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ZEAL POLYTECHNIC, PUNE



TECHNICA
TECHNICAL MAGAZINE
2020

**DEPARTMENT OF MECHANICAL
ENGINEERING**

FROM PRINCIPAL'S DESK



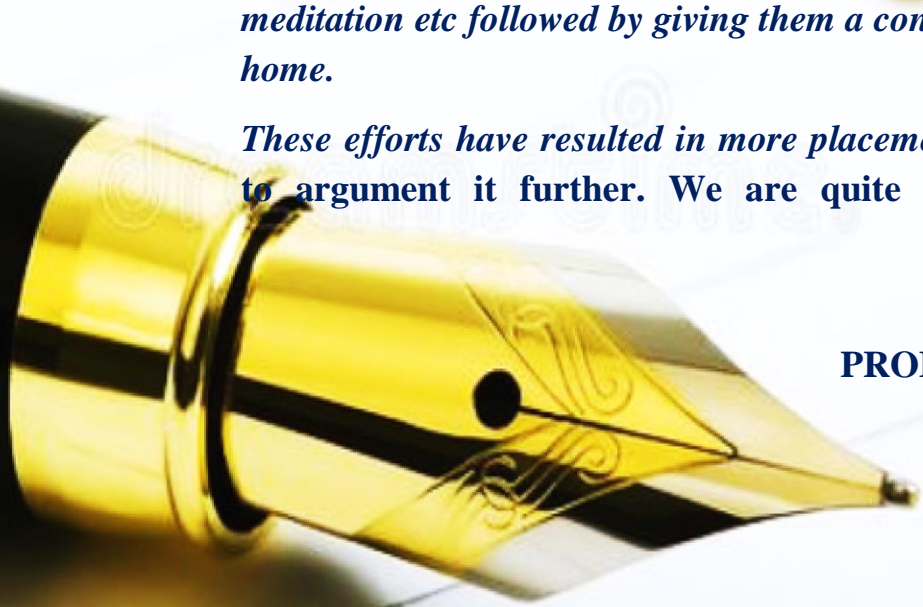
We provide best platforms to budding engineers to acquire technical knowledge, motor skills and soft skills which are utmost demands of the industry. Uniqueness of our institute is a caring, nurturing culture that recognizes the various aspects of each student and encourages them to bloom to their fullest with confidence.

We are also committed to very good quality of teaching-learning process with having maintained high grade discipline among the staff and students and to achieve sky-scraping point superiority in academic by maintaining a conducive atmosphere for studies, state-of art laboratories communication centre and digital library. MOUs have been signed with reputed organization to impart cutting edge technologies through extensive courses.

In another view, we aim at development of our student at different levels by the proper encouragement, guidance, support, and generation of in-house recourses for sports, cultural, yoga, meditation etc followed by giving them a confidence to feel free at home.

These efforts have resulted in more placements and we are keen to argument it further. We are quite self-assured for the

Regards,
PROF. A. A. TAMBOLI
PRINCIPAL





Department of
Mechanical
ENGINEERING

Mechanical Engineer is a professional who is equipped with the knowledge of designing, manufacture and maintenance or mending of machines. The Department was established in 2008 & offers Diploma in Mechanical engineering can accommodate 150 students.

Our vision is to be recognized as innovative & leading mechanical department in Pune & beyond. Our goal is to provide students a well-equipped lab to keep the students up-to-date in terms of knowledge to seek new advancements of professional skills which will make our students industry ready. The syllabus in Mechanical engineering is designed to deliver the needs of manufacturing industries, the power sector etc. With the growth of technologies, the new subjects of studies are also introduced such as CAD/CAM & Automation, Alternative energy sources & Management, Material Handling Systems. The Department has experienced and highly qualified staff, spacious classrooms and well-equipped laboratories. The faculty members extend their extensive support and guidance to the students to help them build a bright future.

FROM HOD'S DESK



The Department was established as Dnyanganga Polytechnic in 2008. It offers a diploma in mechanical engineering and can accommodate 150 students. We function with the vision that the Department should get recognized as an innovative and leading Mechanical department in Pune region and afar. The department aims at offering students with the high quality education clubbed with practical exposure that empowers them with the ability to aid the society by their services in the future. The Department aims at making superior diploma engineering professionals through academic brilliance and excellent education. The syllabus in Mechanical Engineering is steered with an extraordinary approach that helps students to meet the modern requirements of industries. To cater to the current advancement in technology, new subjects such as CAD / CAM and Automation, alternative Energy Resources, Material Handling System are also conducted using modernized laboratories and the required infrastructure. A team of well qualified and experienced faculty members forms the backbone of the Department. This team is determined to empower students with sound academic knowledge and practical experience which in turn makes the students ready to face the industry challenges.

Regards,
PROF. R. S. KHORANE
HOD

DEPARTMENTAL VISION AND MISSION

VISION

Inculcate foundational and experimental knowledge with entrepreneurial skills that prepares students to succeed in the field of mechanical engineering.

MISSION

- ❖ Enlightening the students with fundamental concepts of mechanical engineering.
- ❖ Providing practical training through upgrading department resources and industry interaction.
- ❖ Inculcating entrepreneurial qualities by arranging co-curricular and extra-curricular activities.
- ❖ Nurturing ethical values among students.

PROGRAM EDUCATIONAL OBJECTIVES

PEO 1: Graduates will have core competency in diversified areas.

PEO 2: Graduates will be able to work individually/in team to solve engineering problems.

PEO 3: Graduates will practice ethical responsibilities and services towards their employers and society.

PEO 4: Graduates will be able to continue life-long learning.



PROGRAM OUTCOMES

1. **Basic and Discipline specific knowledge:** Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.
2. **Problem analysis:** Identify and analyse well-defined engineering problems using codified standard methods.
3. **Design/ development of solutions:** Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.
4. **Engineering Tools, Experimentation and Testing:** Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.
5. **Engineering practices for society, sustainability, and environment:** Apply appropriate technology in context of society, sustainability, environment, and ethical practices.
6. **Project Management:** Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities.
7. **Life-long learning:** Ability to analyse individual needs and engage in updating in the context of technological changes.

PROGRAM SPECIFIC OUTCOMES

PSO1: The mechanical engineering graduates will be able to supervise production planning and control of mechanical components/systems.

PSO2: The mechanical engineering graduates will be able to maintain the mechanical systems and inspect mechanical component using various tools for quality assurance.

PSO3: The mechanical engineering graduates will be able to design and draft mechanical components and systems.



EDITORIAL

We proudly present 1st consecutive edition of our department's annual technical magazine "Prarambh-2020". This year we are showcasing innovative ideas and hidden talents of our young minds on the theme "**Technological Advancement**". The objective of the magazine is to provide platform for our students to augment the technology focus and scope of it. The technical section of this magazine elaborates the advancement of technology in this era of **technology** and how it has impacted individual's lives both personal and professional. During this time of sheer uncertainty and constant fear, our willingness to adopt technology has been our lifeline. So, we started adopting technological advancements like distance learning, online entertainment, fitness and health apps etc. On behalf of the entire magazine team, I would like to extend my gratitude to our respected Principal Prof. A. A. Tamboli Sir and HOD Prof. R. S. Khorane Sir for their invaluable guidance and support towards accomplishment of MESA events successfully. Special thanks to team of passionate and dynamic students for their incredible contribution in making of the magazine. There is remarkable contribution of the student's editorial team to make this magazine amazing. I congratulate all the participants for sharing distinguished articles in the magazine.

MAGAZINE COMMITTEE

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The background of the page is a dark blue gradient with a central white horizontal band. The top and bottom portions of the page are filled with a pattern of glowing blue gears of various sizes and orientations, creating a technical and mechanical aesthetic.

TECHNICAL ARTICLE

MECHATRONICS: HISTORY AND BENEFITS TO HUMANITY**History:**

The term "mechatronics" is a blend of "mechanics" and "electronics" and represents a field of engineering that integrates mechanical engineering, electronics, computer science, and control engineering to design and create intelligent systems and products. The origins of mechatronics can be traced back to the 1960s and 1970s when the integration of mechanical and electronic components became more prevalent in engineering applications.

1. **Early Developments:** The early developments of mechatronics were influenced by advancements in electronics and computing. Engineers began integrating sensors, actuators, and microprocessors into mechanical systems to enhance their functionality and control.
2. **Japanese Innovation:** The term "mechatronics" was first coined in Japan in the late 1960s, reflecting the country's emphasis on the integration of mechanical and electronic systems. Japanese companies, particularly in the automotive industry, played a significant role in popularizing mechatronics.
3. **Evolution in Manufacturing:** Mechatronics has played a crucial role in the evolution of manufacturing processes. Automation and robotics in manufacturing plants are classic examples of mechatronic systems, where mechanical components are controlled and optimized by electronic and computer systems.

Benefits to Humanity:

- a. **Improved Efficiency:** Mechatronic systems often result in improved efficiency in various applications. Automation of processes, whether in manufacturing or daily life, reduces human effort and leads to more precise and consistent outcomes.
- b. **Advanced Robotics:** Mechatronics is instrumental in the development of advanced robotics. Robots equipped with sensors and intelligent control systems can perform complex tasks in various industries, from healthcare to manufacturing.
- c. **Enhanced Product Performance:** In consumer products, mechatronics has led to the development of smarter and more efficient devices. Examples include smart appliances, automobiles with advanced driver-assistance systems, and wearable devices.
- d. **Medical Applications:** Mechatronics plays a critical role in the field of medicine. Medical robots, prosthetics, and diagnostic equipment often incorporate mechatronic principles, contributing to advancements in healthcare.
- e. **Automotive Innovation:** The automotive industry has seen significant benefits from mechatronics. Advanced safety features, fuel efficiency improvements, and the development of electric and hybrid vehicles are all influenced by mechatronic technologies.

- f. Space Exploration: Mechatronics is essential in space exploration, where robotic systems are used for tasks like planetary exploration and satellite maintenance. These systems often require a combination of mechanical robustness and electronic control.



- g. Educational and Research Opportunities: The interdisciplinary nature of mechatronics has led to educational and research opportunities that bridge traditional engineering disciplines. This has facilitated innovation and the development of new technologies.
- h. Environmental Impact: Mechatronics can contribute to environmental sustainability by optimizing energy usage, improving the efficiency of industrial processes, and facilitating the development of cleaner technologies.

In summary, mechatronics has evolved as a crucial field that has shaped various aspects of modern life. Its integration of mechanical and electronic systems has led to innovations with far-reaching benefits across industries, contributing to efficiency, safety, and advancements in technology.

- **Mr. KADAM AMULYA RAJESH**

MECAHNICAL ENGINEERING AND JOBS

Mechanical Engineers are responsible for designing and innovating technologies, machines and systems that drive modern society. A vast workforce of skilled Mechanical Engineers actively participates in shaping the country’s technological landscape. There are over 6 lakh Mechanical Engineers in India, applying their skills to propel innovation and advancement.

There are ample opportunities for Mechanical Engineers in India. Mechanical Engineers employed in the public sector are earning up to INR 10 LPA in India. A Mechanical Engineer working in the Indian railways can earn up to INR 74,000 per month with an average annual salary of INR 8.97 LPA.

The sections below will discuss the various job opportunities for Mechanical Engineers across government organisations along with their average salaries for various specialisations and types.

Who are Mechanical Engineers:

Mechanical Engineers are professionals who specialise in the design, analysis and development of mechanical systems, products and devices. They apply their knowledge to create solutions that address a wide range of mechanical challenges.

Mechanical Engineering is a diverse field that encompasses various specialisations and sub-disciplines. Some common types include automotive engineers who design, develop and produce vehicles and their components, structural engineers who design and analyse the structural integrity of mechanical systems and many more based on the specialisation.

Jobs for Mechanical Engineers

The duty of a Mechanical Engineer is to develop a wide range of products, machines and systems by applying the principles of physics, mathematics and material science. Mechanical Engineers can be of different types based on their roles and specialisation. A design engineer creates and develops new products, systems and components while a manufacturing engineer optimises the production processes for different works.

Tabulated below is the job description of a Mechanical Engineer across government organisations along with their average salaries for each specialisation.

Mechanical Engineer Profile	Job Descriptions	Average Annual Salary (INR)
Design Engineer	Create and develop new products, systems and components using CAD and other software	3.5 L
Thermal Engineer	Specialise in designing systems that involve heat transfer, fluid dynamics and thermodynamics	8.3 L

Manufacturing Engineer	Optimise the production processes for efficiency, quality and cost-effectiveness	3.9 L
Automotive Engineer	Design, develop and produce vehicles and their components	2.1 L
Aerospace Engineer	Work on aerodynamics, propulsion system and other aspects of aircraft and spacecraft	4.8 L
Materials Engineer	Select and develop materials for specific applications by considering different properties	5 L
Structural Engineer	Focus on designing and analysing the structural integrity of mechanical systems and components.	4 L

Government Jobs for Mechanical Engineers

Government jobs for Mechanical Engineers offer promising opportunities to harness their technical skills and contribute to the nation’s growth. From organisations and PSUs to defence and research, these jobs provide stability, competitive pay and comprehensive benefits.

Some of the top govt jobs for Mechanical Engineers across various parameters along with their average salaries are discussed below.

Experience Wise

Experience plays a major role in deciding a Mechanical Engineer’s salary in India. Experienced engineers are compensated more compared to those with less or no experience. Tabulated below is the experience-wise salary of Mechanical Engineers employed across various government organisations.

Experience Years	Average Annual Salary (INR)
1 – 5 Years	3.5 L
6-10 Years	4 L to 10 L
10 Years and above	5L to 20 L

Qualification Wise

Education is an important factor in deciding a Mechanical Engineer’s salary. Candidates with higher salaries are often compensated more. The table below highlights the salaries of Mechanical Engineering according to different courses.

Qualification	Average Annual Salary (INR)
BE / BTech Mechanical Engineering	5 L - 10 L
MTech Mechanical Engineering	4 L - 8 L
PhD Mechanical Engineering	3.5 L - 10 L

Sector Wise

Mechanical Engineers can find opportunities in both the public and private sectors in India with varying levels of pay.

The sector-wise salaries for Mechanical Engineers are as follows.

Sector Average	Annual Salary (INR)
Public sector	10 L
Private sector	7.09 L

Govt Mechanical Engineer Jobs

To become a Mechanical Engineer, candidates have to pursue a degree in Mechanical Engineering like BTech or MTech and appear in the selection process to get selected for the government jobs. Some of the top govt jobs for Mechanical Engineers along with their average salaries are tabulated below.

JOB	Offering Institute	Average Salary (INR)
Assistant Engineer (Mechanical)	RPSC AEN	L-14 (GP 5400)
Project Engineer/JRF	DRDO	31,000
JRF	IIT Indore	As per institute norms
Assistant Work Engineer	OPSC	56,100
JRF	IIT Delhi (Department of Mechanical Engineering)	31000
NIT Goa	Resident Engineer cum Project Manager	50,000
Project Engineer/Trainee Engineer	BEL Panchkula Unit	40,000/30,000
Junior Engineer Tripura	PSC	34,700 - 47,600
Engineer	HPCL	50,000 - 1.60 L

Top Recruiters

Mechanical Engineers are employed by government organisations for different roles and duties across several aspects. The table below lists some of the top government recruiters for Mechanical Engineers in India.

Name of the Institute	Location
Indian Railways (RRB)	Across the country
ONGC	New Delhi
SAIL	New Delhi
BHEL	New Delhi
NTPC	New Delhi
IOCL	New Delhi
HAL	Bangalore
DRDO	New Delhi
SSC	New Delhi
ISRO	Bangalore

- **Mr. SAHIL SAMBHAJI MADKE**



BIOMETRIC VEHICLE ACCESS

Biometric vehicle access refers to the use of biometric technology to control and secure access to vehicles. This involves using unique physiological or behavioural characteristics of individuals to verify their identity before granting access to a vehicle. Biometric authentication adds an extra layer of security compared to traditional methods like keys or key fobs. Here are some common biometric technologies applied to vehicle access:

Fingerprint Recognition: Fingerprint scanners can be integrated into vehicle systems to recognize and authenticate users based on their unique fingerprint patterns.

Retina or Iris Scanning: This technology involves scanning the unique patterns of the iris or retina in a person's eye for identification purposes. It is highly accurate and resistant to forgery.

Facial Recognition: Facial recognition systems use unique facial features to identify and authenticate individuals. Cameras installed in vehicles capture and analyze facial characteristics to grant access.

Voice Recognition: Voice biometrics authenticate users based on their unique vocal patterns. Users speak a passphrase or specific words, and the system compares the voice sample to a pre-recorded template for verification.

Palm Vein Recognition: This method involves scanning the vein patterns in a person's palm to authenticate their identity. It is a highly secure biometric modality.



Gesture Recognition: Gesture-based biometrics involve recognizing unique gestures or movements made by an individual to grant access. This might include specific hand movements or gestures captured by sensors.

DNA Recognition: Although less common due to the complexity and time-consuming nature of DNA analysis, some advanced security applications explore the use of DNA as a biometric identifier for access control.

The integration of biometric technology in vehicle access can enhance security, prevent unauthorized use, and provide a convenient and seamless user experience. However, it's crucial to address potential privacy concerns, ensure the reliability of the biometric system, and implement appropriate security measures to protect the stored biometric data. Additionally, environmental factors such as lighting conditions and changes in appearance (e.g., facial hair or accessories) should be considered for the effective implementation of biometric vehicle access systems.

Mr. GORAD SAURAV GORAKSHANATH

OLED (ORGANIC LIGHT-EMITTING DIODE): NEXT-GENERATION DISPLAY TECHNOLOGY

Introduction to OLED:

OLED is an advanced display technology that uses organic compounds to produce light when an electric current is applied. Unlike traditional LCD (Liquid Crystal Display) technology, which requires a backlight, each pixel in an OLED display emits its own light, allowing for thinner and more flexible displays.

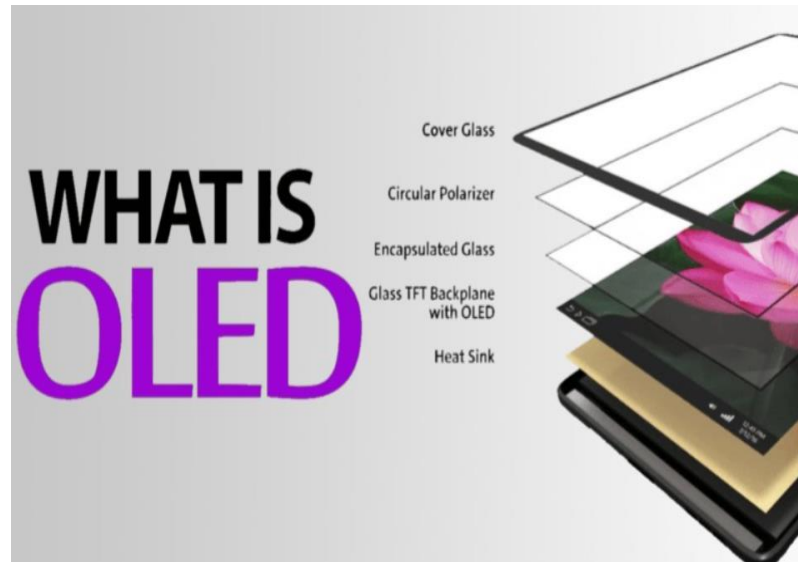
Key Features of OLED Technology:

1. **Flexibility:** OLED displays can be made flexible and bendable, enabling new form factors for devices. This flexibility has led to the development of curved and foldable displays in smartphones, TVs, and wearables.
2. **Thin and Lightweight:** OLED displays are inherently thin and lightweight, contributing to the sleek design of modern electronic devices. This is especially valuable in applications such as smartphones and ultra-thin TVs.
3. **High Contrast Ratio:** OLEDs can achieve high contrast ratios because each pixel can be individually turned on or off. This results in deep blacks and vibrant colors, enhancing the overall visual experience.
4. **Wide Viewing Angles:** OLED displays provide excellent viewing angles with consistent color and brightness from various perspectives. This makes them suitable for large-screen TVs and public displays.
5. **Fast Response Time:** OLEDs have fast response times, reducing motion blur in fast-paced video content. This makes them well-suited for applications like gaming and sports broadcasts.
6. **Energy Efficiency:** OLEDs are energy-efficient because they only emit light when needed. In contrast to traditional displays with a constant backlight, OLED displays can save power by turning off pixels in areas that require dark scenes.

Applications of OLED Technology:

1. **Smartphones:** OLED displays are widely used in smartphones due to their flexibility, vibrant colors, and energy efficiency. They enable features like in-screen fingerprint sensors and curved-edge displays.
2. **TVs and Monitors:** OLED TVs have gained popularity for their superior image quality, deep blacks, and thin profiles. They are also used in high-end monitors for professional applications.
3. **Wearables:** The flexibility of OLED displays makes them suitable for wearable devices, including smartwatches and fitness trackers. Their thin and lightweight nature contributes to the comfort of these devices.

4. Automotive Displays: OLED displays are increasingly used in car interiors for infotainment systems, instrument clusters, and heads-up displays. Their ability to curve and conform to different shapes is beneficial in automotive design.
5. Virtual and Augmented Reality: OLED displays are used in VR and AR headsets due to their fast response times and high pixel density, providing an immersive visual experience.



Challenges and Future Developments:

1. Cost: OLED displays can be more expensive to manufacture than traditional LCDs, which has limited their widespread adoption in some markets. However, ongoing research aims to address cost concerns.
2. Lifetime: The organic compounds in OLEDs can degrade over time, affecting the lifespan of the display. Researchers are working on improving the longevity of OLED panels for extended durability.
3. Technological Advancements: Ongoing developments include improvements in efficiency, brightness, and scalability. The industry is also exploring new materials and manufacturing processes to push the boundaries of OLED technology.

In summary, OLED technology represents a significant advancement in display technology, offering a range of benefits such as flexibility, thinness, and high image quality. As on-going research and development address challenges and improve key aspects, OLEDs are likely to continue playing a crucial role in the next generation of displays across various devices and applications.

Mr. KATURDE SURYAKANT DILIP

HARNESSING SOLAR ENERGY

Meeting the world's ever-growing energy demands in an environmentally responsible and sustainable manner is one of the issues facing by today's generation. Solar energy is an abundant, clean, safe and free resource, providing approximately 1,000 watts of power per square meter to Earth's surface every day.

How can we most effectively capture, convert and store this tremendous natural resource?

One of the first technologies that comes to mind when discussing solar energy is the growing use of solar cells, also known as photovoltaic cell, which convert sunlight directly into electricity. Solar cells are silent, non-polluting and long-lived devices that typically convert 10 to 15 percent of the energy received into energy that can be used.

There are at least two other ways to store solar energy for use later. The sunlight can be stored in the heat capacity of a molten salt (the liquid form of an ionic compound like sodium chloride) at a high temperature. When electricity is needed later, heat is transferred from the molten salt to water, using a heat exchanger to generate steam to drive a turbine.

They are not the only way to get electricity from solar energy, though. Sunlight can also be intensely focused onto a small area, using concentrators such as an array of mirrors or lenses to heat water and create steam. High-pressure steam can be driven through a turbine to generate electricity.

A second method of harnessing and storing solar energy is to employ sunlight to produce a fuel. For example, a photo electrochemical cell uses solar energy to split water into hydrogen and oxygen gases, which can be stored as fuels. These gases are then recombined to generate electricity in a device known as a fuel cell. An attractive feature of this approach is that the byproduct of the fuel cell reaction is simply water. While many of the technologies described here are in use on a small scale today, we must continue to develop innovative methods of storing solar energy and promote sustainable energy policies that benefit generations to come.

Miss .DESHMUKH GAYATRI RAJESH

TRANSITION FROM CONVENTIONAL ENERGY RESOURCES TO ALTERNATIVE FUELS

Our world is quite familiar with the use of conventional energy sources which include coal, fossil fuels, petroleum, nuclear energy etc. Although these contribute large amounts of energy, there are downfalls or disadvantages to using these sources. Conventional fuels cause high levels of pollution, waste and are easily exhausted. Waste is also needed to be sent to landfill, which further causes trouble on land and in water. This is the reason why the United Nations and environmental organizations working across the globe, are advocating alternative fuels.

But what are Alternative Fuels?

They are non-conventional fuels which can be used in place of petroleum, coal etc, due to some of its obvious advantages like relative low cost, employment generation. From electricity-run cars and propane vehicles to natural gas-powered buses and trucks running on biodiesel, the use of alternative fuels is gaining a lot more popularity. Moreover, these alternative fuels have varied sources for harnessing energy as compared to the conventional energy sources.

What are some of the alternative fuels?

Some commonly known alternative fuels are biodiesel, methanol, ethanol, propane etc.



How is India trying to implement the use of alternative fuels?

1. Nitin Gadkari, Minister of Road Transport and Highways of India, launched the world's most advanced technology-developed Green Hydrogen Fuel Cell Electric Vehicle (FCEV) Toyota Mirai. This initiative is to promote clean environmental protection and make India a step closer to being "Energy Self-reliant" by

2047. 2. The government plans on shifting to public transportation to 100% clean energy sources. Flex-fuel is gaining popularity as a relatively environment friendly fuel. This helps combat rising fuel prices, as well as aid in switching to full electrification in the future.

3. Various central and state governments have switched their focus to the use of ethanol as an alternative energy source. Flex-fuel uses 85% petrol and 15% ethanol. The advantage is that it requires minimal modifications to the fuel system and engine to effectively use the fuel.

4. Bihar becomes the first state to start its own ethanol policy in the year 2021.

Although there will always be a need for renewable/alternative fuels, during times like the Russia-Ukraine conflict, the need for crude oil import arises. The rise in prices for crude oil causes a great concern and stress to the economy of the country. India's crude oil import may exceed 100 dollars in the current fiscal year and with the steady decline in India's domestic output of crude oil, it is crucial to shift our focus on alternative fuels.

Mr. ZADE PRITESH PRASAD





**THANK
YOU!**

ZEAL POLYTECHNIC, NARHE, PUNE
DEPARTEMENT OF MECHNICAL ENGINEERING