MANGALAM
COLLEGE OF ENGINEERING

Inspire | Imbibe | Innovate

Department of Electrical and Electronics Engineering

ELECTROVISION

TECHNICAL MAGAZINE

2022-23

MANGALAM
COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

TECHNICAL MAGAZINE

Mangalam College of Engineering

Mangalam Hills, College Rd, Vettimukal P.O,

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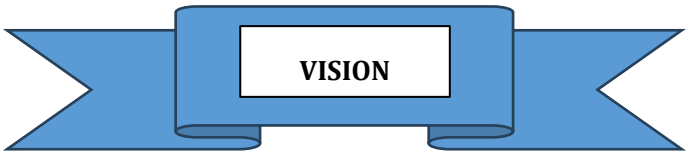
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING



To excel as a premier department in education and research, supporting our students to shape their dreams of becoming employable and committed engineering professionals.

Relentlessly strive to create vibrant learning environment, provide state of the art laboratory facilities, and actively engage in research and live up to high moral and ethical standards.

PROGRAM SPECIFIC OUTCOMES (PSO)

PSO 1: Apply the fundamental knowledge to identify, analyze and solve various real time problems (complex problems) in Electrical Power Systems which comprises of control and protection circuits, power electronic circuits, etc.

PSO 2: Apply emerging technologies along with modern software tools (like MATLAB, PLC, ECAD etc) for designing, simulating and analyzing electrical as well as electronic system to engage in lifelong learning.

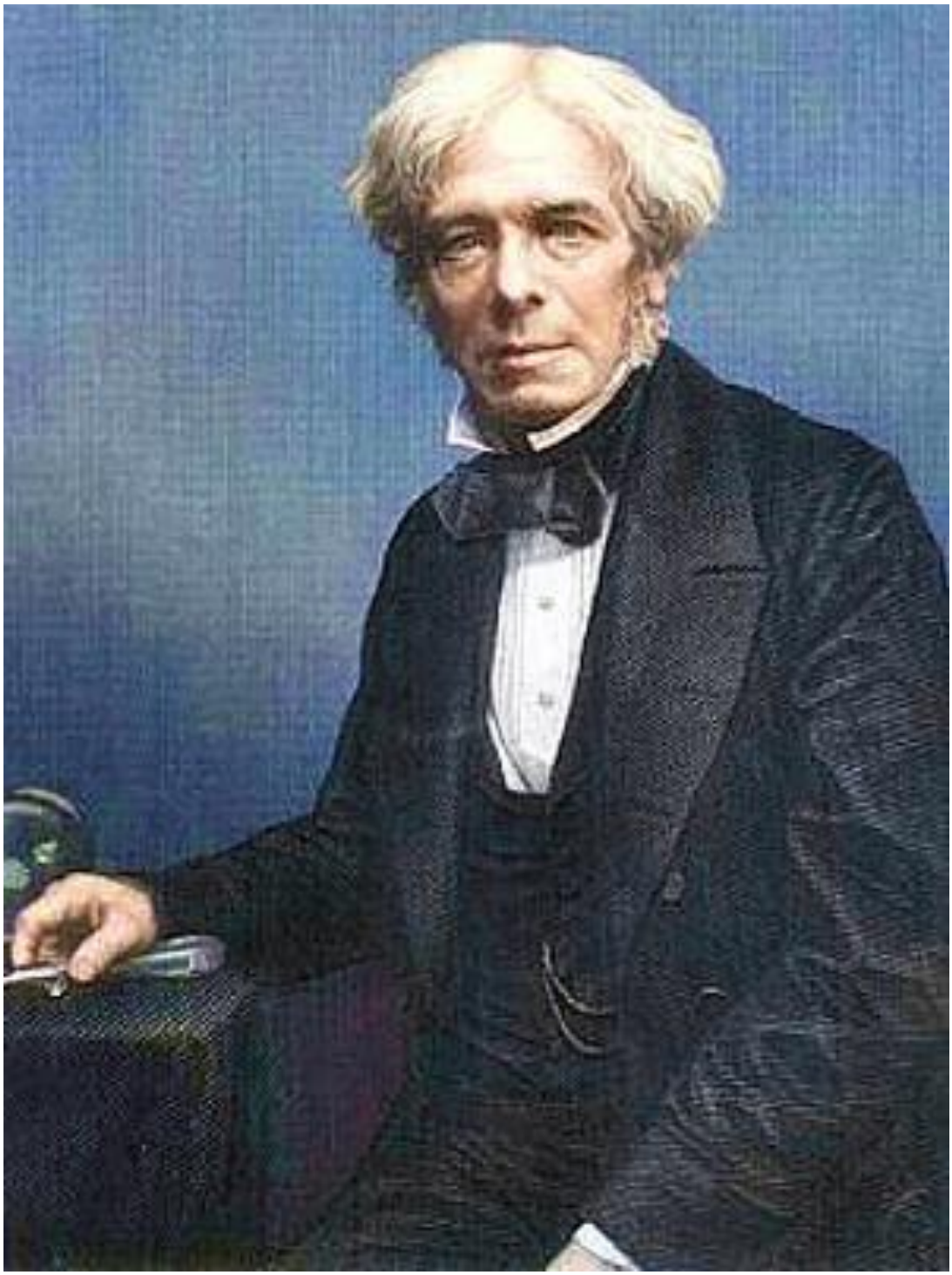
PSO 3: Able to utilize project management techniques and sustainable engineering for developing projects related to electric vehicles, smart power grids, automatic controllers, control and protection circuits, energy management and savings, embedded systems etc.

PROGRAMME EDUCATION OBJECTIVES (PEO)

PEO 1 [Focus: Domain Knowledge and Practical Implementation Skills]: The graduates will have foundation in science, maths and management to interpret core electrical engineering subjects and ability in designing, formulating and solving experimental projects through simulation and hardware.

PEO 2 [Focus: Employability, Leadership, Team work, Communication Skills and Professional studies and pursue lifelong learning. The graduate will be employable with capabilities like communication skills, working with and building teams, upholding moral and ethical values.

PEO 3 [Focus: Life Long Learning and Higher Studies]: The graduates will be equipped for higher studies and pursue life long learning.



Michael Faraday

(22 Sep 1791 - 25 Aug 1867)

”Electricity is often called wonderful, beautiful; but it is so only in common with the other forces of nature."

MAGAZINE EDITOR

It gives me immense pleasure to present this edition of the EEE Department Technical Magazine, a platform that showcases the technical brilliance, innovative spirit, and academic endeavours of our students and faculty. In an era where Electrical and Electronics Engineering is shaping the future through advancements in electric mobility, smart grids, automation, and renewable energy, this magazine serves as a window into our department's continuous pursuit of excellence.

Each article, project, and idea featured here reflects the vibrant learning environment and the commitment of our department to stay aligned with industry trends and research. I hope this issue ignites curiosity, encourages collaboration, and inspires all readers to keep exploring the ever-evolving world of electrical engineering.

Mrs. Jolly George

Assistant Professor

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SOORAJ MOHAN

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MESSAGE FROM CHAIRMAN

It is with great pride and pleasure that I extend my warmest greetings to all readers of this edition of our departmental technical magazine.

At Mangalam College of Engineering, the Department of Electrical and Electronics Engineering has always been at the forefront of academic excellence, research innovation, and holistic student development. We are committed to equipping our students with strong theoretical foundations, practical skills, and the adaptability required to thrive in a rapidly evolving technological landscape.

This magazine is a testament to the creativity, dedication, and intellectual vitality of our students and faculty. It reflects the vibrant academic culture of our department, showcasing insightful articles, innovative projects, and noteworthy achievements that highlight the spirit of inquiry and passion for engineering that defines our EEE community.

I would like to congratulate the editorial team, student contributors, and faculty coordinators for their commitment and hard work in making this publication a reality. I am confident that this magazine will serve not only as a platform for knowledge sharing but also as a source of inspiration for all aspiring engineers.

Wishing you all success, growth, and continued excellence in every endeavour

With warm regards,

Dr. Biju Varghese,

Chairman, Mangalam educational institutions

MESSAGE FROM THE PRINCIPAL

It gives me great pleasure to pen a message for the technical magazine published by the Department of Electrical and Electronics Engineering at Mangalam College of Engineering.

The role of technical education today goes far beyond the classroom. It involves nurturing inquisitive minds, fostering innovation, and encouraging students to apply their knowledge to real-world challenges. The Department of EEE has consistently upheld these ideals, providing a dynamic environment where academic rigor and practical exposure go hand in hand.

This magazine stands as a proud reflection of the department's academic spirit, technical competence, and commitment to excellence. It showcases the collective efforts of students and faculty, bringing forth a diverse range of articles, project highlights, and creative expressions. I am particularly pleased to see the department encouraging young minds to document their insights and discoveries, which is vital in building confidence and a research-oriented mindset.

I congratulate the Head of the Department, faculty members, editorial team, and all the students who have contributed to this publication. May this magazine inspire all readers to explore, innovate, and achieve greater heights in the field of Electrical and Electronics Engineering.

Wishing the department continued success in all its future endeavours.

Warm regards,

Dr. Vinodh P Vijayan

M.Tech., Ph.D.

MESSAGE FROM THE HOD

It gives me immense pleasure to present this edition of our departmental technical magazine, a platform that reflects the academic zeal, technical prowess, and creative energy of the students and faculty of the Department of Electrical and Electronics Engineering.

In today's rapidly evolving technological world, the role of electrical and electronics engineers is more critical than ever. From powering the world to driving innovations in automation, smart systems, and renewable energy, the opportunities are vast and inspiring. At Mangalam College of Engineering, our department is committed to preparing students to meet these challenges with confidence, integrity, and innovation.

This magazine serves not only as a chronicle of departmental activities and achievements but also as an avenue for students to express their technical insights, research initiatives, and innovative ideas. It is heartening to see the enthusiasm with which our students engage in projects, competitions, and academic pursuits beyond the classroom.

I extend my heartfelt congratulations to the editorial team, contributors, and faculty coordinators who have worked diligently to bring out this magazine. Let this be a source of motivation for all our students to continue exploring, learning, and contributing meaningfully to the engineering world.

With best wishes,

Dr. BINCY K JOSE
Associate Professor & HoD

CONTENTS

SHARATH KRISHNAN

LMLM19EE027

Emerging Changes in Electric Vehicles: Driving the Future

The **electric vehicle (EV)** revolution is no longer a distant dream—it is unfolding before our eyes. With global concerns over climate change, rising fuel costs, and rapid technological advancements, EVs are emerging as a vital part of the transportation ecosystem. But beyond the shift from gasoline to batteries, the EV landscape is undergoing **transformative changes** that are redefining mobility.

1. Advancements in Battery Technology

One of the most significant breakthroughs in EVs is in **battery innovation**. Traditional lithium-ion batteries are giving way to **solid-state batteries**, offering **higher energy density, faster charging, and improved safety**. Research in **lithium-sulfur** and **graphene-based batteries** is also gaining traction, promising longer range and reduced environmental impact.

2. Fast and Smart Charging Infrastructure

The development of **ultra-fast charging stations**, some capable of charging a vehicle in under 15 minutes, is addressing a major barrier to EV adoption. Moreover, the integration of **smart charging networks**—powered by AI and IoT—allows for real-time energy optimization and load balancing with the grid.

3. Vehicle-to-Grid (V2G) Technology

EVs are now being seen not just as consumers of electricity but also as **mobile energy storage units**. V2G technology enables EVs to **feed excess electricity back to the grid**, playing a vital role in stabilizing renewable energy sources like solar and wind.

4. Lighter, Smarter Designs

Automakers are incorporating **lightweight materials**, **aerodynamic body structures**, and **advanced power electronics** to enhance efficiency. Additionally, the rise of **autonomous driving** and **connected vehicle systems** is transforming EVs into smart mobility platforms.

5. Policy and Market Shifts

Governments around the world are offering incentives for EV adoption, setting **zero-emission vehicle mandates**, and investing in **green infrastructure**. As a result, global EV sales are surging, and even legacy automotive giants are transitioning to all-electric fleets.

Conclusion

The electric vehicle industry is at a tipping point, not just evolving—but **revolutionizing transportation**. With innovation across batteries, charging, software, and energy systems, EVs are set to become more accessible, efficient, and sustainable. For budding engineers, especially in the field of Electrical and Electronics Engineering, this is a golden era to innovate and shape a greener tomorrow.

SOORAJ MOHAN

LMLM19EE028

Flexible Displays: Shaping the Future of Screens

In a world increasingly driven by innovation, **flexible display technology** is transforming the way we interact with electronic devices. Unlike traditional rigid screens, flexible displays are made using thin, bendable materials such as **organic light-emitting diodes (OLEDs)** and **electronic ink**, enabling screens to bend, fold, roll, and even stretch—without compromising visual performance.

What Makes Flexible Displays Unique?

The core of this technology lies in its **substrate**—replacing conventional glass with materials like **plastic, metal foil, or flexible glass**. These substrates provide mechanical flexibility while supporting high-resolution display performance. Combined with OLED technology, which emits light without the need for a backlight, flexible displays are **thinner, lighter, and more energy-efficient**.

Applications on the Rise

- **Smartphones & Tablets**: Foldable phones and rollable tablets are already entering the consumer market, offering portability and larger screen sizes without bulk.
- **Wearable Devices**: Flexible displays are revolutionizing smartwatches and fitness bands with curved, comfortable designs.
- **E-paper & E-readers**: Lightweight, flexible e-ink screens enhance durability and battery life for digital reading.
- **Healthcare & Textiles**: Electronic skin and smart clothing embedded with flexible displays are expanding possibilities in health monitoring and wearable tech.

Challenges Ahead

Despite their promise, flexible displays face challenges such as **durability, high manufacturing cost, and complexity in integration**. However, with ongoing research in **nanomaterials, flexible circuits, and display encapsulation**, these hurdles are gradually being overcome.

The Future is Foldable

As industries race toward more immersive and adaptable user experiences, flexible displays are poised to redefine the future of screens. From **next-gen gadgets** to **smart cities**, this technology represents a crucial step in making electronics more human-centric—molded not just to fit our hands, but our lives.

JELIN K JAYAN

LMLM19EE025

WALK AND CHARGE

Imagine charging your smartphone simply by walking. It may sound futuristic, but with the rise of **energy harvesting technologies**, this concept—often called **"Walk and Charge"**—is becoming a reality. It combines innovation in **wearable electronics**, **piezoelectric materials**, and **human kinetic energy harvesting** to transform motion into usable electrical energy.

The Science Behind It

At the heart of "Walk and Charge" systems lies **piezoelectricity**—a property of certain materials that generate an electric charge in response to mechanical stress. When integrated into shoe soles, floor tiles, or wearable bands, these materials convert the pressure and motion from walking into small amounts of electrical energy.

This harvested energy can then be stored in batteries or supercapacitors and used to charge low-power devices like:

- Mobile phones
- Smartwatches
- Fitness bands
- GPS trackers
- IoT-enabled wearables

Applications and Innovations

- **Smart Footwear**: Shoes embedded with piezoelectric or triboelectric nanogenerators can produce electricity with every step.
- **Energy-Generating Pavements**: Public walkways embedded with sensors and generators can power streetlights or transmit data.
- **Emergency Devices**: In remote areas or disaster zones, "walk and charge" gear can provide critical power when traditional sources fail.

Challenges to Overcome

While the concept is promising, current limitations include **low energy conversion efficiency**, **comfort concerns**, and **durability**. However, research is advancing rapidly in the fields of **nanogenerators**, **flexible electronics**, and **energy-efficient circuits** to make this technology more practical and accessible.

A Step Toward Sustainable Energy

In an age where clean energy and portable power are becoming essential, "Walk and Charge" represents an exciting step forward—quite literally. It combines **sustainability, mobility, and innovation**, making it a great example of how Electrical and Electronics Engineering can integrate with everyday life.

WIRELESS DYNAMIC EV CHARGING

Static wireless charging is becoming popular all over the world to charge the electric vehicle (EV). But an EV cannot go too far with a full charge. It will need more batteries to increase its range. Dynamic wireless charging is introduced to EVs to capitally increase their driving range and get rid of heavy batteries. But with Dynamic 'Wireless Power Transfer the need of plug-in charge and static WPT will be removed gradually and the total run of an EV can be limitless. If we charge an EV while it is driven, we do not need to stop or think for charging it again. Eventually, in the future the batteries can be also removed from EVs by applying this method in everywhere. Charging needs two kinds of coils named the transmitter coil and the receiver coil. The receiver coil will collect power from the transmitter coil while going over it in the means of mutual induction. But the variation of distance between two adjacent coils affects the wireless power transfer (WPT) Here we should implement an infrastructural change that we have to install induction coils to our specific roads were most EV's run through. And we can also add this feature to the existing EV's.

Authors

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JUBIN BIJU (MLM19EE013)

DRIVING SAFETY ENHANCEMENT USING EYE TRACKING

Eye tracking technology enables the collection of crucial data about drivers' behaviour during their driving activities by monitoring eye movements and gaze points. Distracted driving. Which diverts attention from the road, significantly increases the risk of motor vehicle crashes.

Visual and manual distractions are two common types, and eye tracking can effectively mitigate their effects. The project "Driving safety enhancement using eye tracking" comprises both hardware and software modules. The primary objective is to develop a non-intrusive system that can detect driver fatigue and issue timely warnings, as drowsiness is a leading cause of road accidents. By implementing this system, many accidents can be prevented, resulting in saved costs and reduced personal suffering. The proposed project involves developing an Arduino-based safety system that utilizes the BH1750 light sensor to detect changes in reflectance and approximately predict driver drowsiness. It will activate the safety system when eyes remain distracted beyond a predefined threshold period.

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HIGH EFFICIENCY CLOSED LOOP MODEL PREDICTIVE CONTROLLED FLYBACK CONVERTER

The growing demand for compact, efficient, and reliable power conversion systems in consumer electronics and renewable energy applications has spurred research into intelligent control strategies for isolated DC-DC converters. Among them, the flyback converter stands out for its simplicity, low component count, and galvanic isolation. However, traditional control methods like PI or hysteresis control often struggle to provide optimal performance under dynamic load and input conditions. This paper presents a high-efficiency flyback converter operated under closed-loop Model Predictive Control (MPC) to enhance dynamic response, efficiency, and voltage regulation.

Model Predictive Control (MPC) is a modern control technique that uses a system model to predict future behavior and optimize control actions over a receding time horizon. By implementing MPC in the fly back topology, the converter can proactively adjust the duty cycle in response to disturbances and reference changes, thereby reducing overshoot, undershoot, and steady-state error. The control system continuously solves an optimization problem in real-time, incorporating converter dynamics, operational constraints, and switching behavior.

Simulation and hardware-level validation demonstrate that the MPC-controlled flyback converter achieves a notable improvement in efficiency (up to 93%), especially under variable load conditions. Moreover, the closed-loop design ensures robust performance across a wide input voltage range, with fast transient response and minimal output voltage ripple. Thermal performance is also improved due to reduced switching and conduction losses.

This work underscores the potential of integrating predictive control algorithms in power converters to meet the stringent performance standards of modern applications such as IoT devices, battery chargers, and renewable energy systems. Future enhancements may include implementation on low-cost DSP/FPGA platforms and adaptive learning-based tuning for real-time optimization.

Authors

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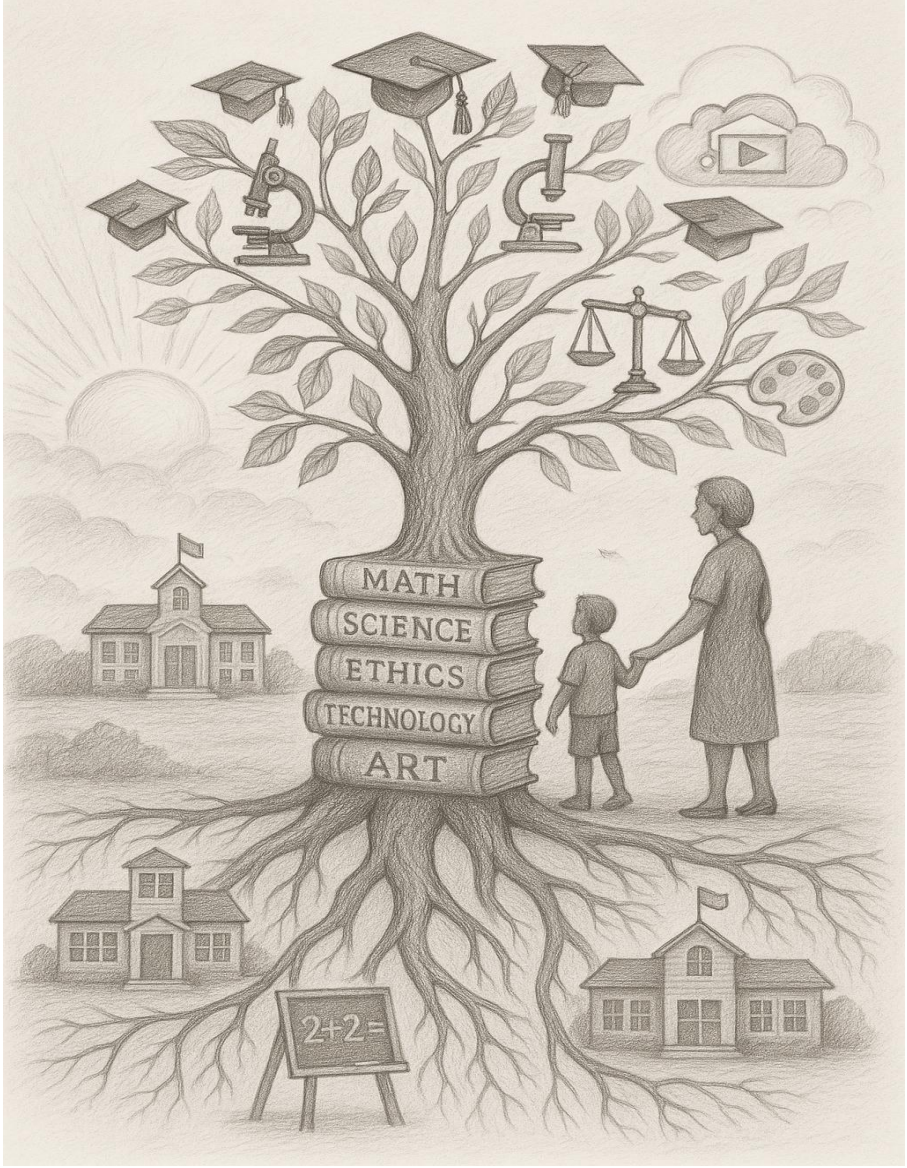

ANANDAKRISHNA K R

S7 EEE

തെളിയാത്ത വഴികൾ

വിദ്യയുടെ വെളിച്ചത്തിൽ ഞങ്ങൾ
പടർത്തിയൊരുപാട് സ്വപ്നങ്ങൾ,
പുസ്തകത്തിന്റെ മൗനത്തിലൂടെ
നാളെയ്ക്കായ് കാത്തിരിപ്പിൻ ഗാഥകൾ...

പദവികളും സർട്ടിഫിക്കറ്റുകളും
ചുമരിൽ ഞങ്ങൾ മിനുങ്ങിച്ചിട്ടു,
പക്ഷേ തൊഴിൽ എന്ന വാതിലിന്
തുറക്കാനാരുമില്ല ഈ വഴി...

മേളങ്ങളിലുടൻ ഭാവികൾ ചിരിക്കുന്നു,
ചോദ്യങ്ങളിലാഴ്ന്നു ഞങ്ങൾ വിങ്ങുന്നു,
"ഒന്നൊരുക്കോ?" എന്നുള്ള കാറ്റിൽ പോലും
നമ്മുടെ ഉള്ളിലെ മൗനം വിളിക്കുന്നു.

അച്ഛന്റെ മുഖത്തു പ്രതീക്ഷ മങ്ങിയിരിക്കുന്നു,
അമ്മയുടെ പ്രാർത്ഥന സ്വപ്നം പോലെ,
സുഹൃത്തുക്കൾ പുറപ്പെട്ടുവെന്നോരു വാർത്ത
കാതിൽ മുഴങ്ങുമ്പോൾ, ഹൃദയം കനലാകുന്നു.

വിദ്യാർത്ഥികൾക്ക് പറയാം നമ്മുടെയഥം —
തൊഴിൽ എന്നത് നേർക്കാഴ്ചയല്ലെല്ലാം,
സ്വയംപഠിച്ചു സ്വയംസൃഷ്ടിക്കുവാൻ
നാം തയ്യാറാവണം — അതാണ് വിപ്ലവം!

PENINNA JOSE

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