



# SRI SHANMUGHA

## COLLEGE OF ENGINEERING AND TECHNOLOGY

(AN AUTONOMOUS INSTITUTION)

DEPARTMENT OF  
MECHANICAL ENGINEERING

presents

THE MECHANIST'23

2023-2024

## **About Us**



- The department of Mechanical Engineering was established in the year 2011.
- The Department offers Under Graduate program in Mechanical Engineering leading to B.E. degree graduate program with intake of 60 and also Post graduate program M.E., in Industrial safety Engineering with intake of 12.
- The Department has been accredited with NBA (2<sup>nd</sup> Accreditation) from the academic years 2023 – 2024 to 2025 -2026 and got permanent affiliation from Anna university Chennai.
- The Department has been approved as Anna university Research centre.
- The department strives to enhance student interests in advances in mechanical engineering, and impart high quality education through well-qualified & highly motivated faculty team, well- equipped laboratories, and instructional facilities.
- The department underscores the importance of recognizing that mechanical engineering education must be coupled with modern industry with practices giving hands-on opportunity for every student to relate theory with practice.
- The department's all around sound performance in every sphere of academic activity has a well enough proof that it is student focused.



# Organization's Vision & Mission



## Vision:

Our founding ethos remains at the core of the Institution's vision. To be an institute of repute in all fields of education by implementing the best practices akin to global standards for fostering domain knowledge and developing research attitude among students to make them globally competent.



## Mission:

- M1** - Achieving excellence in Teaching & Learning process using state-of-the-art resources.
- M2** - Extending opportunity to upgrade faculty knowledge and skills.
- M3** - Motivating faculty and students in research activity for real time application.
- M4** - Implementing the best student training practices for requirements of industrial scenario of the state.

## **CHAIRMAN MESSAGE**



**Thiru. Shanmugam K,  
Founder & Chairman  
Sri Shanmugha Institutions**

Dear THE MECHANIST Readers,

Greetings! Education builds a bridge between ignorance and wisdom. Sri Shanmuga Educational Institutions has been established with fulfilling such an objective. It is an undeniable fact that education always serves the purpose of enlightening the rural mass by showing the light of knowledge and wisdom towards the path of success. This aspiration has paved the primary base for the emergence of Sri Shanmuga College of Engineering and Technology, which, in fact, disseminates knowledge through innovative teaching and learning practices and industry connect endeavors. As the Founder-Chairman, I am highly privileged that the Sri Shanmuga campus functions as an instrument for making potential engineers with human ethics, who are absolutely the masterminds of building our nation.

**Best Regards,**

**Thiru. Shanmugam K**

## **VICE - CHAIRMAN MESSAGE**



**Thiru. Prabhakar S, Vice-Chairman  
Sri Shanmuga Institutions**

Dear THE MECHANIST Readers,

Greetings! Nelson Mandela says, "Education is the most powerful weapon we can use to change the world." True to this quote, knowledge plays a pivotal role in shaping the youth for the better future of our country. It has the power to reshape the world. To attain it, education plays a dominant role as the source of inspiration and transformation.

My dream to establish a fountainhead of education has been fulfilled with Sri Shanmuga platform for the young minds to aspire and acquire knowledge in engineering and technology. Sri Shanmuga makes the dreams of young individuals come true in a way of equipping competence to meet their personal and professional life. It is the forerunner in setting up and exemplifying benchmark in the fields of engineering and technology. The learners derive pleasure in learning current trends via a range of curricular, co-curricular and extra-curricular activities with regard to satiating the industrial standards and expectations.

**Best Regards,**

**Thiru. Prabhakar S**

## **EXECUTIVE DIRECTOR MESSAGE**



**Thirumoorthy Arumugam,  
Executive Director  
Sri Shanmuga Institutions**

Dear THE MECHANIST Readers,

Greetings! Preparing our students for today's competitive world is our primary focus. Identifying right opportunities for students and ensuring that these opportunities have complete visibility through excellence in operations is my targeted approach for our young bright minds.

Rightly said by Marian Edelman that "Education is for improving the lives of others and for leaving your community and world better than you found it", we resonate this by ensuring no student who walks into our campus is left without the opportunity of learning. Our actions are focused on creating an ambience suitable for fostering quality education along with activities that transform our students as responsible citizens of our country.

**Best Regards,**

**Thirumoorthy Arumugam**

# Department Vision & Mission



## Vision

To prepare competent Mechanical engineers capable of working in an interdisciplinary environment contributing to society through innovation, leadership and entrepreneurship.



## Mission

**DM1** - To offer quality education which enables them in professional practice and career.

**DM2** - To provide learning opportunities in the state-of-the-art research facilities to create, interpret, apply

**DM3** - To prepare the students as professional engineers in the society with an awareness of environmental and ethical values.



## Program Educational Objectives (PEO's)

**PEO1:** To prepare students to take up career in Industry, Academia as well as in Public service.

**PEO2:** To provide core domain and interpersonal skills to design & develop mechanical systems for interdisciplinary applications following ethical code.

**PEO3:** To develop qualities to progress in entrepreneurship and research activities.

## **HEAD OF THE DEPARTMENT MESSAGE**

Dear Team,

I am delighted to share that we are launching our new magazine, THE MECHANIST designed to highlight the outstanding work and achievements within our department. This publication will serve as a platform to showcase our projects, initiatives, and the incredible talent we have.

I encourage everyone to contribute articles, stories, and insights that reflect our community. Your input is invaluable in making this magazine a true representation of our collective efforts.

More details on submission guidelines and deadlines will follow soon. Let's make this magazine a celebration of our hard work and creativity!

Thank you for your continued dedication.

**Best Regards,**

**Dr.L.Prabu**

**Associate Professor & Head**

**Department of Mechanical Engineering**

## **Student Association Members**

(Student Association Members

Individual photo)

## **Editorial Board**

**(Team members individual photo)**

## Editorial Board Message

Dear Readers,

We are excited to bring you the latest issue of THE MECHANIST. Our editorial team has been hard at work curating a collection of articles, stories, and insights that reflect the vibrant spirit of our department.

In this issue, you'll find briefly about project showcases, interviews, team achievements. We hope these pieces inspire and engage you, sparking conversations and collaboration within our community.

Thank you for your continued support and enthusiasm. We'd love to hear your feedback, so feel free to reach out with your thoughts.

Happy reading!

**Best Regards,**

**The Editorial Team**

**THE MECHANIST**

## **HIGHLIGHTS OF THE DEPARTMENT (2023-2024)**

### **Department Achievements:**

Our esteemed department has successfully signed the MOU with PRD RIGS INDIA PRIVATE LIMITED, TIRUCHENGODE on this academic year (2023-2024).

(Event Photo)

Raja Selvaraj, Sanjana Jogi, Gokulakrishnan Murugesan, NR Srinivasan, Louella Concepta Goveas, Thivaharan Varadavenkatesan, Adithya Samanth, Ramesh Vinayagam, Mohammed Ali Alshehri, Arivalagan Pugazhendhi, published an article titled "**Machine learning and statistical physics modeling of tetracycline adsorption using activated carbon derived from Cynometra ramiflora fruit biomass**" , Environmental Research, Volume 252.118816, July 2024. **Impact Factor: 7.7**

(Paper publishing screenshot)

Our department faculty member **Dr. L.Prabhu, Associate Professor & Head** got "**Best ideation of the year (Retrofit E-Bike)**" in the year of 2023 from SSEI.

(Event Photo)

Our department, 4 staff members, and 40 students have successfully actively engaged with a professional society of “**SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)**.”

(Event Photo)

A seminar on “**Advancement in Farm Machinery**” by **Er.M.Krishnamurthi, Assistant General Manager, John Deer Tractors, Karnataka** on 14/02/2024 in association with SAE . Actively 67 students have benefited from that seminar.

(Event Photo)

An “**Industrial Lecture on “Design of EV Based Farm Equipments”** by **Dr.E.Ravi, Senior Design Engineer Bull Agro, Coimbatore** on 06/12/2023 in association with SAE. Actively 98 students have benefited from that seminar.

(Event Photo)

Workshop on “**Farm machinery workshop**” by **Dr.T.Senthilkumar, Principal Scientist RS, ICAR-CIAE** on 09/09/2023 in association with SAE. Actively 89 students have benefited from that seminar.

(Event Photo)

Hands-on training on “**Drone Manufacturing**” by **Mr.K.Sathyaselan, Manager, Aero-Knotes** on 08/07/2023 in association with SAE. Actively 95 students have benefited from that seminar.

(Event Photo)

## Faculty Achievements:

(In the year of 2024)

### Event Organized:

Our department faculty member **Dr.L.Prabu, Associate Professor & Head**, organized a workshop on “**Surface modeling insights for the automotive industry**” on **12/03/2024**.

(Event Photo)

### Faculty Enrichment:

Our esteemed department faculty member, **Mr. T.R. Arunprasand, Assistant Professor** actively participates in a 6-day (**05/08/2024 to 10/08/2024**) FDP program on the topic of “**Technological Advancement in Synthesis of Novel Materials**” conducted by **Chaitanya Bharathi Institute of Technology, Hyderabad**, enriching his knowledge & expertise.

(Certificate photos)

Our esteemed department faculty member, **Mr. T.R. Arunprasand, Assistant professor**, actively participates in a 6-day (**22/07/2024 to 27/07/2024**) FDP program on the topic of “**Teaching Turbomachinery**” conducted by **KPR Institute of Engineering and Technology, Coimbatore** enriching his knowledge & expertise.

(Certificate photo)

Our esteemed department faculty member, **Dr. L. Prabu, Associate Professor & Head** actively participates in a 8-day (**30/05/2024 to 07/06/2024**) Workshop

program on the topic of “**NEP 2020 Orientation & Sensitization Programme**” conducted by **Malaviya Mission Teacher Training Programme of University Grants Commission (UGC) organized by University of Jammu, Jammu, UT of J&K, India**, enriching his knowledge & expertise.

Our esteemed department faculty member, **Dr. N. R. Srinivasan, Associate Professor** actively participates in a 14-day (**17/05/2024 to 30/05/2024**) Workshop program on the topic of “**NEP 2020 Orientation & Sensitization Programme**” conducted by **Malaviya Mission Teacher Training Programme of University Grants Commission (UGC) organized by University of Jammu, Jammu, UT of J&K, India**, enriching his knowledge & expertise.

Our esteemed department faculty member, **Dr. N. R. Srinivasan, Associate Professor** actively participates in a 5-day (**24/06/2024 to 28/06/2024**) FDP program on the topic of “**Fundamentals of Data Science**” conducted by **National Institute of Technical Teachers Training and Research, Kolkata**, enriching his knowledge & expertise.

Our esteemed department faculty member, **Mr. T. R. Arunprasand, Assistant Professor**, actively participates in a 5-day (**05/02/2024 to 09/02/2024**) workshop

program on the topic of “**Additive Manufacturing and Reverse Engineering**” conducted by **NCAM & IDEMI**, enriching his knowledge and expertise.

(Certificate photo)

### **NPTEL:**

The Outstanding achievement of our department faculty member **Dr.L.Prabu, Associate Professor& Head**, who has attained the distinguish rank of “**Elite + Silver**” in NPTEL course for **Biomechanics (January to April 2024)**.

(Attach certificate picture)

Our department faculty member **Mr.R.Boopathi, Assistant Professor** successfully completed an online course of **IC Engines and Gas Turbines (January to April 2024)** on the NPTEL platform.

(Attach certificate picture)

The Remarkable achievement of our department faculty member **Mr.N.Vasantha Prasath, Assistant Professor**, who has attained the distinguish rank of “**Elite**” in NPTEL course for **Manufacturing Process Technology I & II (January to April 2024)**.

(Attach certificate picture)

The Impressive achievement of our department faculty member **Mr.M.Mohan, Assistant Professor**, who has attained the distinguish rank of “**Elite**” in NPTEL course for **Computer Integrated Manufacturing (January to April 2024)**.

(Attach certificate picture)

The Striking performance of our department faculty member **Mr.T.R.Arunprasand, Assistant Professor**, who has attained the distinguish rank of “**Elite**” in NPTEL course for **Computer Integrated Manufacturing (January to April 2024)**.

(Attach certificate picture)

**(In the year of 2023)**

**Event Organized:**

Our department faculty member, **Mr. J. Prem, Assistant Professor**, organized a workshop, “**Amrita Virtual Lab Workshop**” on **06/10/2023**.

(Event photo)

Our department faculty member, **Dr. L. Prabu, Associate Professor & Head**, organized a Research seminar, “**Suitability of metal based alloys for automotive components**” on **22/07/2023**.

(Event photo)

Our department faculty member, **Dr. L. Prabu, Associate Professor & Head**, organized a Research seminar, “**Effect of fertilizers in the nutrition and growth of rice**” on **24/06/2023**.

(Event photo)

Our department faculty member, **Dr. L. Prabu, Associate Professor & Head**, organized a Research seminar, “**Effective usage of communication for engineers**” on **20/05/2023**.

(Event photo)

Our department faculty member, **Mr. M. Mohan, Assistant Professor**, organized a workshop, “**Drone technology workshop**” on **21/04/2023**.

(Event photo)

Our department faculty member, **Mr. R. Boopathi, Assistant Professor**, organized a workshop, “**Drone Technology Workshop**” on **31/03/2023**.

(Event photo)

### **Faculty Enrichment:**

Our esteemed department faculty member, **Mr. T.R. Arunprasand, Assistant professor**, actively participates in a 5-day (**18/12/2023 to 22/12/2023**) FDP program on the topic of “**Composite Additive Manufacturing**” conducted by **NIT Tiruchirapalli**, enriching his knowledge & expertise.

(Event photo)

Our esteemed department faculty member, **Dr. L. Prabu, Associate Professor & Head** actively participates in one day (**28/04/2023**) Conference program on the topic of “**Advances in Automobile, Manufacturing and Mechanical Engineering**”

conducted by **SRM Easwari Engineering College**, enriching his knowledge & expertise.

(Certificate photo)

Our esteemed department faculty member, **Mr. R. Boopathi, Assistant Professor**, actively participates in one (**10/03/2023**) Conference program on the topic of "**Engineering Applications of Alternate Fuels, Sustainable Energy and Bio-Materials**" conducted by **Annamalai University**, enriching his knowledge and expertise.

(Certificate photo)

Our esteemed department faculty member, **Mr. M. Mohan, Assistant Professor**, actively participates in one day (**28/04/2023**) Conference program on the topic of "**Advances in Automobile, Manufacturing and Mechanical Engineering**" conducted by **SRM Easwari Engineering College**, enriching his knowledge & expertise.

(Certificate photo)

Our esteemed department faculty member, **Mr. R. Boopathi, Assistant Professor**, actively participates in one day (**28/04/2023**) Conference program on the topic of "**Advances in Automobile, Manufacturing and Mechanical Engineering**" conducted by **SRM Easwari Engineering College**, enriching his knowledge & expertise.

(Certificate photo)

#### **NPTEL:**

The Remarkable achievement of our department faculty member **Dr. L. Prabu**,

**Associate Professor & Head**, who has attained the distinguish rank of “Elite” in NPTEL course for “**Biomechanics of Joints and Orthopaedic Implants**” (**July to December 2023**).

(Certificate photo)

The striking achievement of our department faculty member **Mr. R. Boopathi, Assistant Professor**, who has attained the distinguish rank of “Elite” in NPTEL course for “**Applied Thermodynamics**” (**August 2023 to November 2023**).

(Certificate photo)

The outstanding achievement of our department faculty member **Mr. N.Vasantha Prasath, Assistant Professor**, who has attained the distinguish rank of “Elite” in NPTEL course for “**Automation in Manufacturing**” (**August 2023 to November 2023**).

(Certificate photo)

## STUDENT ACHIEVEMENTS:

The Phenomenal achievement of our department student **V.Tamilarsan, IV year**

**Mechanical**, who got **First prize** in “**Designing CAD Model**” event at **Excel Engineering College, Namakkal**.

(Certificate photo)

The Notable achievement of our department student **V.Kirubakaran, III year Mechanical**, who got **Second prize** in “**Designing CAD Model**” event at **Excel Engineering College, Namakkal**.

(Certificate photo)

Our department student, **P.Karthi, III year Mechanical** actively participates in one day workshop on the topic of “**Workshop – E-Vehicle Hub**” conducted by **Erode Sengunthar Engineering College, Perundurai**, enriching his knowledge.

(Certificate photo)

Our department student, **C.Naga Mahesh Kumar, III year Mechanical** actively participates in one day workshop on the topic of “**Workshop – 3D Printing**” conducted by **Erode Sengunthar Engineering College, Perundurai**, enriching his knowledge.

(Certificate photo)

Our department student, **S Venkatesh, II year Mechanical** actively participates in online workshop on the topic of “**Workshop – Data Science and Analytics**” enriching his knowledge.

(Certificate photo)

## **STUDENT ARTICLES**

### **ARTICLE 1: Applications of Machine Learning and AI in Mechanical Engineering**

#### **Introduction:**

The world of mechanical engineering is rapidly evolving as it adopts emerging technologies. Technologies like Machine Learning (ML) and Artificial intelligence (AI) have revolutionized the field and are used in many applications. This blog will explore how AI and ML are transforming the industry for the better and the challenges ahead.



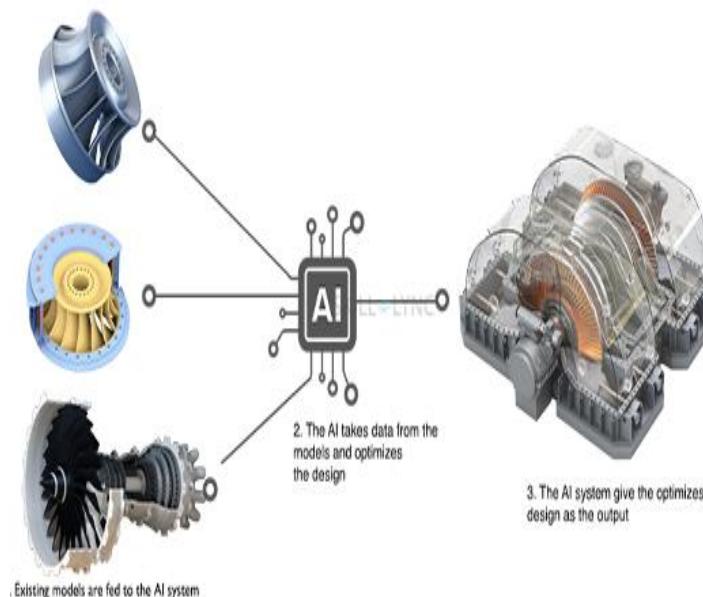
#### **What are Artificial Intelligence (AI) and Machine Learning (ML)?**

AI and ML are two of the digital age's most important and rapidly advancing technologies. Computers can execute tasks that ordinarily require human intelligence, such as decision-making, pattern recognition, and problem-solving. They are programmed to think like a human and are built on the working principle of how the human brain works.

## **Applications of AI and ML in Mechanical Engineering:**

AI and ML are extensively used in mechanical engineering; the following is a list of what and how these technologies are applied.

- Turbomachinery Explorer
- Heat Exchanger
- Boat Race
- Autonomous Vehicles



### **Turbomachinery Explorer:**

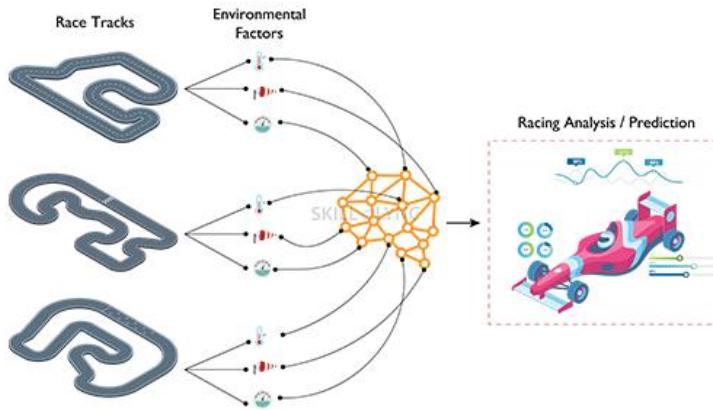
- AI and ML have enabled engineers to develop more efficient and reliable turbomachines, from designing and optimizing turbine blades to analyzing complex flow fields.
- AI and ML algorithms analyses the performance of various blade designs and then suggest changes to improve efficiency. They are used with other technologies like CFD to identify flow field patterns and suggest improvements to improve efficiency.

- AI and ML are used to develop predictive models for turbomachinery performance. These models can be used to predict the performance of turbomachines under different operating conditions, allowing engineers to make more informed decisions about how to design and operate their machines.

## **Racing:**

Racing is one of the most competitive spots in the world. As such, teams are constantly looking for ways to improve their designs to give them a competitive advantage over the grid. Engineers use AI and ML to give them that edge they need to win. Data from earlier races are analysed using to help determine the best course and improve performance, such as,

- Wind speed
- temperature
- Grip levels

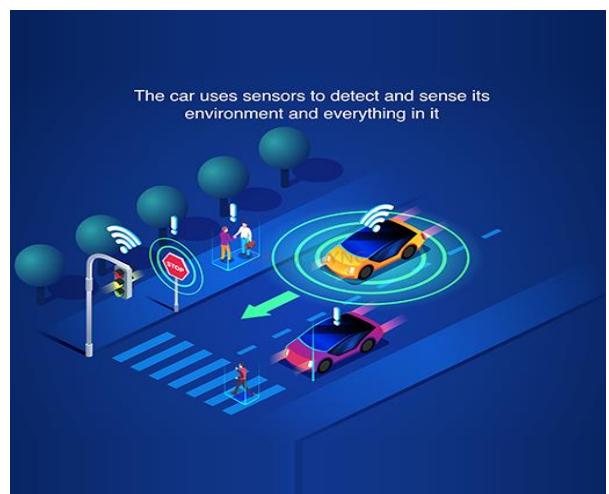


The performance of the car/bike/boat and its crew can also be examined using AI and ML, allowing for improved training and preparation for upcoming races. They can be used to optimize the design of the vehicle, its components, and its systems and automate manufacturing, allowing faster production and better quality control.

### Autonomous Vehicles:

Autonomous vehicles can operate without a human driver, using sensors, cameras, and other technologies to navigate the environment. Machine learning and AI are essential for these vehicles, allowing them to detect and respond to their environment accurately.

AI can detect obstacles, recognize traffic signals, and anticipate potential hazards. They can also be programmed to take the most efficient routes, saving time and fuel. Autonomous vehicles are also being used to improve safety. By using machine learning and AI, autonomous vehicles can detect potential hazards and take evasive action to avoid them. This can help reduce the number of accidents on the road and make driving safer for everyone.



## **Advantages of Using AI and ML in Mechanical Engineering:**

- Improved Design
- Automation
- Cost Savings
- Increased Productivity
- Improved Quality

## **Challenges of Using AI and ML in Mechanical Engineering:**

### **1. Lack of Data**

AI and ML programming require large amounts of data to be trained on and to be effective. Mechanical engineering is a field that is not particularly optimised for the collection of storing large amounts of data. This can make it a challenge to create accurate models and algorithms.

### **2. The Complexity of the Data**

Mechanical engineering involves a wide range of complex processes, and machine learning and AI algorithms may be unable to model these processes accurately. This can lead to inaccurate results and can be difficult to debug.

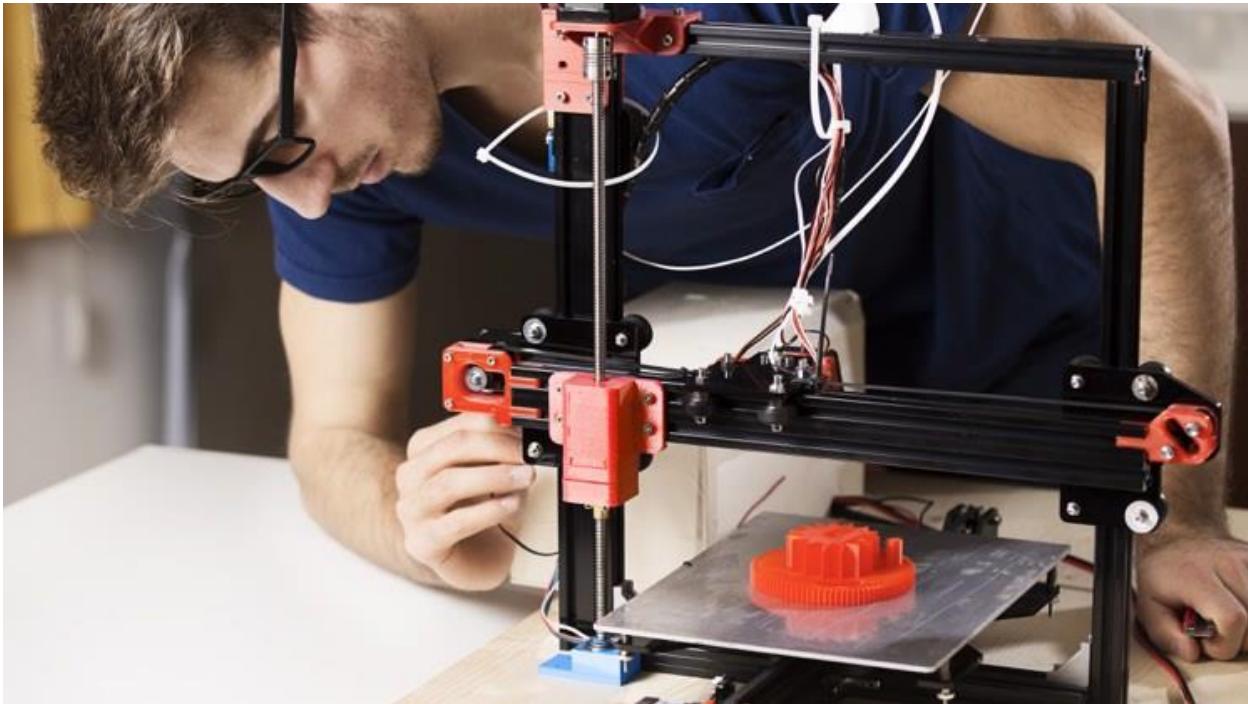
### **3. Integrating Both the Systems**

Mechanical engineering systems are often complex and require significant manual intervention. This can make it difficult to integrate machine learning and AI into existing systems without disrupting the existing workflow.

## **Conclusion:**

As AI and ML technology continues to evolve, their application in mechanical engineering will increase; as it stands today, we are only beginning to scratch the surface of what is possible.

## ARTICLE 2: 4D Printing Technology



### What is 4D printing?

4D printing uses 3D printers to create live three dimensional objects without wires or circuits. It does so by using intelligent materials, which can be programmed to change shape, colour or size when they receive an external stimulus.

Such is the case with **hydrogel resins, active polymers or even live tissues**. They are printed in 3D with a specific design that evolves over time and when in contact with humidity, light, pressure or temperature, among other factors, to achieve the intended finish.

**4D printing makes it possible for an object, for example, to bend, repair, assemble or even disintegrate itself.** It acquires a new shape or functionality on its own by reacting with the environment.

## **4D printing origins**

The forefather of this emerging technology is computer scientist Skylar Tibbits, founder and co-director of the Self-Assembly Lab at the Massachusetts Institute of Technology (MIT). It was presented to the world in 2013 and could possibly be marketed in 2019, according to the *4D Printing Market Research Report- Global Forecast 2022 report*.

The origins of 4D printing is in the introduction of a time factor to 3D printing. It consists of **creating three-dimensional objects that adapt to the circumstances of each moment** without the intervention of robots or people, only combining materials and geometry with interactions, an energy source and intelligent design, Tibbits explains.

The Self-Assembly Lab is currently experimenting with new 4D printing techniques such as *Rapid Liquid Printing*, which allows **a large sofa to be printed in just a few minutes**, and materials such as plastic, rubber or foam.

## **4D printing applications by sectors**

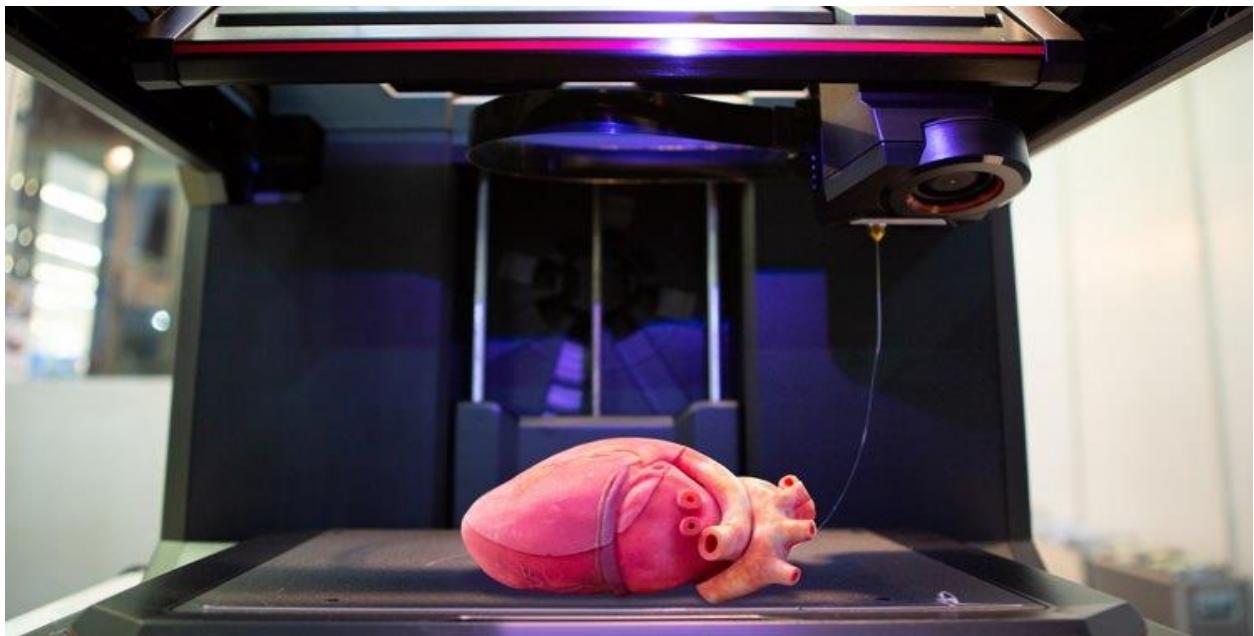
4D printing is destined to revolutionise the industry. These are some of its possible achievements:

- **Medicine and surgery**

**In 2015, a medical team from the University of Michigan saved the lives of three babies with respiratory problems by inserting a 4D printed implant.** This polycaprolactone device, designed to fit each patient, was designed to adapt its size to the child's growth and to dissolve itself when no longer necessary.

At present, the use of 4D printing in ultrasound scans allows, for example, to know more precisely the structural and functional development of the nervous system of the foetus.

**In the future**, vascular endoprostheses (stents) or other 4D parts that react to body heat and expand to adapt to the patient, may be able to be printed.



4-D printed heart

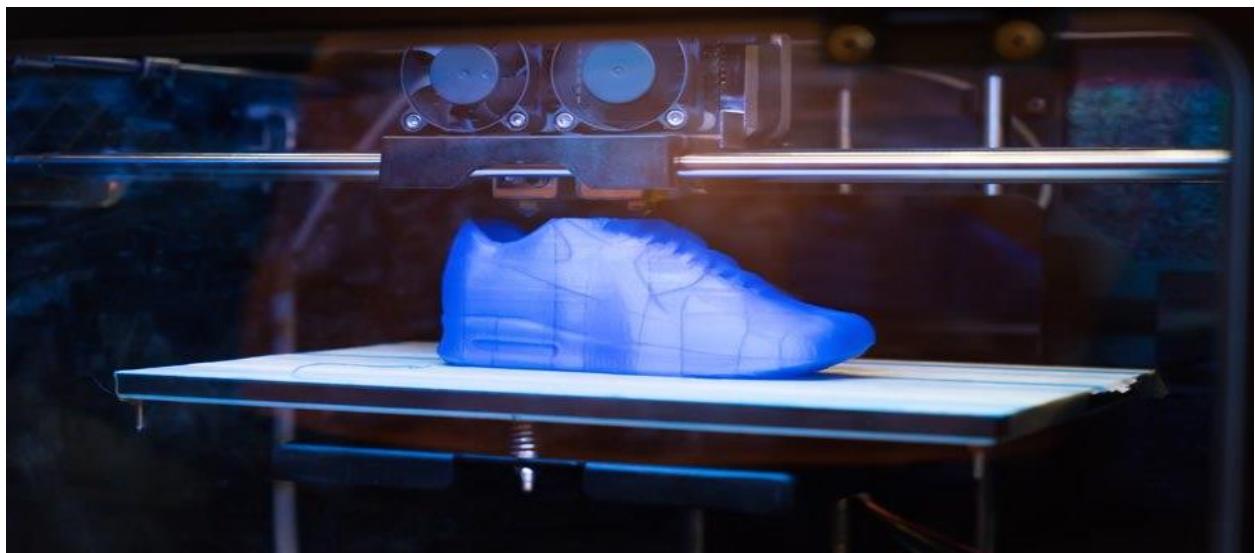


4-D printed skull

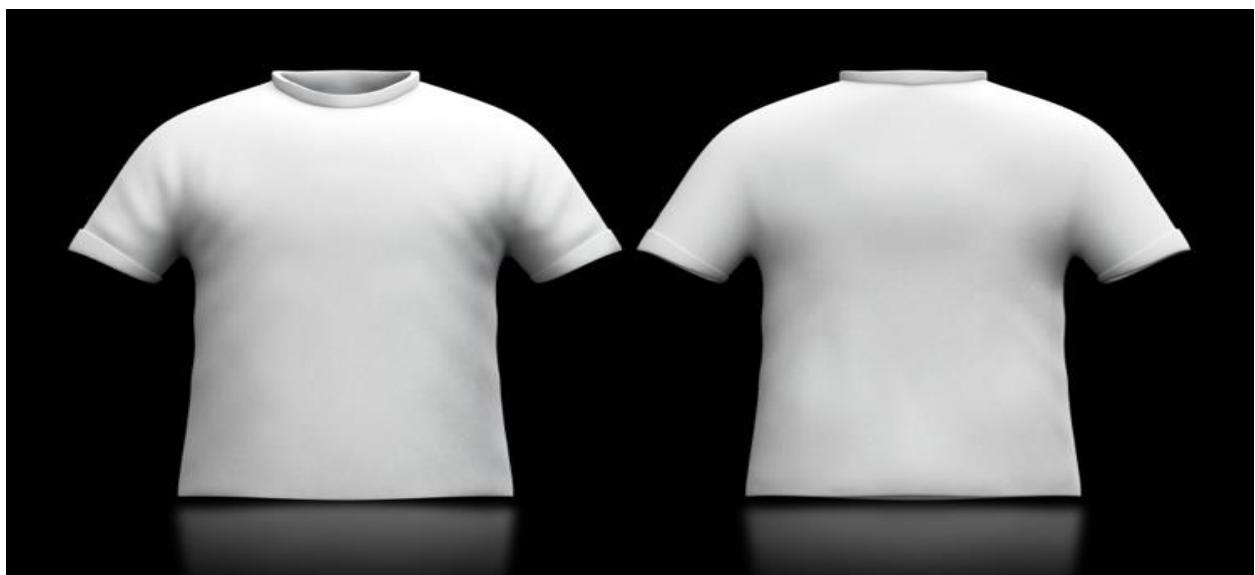
- **Clothing and footwear**

4D printing allows the manufacture of clothing that adapts to the body's shape and movement. The U.S. military is testing, for example, uniforms that change colour depending on the environment, or that regulate perspiration depending on the soldier's pulse or environment temperature.

4D printed shoes will also be able to adapt to movement, impact, temperature and atmospheric pressure.



4-D printed shoe

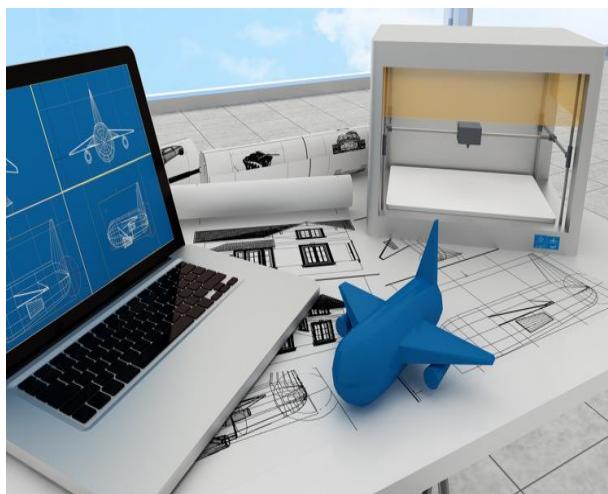


4-D printed shoe

- Aeronautics and automotive

The NASA has developed an intelligent metallic fabric with 4D printing. This fabric, which is already used for astronaut suits due to its insulating nature, **could also be used to protect spacecraft and antennas against the impact of meteorites**. Meanwhile Airbus is testing **materials that react to heat to cool its aircraft engines**.

Thanks to 4D printing, intelligent **airbags can be produced in the future that can anticipate any impact and reduce the risk of injury to the driver and passengers**.



4-D printed plane



4-D printed car



## ARTICLE 3: Industry 4.0

### **Introduction:**

Industry 4.0, which is synonymous with *smart manufacturing*, is the realization of the digital transformation of the field, delivering real-time decision making, enhanced productivity, flexibility and agility to revolutionize the way companies manufacture, improve and distribute their products.

### **How Industry 4.0 technologies are changing manufacturing?**

Manufacturers are integrating new technologies, including Internet of Things (IoT), cloud computing and analytics, and AI and machine learning into their production facilities and throughout their operations.

*Smart factories* are equipped with advanced sensors, embedded software and robotics that collect and analyze data and allow for better decision making. Even higher value is created when data from production operations is combined with operational data from *ERP*, supply chain, customer service and other enterprise systems to create whole new levels of visibility and insight from previously siloed information.

Developing smart factories provides an incredible opportunity for the manufacturing industry to enter the fourth industrial revolution. Analyzing the large amounts of big data collected from sensors on the factory floor ensures real-time visibility of manufacturing assets and can provide tools for performing predictive maintenance in order to minimize equipment downtime.

Industry 4.0 concepts and technologies can be applied across all types of industrial companies, including discrete and process manufacturing, as well as oil and gas, mining and other industrial segments.

## **From Steam to Sensor: Historical Context for Industry 4.0:**

### *First industrial revolution*

Starting in the late 18th century in Britain, the first industrial revolution helped enable mass production by using water and steam power instead of purely human and animal power. Finished goods were built with machines rather than painstakingly produced by hand.

### *Second industrial revolution*

A century later, the second industrial revolution introduced assembly lines and the use of oil, gas and electric power. These new power sources, along with more advanced communications via telephone and telegraph, brought mass production and some degree of automation to manufacturing processes.

### *Third industrial revolution*

The third industrial revolution, which began in the middle of the 20th century, added computers, advanced telecommunications and data analysis to manufacturing processes. The digitization of factories began by embedding programmable logic controllers (PLCs) into machinery to help automate some processes and collect and share data.

### *Fourth industrial revolution*

We are now in the fourth industrial revolution, also referred to as Industry 4.0. Characterized by increasing automation and the employment of smart machines and smart factories, informed data helps to produce goods more efficiently and productively across the value chain. Flexibility is improved so that manufacturers can better meet customer demands using mass customization—ultimately seeking to achieve efficiency with, in many cases, a lot size of one.

## **What technologies are driving Industry 4.0?**

- **Internet of Things**

The IoT is a key component of smart factories. Machines on the factory floor are equipped with sensors that feature an IP address that allows the machines to connect with other web-enabled devices. This mechanization and connectivity make it possible for large amounts of valuable data to be collected, analyzed and exchanged.

- **Cloud computing**

Cloud computing is a cornerstone of any Industry 4.0 strategy. Full realization of smart manufacturing demands connectivity and integration of engineering, supply chain, production, sales and distribution as well as service. Cloud helps make that possible. In addition, the typically large amount of data being stored and analyzed can be processed more efficiently and cost-effectively with cloud. Cloud computing can also reduce startup costs for small- and medium-sized manufacturers who can right-size their needs and scale as their business grows.

- **AI and machine learning**

AI and machine learning allow manufacturing companies to take full advantage of the volume of information generated not just on the factory floor, but across their business units, and even from partners and third-party sources. AI and machine learning can create insights providing visibility, predictability and automation of operations and business processes. For instance, industrial machines are prone to breaking down during the production process. Using data collected from these assets can help businesses perform predictive maintenance based on machine learning algorithms, resulting in more uptime and higher efficiency.

- **Edge computing**

The demands of real-time production operations mean that some data analysis must be done at the “edge”—that is, where the data is created. This minimizes the latency time from when data is produced to when a response is required. For instance, the detection of a safety or quality issue might require near-real-time action with the equipment. The time needed to send data to the enterprise cloud and then back to the factory floor may be too lengthy and depends on the reliability of the network. Using edge computing also means that data stays near its source, reducing security risks.

- **Cyber security**

Manufacturing companies have not always considered the importance of cyber security or cyber-physical systems. However, the same connectivity of operational equipment in the factory or field (OT) that enables more efficient manufacturing processes also exposes new entry paths for malicious attacks and malware. When undergoing a digital transformation to Industry 4.0, it is essential to consider a cyber-security approach that encompasses IT and OT equipment.

- **Digital twin**

The digital transformation offered by Industry 4.0 has allowed manufacturers to create digital twins that are virtual replicas of processes, production lines, factories and supply chains. A digital twin is created by pulling data from IoT sensors, devices, PLCs and other objects connected to the internet. Manufacturers can use digital twins to help increase productivity, improve workflows and design new products. By simulating a production process, for example, manufacturers can test changes to the process to find ways to minimize downtime or improve capacity.

## **ARTICLE 4 : EV Technology: Current Trends and Future Prospects**

### **Introduction to Electric Vehicle Technology:**

The electric vehicle industry is revolutionizing the automotive industry with every passing day. EVs offer a sustainable and eco-friendly alternative fuel vehicle by reducing carbon emissions. This industry has always been at the forefront of delving into new technologies, innovations and facing challenges related to the EV sector, hence playing an important role in modern-day transportation.

### **Importance of Electric Vehicles (EVs) in Modern Transportation:**

As we know,

- EVs are more than just a technological innovation; they are a response to the need for sustainable mobility.
- EVs are vehicles that are fully or partially powered by electric motors, using a rechargeable battery system.
- EVs are beneficial to the environment because of their ability to reduce greenhouse gas emissions, lower dependence on fossil fuels, and, of course, provide a pollution-free commute.

### **Comparison of EVs with Traditional Internal Combustion Engine Vehicles:**

Comparing EVs to traditional internal combustion engine (ICE) vehicles highlights the contrast and potential benefits of adopting EV technology. While ICE vehicles are known for their power and range, EVs excel in efficiency and environmental friendliness.

- Emissions: EVs produce zero emissions, which is crucial for urban air quality.
- Maintenance: Reduced mechanical complexity in EVs leads to lower maintenance costs and fewer moving parts.

## Different Types of EVs:

- **BEVs (Battery Electric Vehicles):** Operate solely on electric power stored in batteries and emit no pollutants.
- **HEVs (Hybrid Electric Vehicles):** Combine a petrol/diesel engine with an electric motor and battery, allowing for improved fuel efficiency.
- **PHEVs (Plug-in Hybrid Electric Vehicles):** Can run on both gasoline and electricity, with the ability to recharge the battery by plugging into an electric power source.
- **FCEVs (Fuel Cell Electric Vehicles):** Use hydrogen fuel cells to generate electricity, emitting only water vapor as a byproduct.

## Current Trends in EV Technology:



- Advancements in Battery Technology, Including Energy Density and Charging Speed
- Development of Public Charging Infrastructure and Innovations in Fast Charging
- Impact of Regulations and Policies on Accelerating EV Adoption

- Integration of AI and Advanced Driver Assistance Systems (ADAS) for Enhanced Vehicle Safety
- The Rise of Software-defined Vehicles and Improvements in Connectivity Features

## **Key Components of Electric Vehicles:**

- **Battery Packs:** Their Role in Storing Electricity and Powering the Motor
- **Electric Traction Motor:** Driving the Vehicle's Wheels
- **Onboard Charger and Charge Port:** Facilitating the Vehicle's Charging
- **Thermal Management Systems:** Ensuring Efficiency and Longevity of EV Components
- **Power Electronics Controller:** Managing the Flow of Electrical Energy

## **Innovations Shaping the Future of EVs:**

- **Solid-state Batteries:** Potential to Revolutionize Energy Storage.
- **Vehicle-to-Grid (V2G) Technology:** Enabling EVs to Contribute to Grid Stability.
- **Advancements in Regenerative Braking:** Enhancing Energy Efficiency.
- **Hydrogen Fuel Cell Vehicles:** Exploring Alternatives to Battery Technology.
- Sustainable Material Disposal and Recycling of EV Components.

## **Challenges Facing EV Technology**

- Infrastructure and Range Anxiety: Addressing Public Charging Gaps
- Battery Technology Limitations: Energy Density Comparison With Fossil Fuels
- Safety Concerns With Advanced Autonomous Driving Features
- Integration Challenges of Connectivity Features and Cyber security Concerns.

## ARTICLE 5: Alternative Fuels – Hydrogen Fuel Cell

### Introduction:

A hydrogen fuel cell uses the chemical energy of hydrogen to produce electricity. It is a clean form of energy with electricity, heat and water being the only products and by-products. Fuel cells offer a variety of applications, from transportation to emergency back-up power, and can power systems as large as a power plant or as small as a laptop.

Fuel cells provide advantages over traditional combustion-based technologies, including greater efficiencies and lower emissions. Since hydrogen fuel cells only emit water, there are no carbon dioxide emissions or other pollutants released into the atmosphere. Fuel cells are also quiet during operation as they have fewer moving parts than combustion technologies.

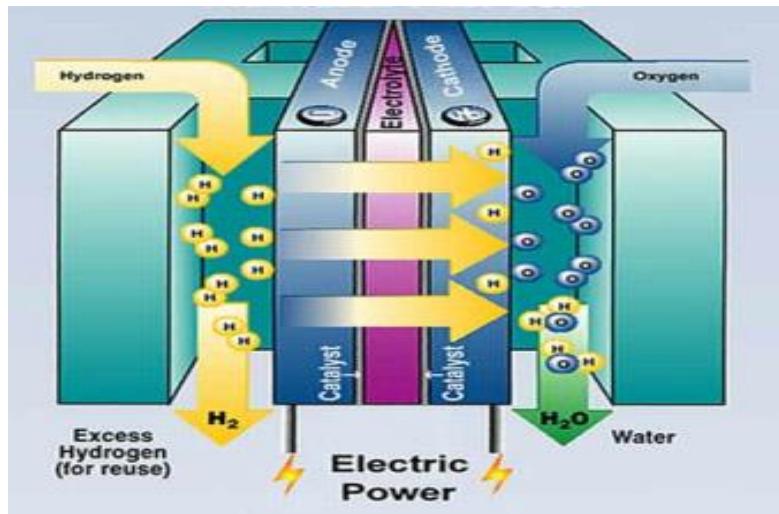
### How Does A Hydrogen Fuel Cell Work?

Hydrogen fuel cells generate electricity using a chemical reaction. Each fuel cell has two electrodes; **a negative anode and a positive cathode**. The reaction to produce the electricity happens at these electrodes, with an electrolyte carrying electrically charged particles between them and a catalyst to speed up the reactions.

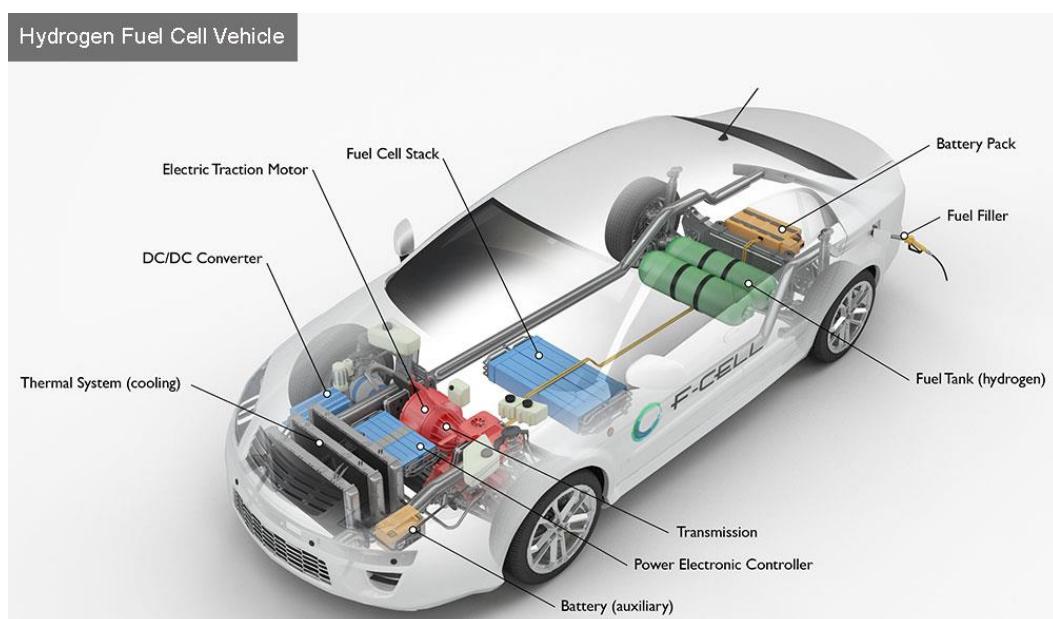
Hydrogen acts as the basic fuel in a hydrogen fuel cell, but the cell also needs oxygen to work. One of the largest advantages of these fuel cells is that they **generate electricity with very little pollution**, as the hydrogen and oxygen used to generate the electricity combines to produce **water as a by-product**. Cells that use pure hydrogen as fuel are completely **carbon-free**.

The process by which a fuel cell works can be summarized as follows:

- Hydrogen atoms enter at the anode, while oxygen is fed to the cathode



- The hydrogen atoms are separated into protons and electrons at the anode.
- The now positively charged protons pass through the membrane (or electrolyte) to the cathode, with the negatively charged electrons take a different route as they are forced through a circuit to generate electricity.
- After passing through the circuit and the membrane accordingly, the electrons and protons meet at the cathode where they combine with oxygen to produce heat and water as by-products.



## **Key Components of a Hydrogen Fuel Cell Electric Car:**

- **Battery (auxiliary):** In an electric drive vehicle, the low-voltage auxiliary battery provides electricity to start the car before the traction battery is engaged; it also powers vehicle accessories.
- **Battery pack:** This high-voltage battery stores energy generated from regenerative braking and provides supplemental power to the electric traction motor.
- **DC/DC converter:** This device converts higher-voltage DC power from the traction battery pack to the lower-voltage DC power needed to run vehicle accessories and recharge the auxiliary battery.
- **Electric traction motor (FCEV):** Using power from the fuel cell and the traction battery pack, this motor drives the vehicle's wheels. Some vehicles use motor generators that perform both the drive and regeneration functions.
- **Fuel cell stack:** An assembly of individual membrane electrodes that use hydrogen and oxygen to produce electricity.
- **Fuel filler:** A nozzle from a fuel dispenser attaches to the receptacle on the vehicle to fill the tank.
- **Fuel tank (hydrogen):** Stores hydrogen gas onboard the vehicle until it's needed by the fuel cell
- **Power electronics controller (FCEV):** This unit manages the flow of electrical energy delivered by the fuel cell and the traction battery, controlling the speed of the electric traction motor and the torque it produces.
- **Thermal system (cooling) - (FCEV):** This system maintains a proper operating temperature range of the fuel cell, electric motor, power electronics, and other components.
- **Transmission (electric):** The transmission transfers mechanical power from the electric traction motor to drive the wheels.

### **Fuel Cell Benefits:**

- Zero-Emission Power
- Robust Reliability
- Improved Efficiency
- Scalable
- Lower Operational Costs

### **Need to attach:**

1. PROJECT WORK DONE BY THE STUDENTS:
2. DEPARTMENT SYMPOSIUMS PHOTOS
3. SPORTS ACTIVITIES
4. STUDENTS INSIDE INNOVATION (Drawings & Art works)
5. ALUMNI TALK WITH DEPARTMENT JUNIOR STUDENTS
6. ANNUAL DAY CELEBRATIONS
7. OTHER ACHIEVEMENTS (Other than academics like NCC, blood donate)
8. SYMPOSIUMS DIFFERENT EVENT PHOTOS
9. GRADUATION DAY
10. PONGAL CELEBRATION PHOTOS