Gnanamani
College of Technology
Accredited by NAAC 'A' Grade & HBA
AUTONOMOUS

IMPULSE

ELECTRONICS AND COMMUNICATION ENGINEERING

Volume 9
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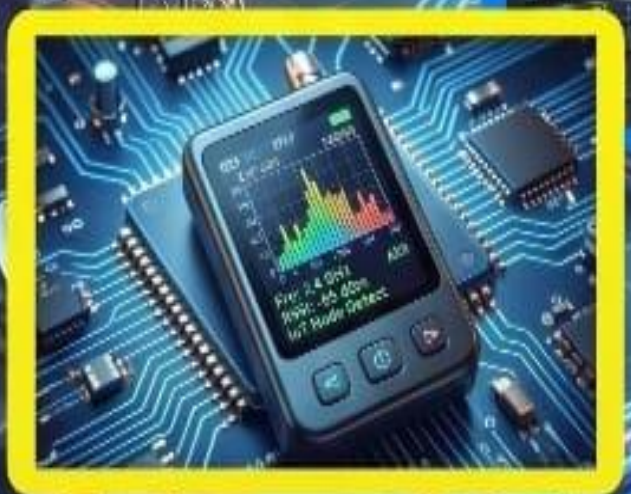
2024-2025



Acoredited by NAAC 'A' Grade and NBA
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www.gct.org.in

GNYANAMANI EDUCATIONAL INSTITUTIONS

Gnyanamani Educational Institutions that have carved a niche for itself in the field of engineering education within a very short span of time. Gnanamani College of Technology which was established in the year 2006, the group comprises of Gnanamani College of Education, established in the year 2005.

Gnanodaya CBSE International School was established in the year 2015. These Institutions serve under the aegis of The Christian Educational Development Trust.

Gnyanamani Educational Institutions were established in a well-planned campus with a green environment. The Colleges are spread on a sprawling 60 acres of serene land. The Colleges are easily accessible from all major cities by road and railway networks.

These Institutions have emerged as a pioneer venture in the field of Technical Education. Dr.T.Arangannal – a Rashtria Vidhya Saraswathi Puraskar Awardee is the Chairman and Mrs.P.Malaleena is the Chairperson of the Educational Institutions.

GNANAMANI COLLEGE OF TECHNOLOGY

Gnanamani College of Technology is a leading Institution with state-of-the-art facility.

The institution is rendering noble service to the youths in rural and urban areas.

The college is accredited by the NAAC and NBA (CSE, ECE, EEE, and Mechanical).

The college has grown in a short span of 17 years with 12 UG Courses namely Agricultural, Artificial Intelligence and Data Science, Bio-Medical, Biotechnology, Chemical, Computer Science, Electrical and Electronics, Electronics and Communication, Food Technology, Mechanical, Information Technology and Pharmaceutical Technology.

The Institute also offers 9 PG courses in Computer Science, Construction Engineering and Management, Environmental Engineering, Embedded System Technology, Power Electronics and Drives, Industrial Engineering, VLSI Design, BME, MBA and MCA.

INSTITUTE VISION

Emerging as a technical institution of high standard and excellence to produce quality Engineers, Researchers, Administrators and Entrepreneurs with ethical and moral values to contribute the sustainable development of the society.

INSTITUTE MISSION

We facilitate our students

- To have in-depth domain knowledge with analytical and practical skills in cutting edge technologies by imparting quality technical education.
  To be industry ready and multi-skilled personalities to transfer technology to industries and rural areas by creating interests among students in Research and Development and Entrepreneurship.

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

- The Department of Electronics and Communication Engineering (ECE) was established in 2006 with the vision of developing the department as a Centre of Excellence in R&D, and in the field of Electronics and Communication Engineering. It also puts strenuous efforts to make the students into technically strong and mentally stable.
- Our mission is to develop innovative and simple instructional material to instil the concepts into the minds of students and infuse scientific temper in the students and exhort them towards research in their specialization. It is also striving arduously with a team of committed teachers to bring out the excellence in both teaching and research. It also entails its road with a view to developing Collaborative Research and strengthening Development linkages with leading organizations in India and overseas.
- The department has Analog and Digital Circuit Lab, Communication Lab, Embedded Systems Lab, DSP/VLSI Lab, Optical and Microwave Lab, Linear Integrated Circuits lab, Electron Devices & Circuits lab, Modelling & Simulation lab, and Microprocessor & Microcontroller lab.
- All the laboratories are set up with air conditioning and supported by uninterrupted power supply facility. The state-of-the-art equipment in the laboratories makes it ideal hub for research and development in the field of Electronics and Communication Engineeering.

VISION

- To produce globally competent, innovative, ethical, socially responsible and academically excellent graduates in Electronics and Communication Engineering.

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MISSION

- Imparting high quality education with value added programs through state-of- the- Art facilities to prepare technically strong engineers with social awareness.
- Addressing the needs of the people's aspirations and to our local needs on the Emerging technology.
- Promoting excellence towards productive careers in industry, research and entrepreneurship.

PROGRAM EDUCATIONAL OBJECTIVES

- Be able to apply mathematics, science and Engineering fundamentals and advanced concepts for their successful careers in industries, higher studies and research.
- Analyse, design and execute interdisciplinary projects by addressing the industrial and social needs.
- Demonstrate and exhibit professional practice with ethical behaviour and engage in continuous learning for career growth.

PROGRAM SPECIFIC OUTCOMES

- Possess knowledge and skills to work on analog and digital systems, AdHoc and sensor networks, embedded and communication systems
- Adapt to emerging technologies with required skills and to offer solutions to the novel problems and succeed in their career.

PROGRAM OUTCOMES

Engineering knowledge:

Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems

Problem analysis:

Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

Design/development of solutions:

Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal and environmental considerations.

Conduct investigations of complex problems:

Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.

Environment and sustainability:

Modern tool usage:

Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

Engineer and society:

Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

Ethics:

Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

A Individual and team work:

Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.

Communication:

Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

Project management and finance:

Demonstrate knowledgeand understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

Life-long learning:

Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

MANAGEMENT PROFILE

PROGRAM OUTCOMES

Gnyanamani Educational Institutions are run by two legendary visionaries, Dr. T. Arangannal and Mrs. P. Malaleena, whose dedication to education has shaped the institution's identity and direction.

At the forefront is Dr. T. Arangannal, Chairman, a distinguished leader, who has been a driving force behind the institution's evolution. A recipient of the Rashtriya Vidya Saraswati Puraskar and an honorary Doctorate from the University of Sri Lanka, Dr. Arangannal is widely revered for his lifelong contributions to the field of education. His visionary leadership has cultivated a culture of excellence, discipline, and innovation across all levels of the institution.

Mrs. P. Malaleena, Chairperson, whose unwavering commitment and strategic foresight have been instrumental in establishing the institution's strong ethical and academic foundations. Her focus on student-centered learning and inclusive growth continues to define its mission, vision, and core values.

The leadership team also includes Ms. Madhuvanthinie Arangannal, Vice-Chairperson, who brings a contemporary vision and strategic insight to the institution's development. Her dynamic leadership focuses on aligning the institution with global academic standards and fostering innovation in education.

Operational administration is efficiently managed by Dr. P. Premkumar, Chief Administrative Officer, whose expertise in institutional management and policy implementation ensures the smooth functioning of all academic and support services. His strategic leadership plays a vital role in sustaining and enhancing the institution's quality standards.

Academic affairs are led by Dr. T.K. Kannan, Principal, who is committed to providing a rigorous and engaging academic environment. His leadership promotes research-driven teaching, skills development, and student empowerment, ensuring that learners are prepared to meet the demands of a rapidly changing global landscape.

CHAIRMAN'S MESSAGE

It gives me immense pleasure to express that our Electronics and Communication Engineering release the department magazine for the academic year 2023-24 highlighting the various activities and budding talents of the students on this special occasion. I value the emerging ability and the endowment of the students in their articles, poems, drawing etc., which bloom out their young talents and skills. I appreciate our magazine committee for their venture in bring out this memorable edition.

I wish the Principal, Magazine Committee and the Editorial team, Staff and Students and all the hands that rendered service to bring out a fabulous magazine for this year, I am passionately waiting for the editorial team to reach another mile stone of perfection in the next magazine. I wish them all success.

Dr. T. Arangannal

CHAIRPERSON'S MESSAGE

1 am glad to know that our Gnanamani College Of Technology is leading a step forward by releasing the magazine 2023-2024. This magazine would be a common platform for the students to express their hidden talents and creativity. My hearty wishes to the Principal, staff members and students for the completion of this IMPULSE.

Wishing you all success in their Academic Endeavours.

Tmt.P.Malaleena

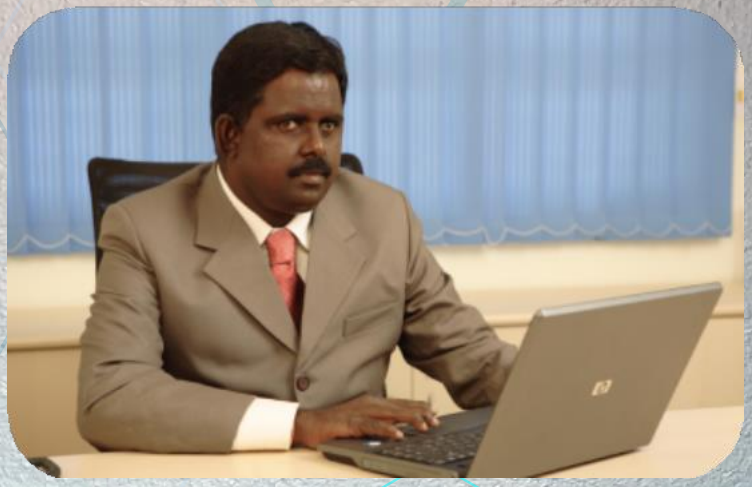
VICE CHAIRPERSON'S MESSAGE

Impulse is particularly important as it encourages the students to share the knowledge they have acquired. Writing articles for the magazine also improves the communication skills of the budding engineers of the ECE department. It is common knowledge that representation of an idea is as important as, if not more important, than the idea itself.

I would like to congratulate the faculty and the students of the editorial team on bringing out the issue of Iconic and my best wishes to the students for a bright future.

Ms. Madhuvanthinie Aranganal

CAO'S MESSAGE



It is my privilege to know that Department of Electronics and Communication Engineering releasing its achievements in a nutshell in the form of a magazine. This magazine is a skylight which always exhibit innovative and the creative thoughts of the blooming engineers. I take this opportunity to congratulate and wish all faculty members and students success.

Dr.P.Premkumar

PRINCIPAL'S MESSAGE

Impulse represents a cloud with a silver lining for the world of technology. It aims to inspire and nurture upcoming-world of technology. The magazine captures the current engineers to bring a revolution in this ever-evolving technological advancements.

I would like to congratulate the vice principal, HoD, Staff members and students for bringing out the issue of Impulse.

Dr. T.K. Kannan

HOD's MESSAGE

Congratulations to the students and faculty associated to magazine committee for successfully publishing the issue of departmental technical magazine Iconic. Iconic is creating platform which provides an opportunity to the students and staff to express their original thoughts on technical topics.

The magazine plays an instrumental role in providing exposure to the students to develop written communication skills and command over the language. It is a step towards building professional and ethical attitude in them. The entire journey of creating Impulse is an outcome of rigorous effort made by students and faculty.

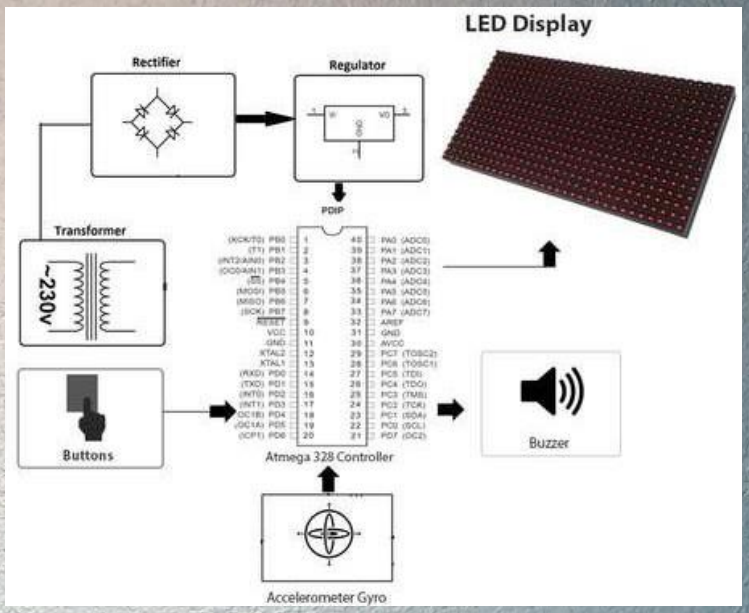
On concluding note, I would like to thank all the stakeholders for their involvement and encouragement and wish all the best for their bright future.

Dr. R. Prabhu

DIGITAL CAR TURNING AND BRAKING INDICATOR

Components

- Atmega 328 Microcontroller
- Accelerometer gyro Sensor
- Buttons
- LED Display
- Transformer
- Regulator Circuitry
- Switches
- LED's
- PCB Board
- Resistors
- Capacitors
- Transistors
- Cables and Connectors



WORKING

This digital car indicator system automates turning and braking signals without requiring manual input from the driver. It is designed to enhance visibility and safety, especially during the day when traditional brake lights may not be as visible. The system uses an Atmega 328 microcontroller, accelerometer gyro sensor, LED display, buzzer, buttons, and other basic electronics to detect and display vehicle movements.

The accelerometer continuously monitors directional changes and deceleration. When the vehicle turns or changes lanes, the sensor detects the movement and sends a signal to the microcontroller, which then displays an arrow on the LED screen to indicate the direction. Similarly, when the vehicle brakes, the sensor detects a sudden decrease in speed,

AUTOMATIC STREET LIGHT CONTROLLER

COMPONENTS

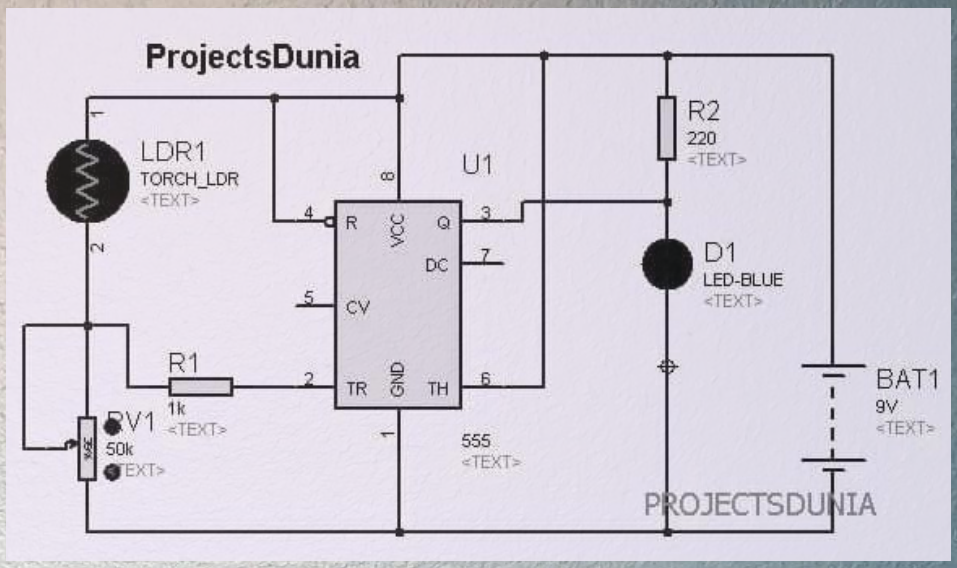
- Light Dependent Resistor (LDR)
- 555 Timer IC •

Relay Module

- Resistors (1 kΩ, 220 Ω)
- Variable Resistor (50 kΩ Potentiometer)
- Capacitors •

Diode

- LED
- Battery (9V)



WORKING

The Automatic Street Light Controller automates the process of turning street lights on and off based on ambient light levels, eliminating the need for manual operation. It is designed to conserve energy by ensuring lights are only on during low-light conditions, such as at dusk or during overcast weather, and off during the day.

The system utilizes an LDR (Light Dependent Resistor) to detect the intensity of surrounding light. During daylight, the LDR's low resistance causes the voltage across it to drop, signaling the 555 Timer IC to keep the LED off. As night approaches or ambient light decreases, the LDR's resistance increases, causing the voltage across it to rise. This change is detected by the 555 Timer IC, which acts as a comparator.

When the voltage across the LDR exceeds a preset threshold, the 555 Timer triggers its output pin (pin 3) to supply power to the LED, simulating a street light turning on. Conversely, during daylight, when the voltage drops below the threshold, the 555 Timer disables the output, turning the LED off. Resistors and capacitors are used to stabilize the circuit, and a diode is included to protect the LED.

This system ensures efficient energy use by automating street lighting, reducing electricity wastage, and offering a reliable and low-maintenance solution suitable for various environments.

ELECTRONIC PIANO

ABSTRACT :

An electric piano circuit using a 555 Timer IC can be designed to produce musical tones by generating different frequencies corresponding to musical notes. The 555 Timer operates in a stable mode to generate continuous square wave signals, which serve as the sound source. Push buttons are used to select different resistors that control the timing of the 555 Timer's oscillations, changing the output frequency, and thereby producing different musical notes when each button is pressed. Capacitors are also part of the timing circuit to stabilize the output. The output from the 555 Timer is then amplified and fed to a small speaker to generate audible sound, simulating the function of a piano keyboard.

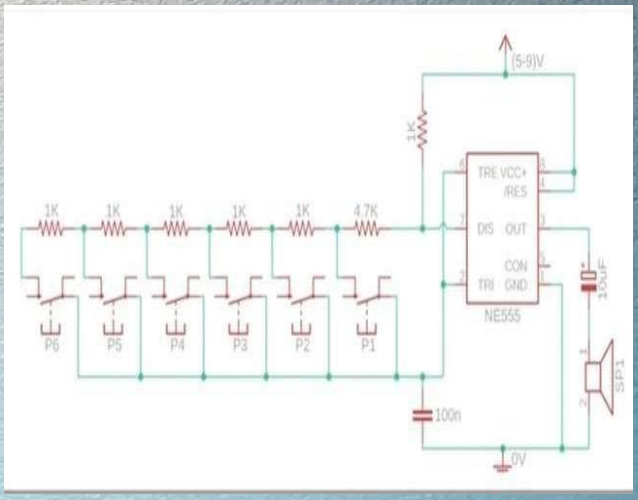
COMPONENTS :

• 555 IC
* 8 Ohm Speaker
* Momentary Push Button Switches x 6
* Capacitors: 100nF, 10uF
* Resistors: 6 x 1K, 4.7K
* Breadboard
*Connecting Wires
* (5-9)V of Power Supply

WORKING:

An electronic piano works by detecting key presses using sensors, which measure velocity to determine sound dynamics. It generates sound using sampled acoustic piano recordings or synthesized tones. The sound is amplified and played through speakers or headphones. Features like touch-sensitive, weighted keys, pedals and MIDI connectivity enhance the playing experience, while it operates on electricity for power.

Diagram:



❖ ELECTRIC VEHICLE CHARGING STATION:

An electric vehicle, also called an EV, uses one or more electric motors or traction motors for propulsion. An electric vehicle may be powered through a collector system by electricity from off-vehicle sources, or may be self-contained with a battery, solar panels or an electric generator to convert fuel to electricity.

An electric vehicle charging station, also called EV charging station, electric recharging point, charging point, charge point and electronic charging station (ECS) is an element in an infrastructure that supplies electric energy for the recharging of plug-in electric vehicles-including electric cars, neighborhoods electric Vehicles and plug-in hybrids.

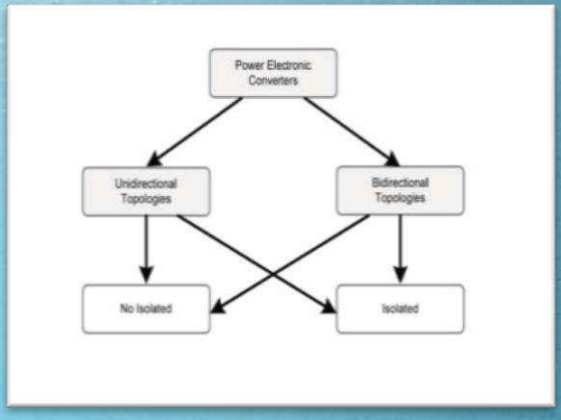
Nowadays, energy efficiency is a top priority, boosted by a major concern with climatic changes and by the soaring oil prices
in countries that have a large dependency on imported fossil fuels, which leads to the demand of EV charging station in the country.

Benefits of E-vehicle Charging Station:

- Increase in number of charging stations will boost the selling of EV's as their will be reduced range anxiety.
- It is always great for environment.
- It will boost direct and indirect employment in country.
- Good Opportunity for young entrepreneur to install charging station in their

EV batteries charging system:

This charging system is an AC-DC power circuit that must be controlled in order to respect the vehicles' batteries nominal characteristics to preserve their lifespan. Additionally, it should monitor the batteries during their operation to prevent damages during the charging or discharging processes. The ACDC power circuit can be implemented with different topologies according to the characteristics desired for the system.



❖ AI: A Powerful Assistant, Not the Master

"AI may be powerful, but imagination, responsibility, and courage belong only to us."

Artificial Intelligence has quietly woven itself into the fabric of our lives. From classrooms and offices to creative studios, it has become more than just a futuristic concept—it's now an everyday reality. Yet amid all the fascination and fear surrounding it, one truth stands firm: AI is a helper, not an owner.

Think back to when calculators were first introduced. Many worried they would ruin mathematics, stripping away the need to think. Instead, calculators freed us from mechanical repetition and opened the door to higher problem-solving. AI is today's equivalent—far more advanced, yes—but at its core, still a tool.

The difference, however, is that AI has crept into areas once thought exclusively human. It filters job applications before managers see them, drafts legal notes within minutes, and even imitates art and music. This raises a pressing question: where do humans still hold an unshakable advantage?

- **Where Humans Outperform Machines**

- **Judgment and Context** : AI can spot patterns, but it doesn't understand context. A single word in a contract, or a subtle tone in conversation, might completely change meaning. Humans can weigh culture, ethics, and intent—dimensions machines still can't process.
- **Common Sense**: Children instinctively avoid touching fire. AI, however, needs endless data to "learn" that. It thrives on repetition but falters when life throws unpredictable, messy situations.
- **True Creativity** : AI generates from what already exists. Humans imagine what has never been. From Leonardo da Vinci's flying machines to the first moon landing, history is proof that innovation often begins with a spark no dataset could predict.
- **Ethics and Accountability** : AI can recommend a business move, but only humans can answer

Adapting Wisely

To thrive in this new age, the key is adaptation. That means building AI literacy—understanding its scope without surrendering control. The strongest results come when human qualities like empathy, imagination, and vision work alongside AI's unmatched speed and efficiency.

The future isn't humans versus AI. It's humans with AI. Just as calculators strengthened mathematics, AI can strengthen society—if we keep it in its place.

❖ Electric Vehicles: Driving Towards a Greener Future

As the world grapples with the pressing challenges of climate change and environmental degradation, electric vehicles (EVs) have emerged as a promising solution for reducing our carbon footprint. With rising awareness, advancing technology, and supportive government policies, the scope of EVs is expanding

The Environmental Cost of Traditional Vehicles

For decades, internal combustion engine (ICE) vehicles have dominated the roads, running primarily on petrol and diesel. While they offer convenience and speed, they are also major contributors to air pollution and greenhouse gas (GHG) emissions. Transport alone accounts for nearly 24% of global CO_2 emissions, with the majority coming from cars, trucks, and buses. These emissions trap heat in the Earth's atmosphere
consequences like rising sea levels, unpredictab

EVs: A Cleaner Alternative

Electric vehicles offer a cleaner, more sustainable alternative. Unlike ICE vehicles, EVs do not emit tailpipe pollutants such as carbon dioxide, nitrogen oxides, or particulate matter. This makes them especially valuable in reducing urban air pollution, which is linked to respiratory diseases, heart conditions, and premature deaths.

renewable sources, EVs are generally more efficient and emit fewer overall greenhouse gases compared to traditional vehicles. As electricity grids transition to greener sources like solar, wind, and hydro, the environmental benefits of EVs will only grow stronger.

Reducing Global Warming

One of the most compelling arguments for electric vehicles is their potential to slow down global warming. If adopted on a large scale and powered by renewable energy, EVs can significantly reduce global CO_2 emissions.

According to the International Energy Agency (IEA), switching to electric cars could cut carbon emissions from transport by over 50% by 2050. This would play a crucial role in meeting global climate targets, including the goals set in the Paris Agreement.

Battery Recycling and Sustainable Manufacturing

Critics often point to the environmental cost of battery production in EVs. However, this is being addressed through innovations in battery recycling, second-life applications, and the development of greener materials. Companies are now investing in closed-loop battery systems that minimize waste and environmental damage.

Moreover, EV manufacturers are increasingly adopting sustainable practices, such as using recycled materials in car interiors, eco-friendly paint, and energy-efficient factories powered by renewable sources.

The Broader Impact: More than Just Cars

The electric mobility revolution isn't limited to passenger cars. Electric buses, trucks, two-wheelers, and even ships are hitting the roads and waters, making transport cleaner across multiple sectors. Governments around the world are investing in EV infrastructure, including charging stations, battery swapping stations, and incentives to make EVs more accessible.

QUIZ

1) A capacitor is used as a filter in a DC power supply. If the ripple voltage is 1V, load resistance is 1kΩ, and the supply frequency is 50Hz, what is the required capacitance?

a) 10 µF
b) 100 µF
c) 200 µF
d) 500 µF

2) A microprocessor with a clock frequency of 2 GHz executes an instruction in 2 clock cycles. What is the instruction execution time?

a) 0.5 ns
b) 1 ns
c) 2 ns
d) 4 ns

3) In an ideal operational amplifier, what is the input impedance?

a) Zero
b) High but finite
c) Infinite
d) Equal to the feedback resistance

4) How many memory locations can a microprocessor with 16 address lines access?

a) 16 KB
b) 64 KB
c) 32 KB
d) 128 KB

5) A sinusoidal signal completes cycles in seconds. What is the frequency of the signal?

a) 500Hz
b) 1000 Hz
c) 2 Hz
d) 2000 Hz

Moral:

To Achieve anything Worthy in Life, one needs Attitude and Will. Skills and techniques can be learned, can be taught but not will. We need to Work towards our Goal with full determination to Succeed.