College	CAD Modeling	12-05-2022
12.	T.Sreejith	TECHNOVA 2022	Amrita College of Engineering and Technology	Technical Event	27-05-2022
13.	P.Ernesto Chegevera	TECHNOVA 2022	Amrita College of Engineering and Technology	Technical Quiz and Paper Presentation	27-05-2022
14.	K.Ajith	TECHNOVA 2022	Amrita College of Engineering and Technology	Technical Quiz and Paper Presentation	27-05-2022
15.	Ajin R.L	TECHNOVA 2022	Amrita College of Engineering and Technology	Technical Quiz	27-05-2022
16.	S.Abihek	TECHNOVA 2022	Amrita College of Engineering and Technology	Non-Technical Event	27-05-2022
17.	Roshan Rajan . M	TECHNOVA 2022	Amrita College of Engineering and Technology	Non-Technical Event	27-05-2022
18.	X.Shiki Shan	TECHNOVA 2022	Amrita College of Engineering and Technology	Non-Technical Event	27-05-2022
19.	R.Shiju	TECHNOVA 2022	Amrita College of Engineering and Technology	Non-Technical Event	27-05-2022
20.	Nikesh Raj	TECHNOVA 2022	Amrita College of Engineering and Technology	Non-Technical Event	27-05-2022
21.	R.Anish	TECHNOVA 2022	Amrita College of Engineering and Technology	Paper Presentation and Quiz	27-05-2022