M.Kumarasamy College of Engineering
NAAC Accredited Autonomous Institution
Approved by AICTE & Affiliated to Anna University
ISO 9001:2015 Certified Institution
Thalavapalayam, Karur, Tamilnadu.

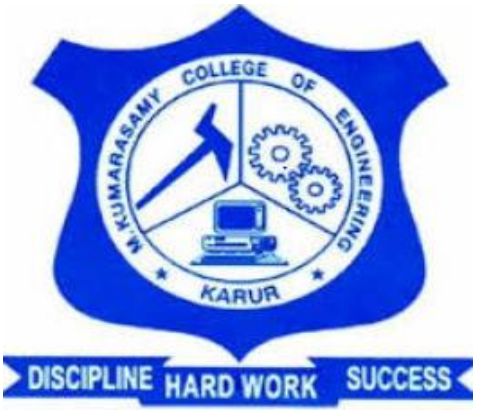
A Minor Project III Report

On

AUTO POWER GUARD FOR ELECTRICAL GADGETS

Submitted by

MADHUMITHA K	**(927622BEE066)**
SANTHOSH S	**(927622BEE097)**
SHOBIYA D	**(927622BEE108)**
SURENDAR M	**(927622BEE120)**



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

M.KUMARASAMY COLLEGE OF ENGINEERING

(An Autonomous Institution Affiliated to Anna University, Chennai)

THALAVAPALAYAM, KARUR-639113

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BONAFIDE CERTIFICATE

Certified that this Report titled **"AUTO POWER GUARD FOR ELECTRICAL GADGETS"** is the bonafide work of **MADHUMITHA K (927622BEE066), SANTHOSH S (927622BEE097), SHOBIYA D (927622BEE108)** and **SURENDAR M (927622BEE120)** who carried out the work during the academic year (2024-2025) under my supervision. Certified further that to the best of my knowledge the work reported here in does not form part of any other project report.

SIGNATURE

Mrs.R.INDHUMATHI M.E.,

SUPERVISOR

Assistant Professor

Department Of Electrical And

Electronics Engineering

M.Kumarasamy College Of

Engineering,Karur.

SIGNATURE

Dr.J.UMA M.E., Ph.D.,

HEAD OF THE DEPARTMENT

Professor& Head

Department Of Electrical And

Electronics Engineering

M Kumarasamy College Of

Engineering,Karur.

Submitted for Minor Project III (18EEP301) viva-voce Examination held at M Kumarasamy College of Engineering, Karur-639113 on ……

DECLARATION

We affirm that the Minor Project report titled **"AUTO POWER GUARD FOR ELECTRICAL GADGETS"** being submitted in partial fulfillment for the award of **Bachelor of Engineering in Electrical and Electronics Engineering** is the original work carried out by us.

REG.NO	STUDENT NAME	SIGNATURE
927622BEE066	**MADHUMITHA K**	_____
927622BEE097	**SANTHOSH S**	----------
927622BEE108	**SHOBIYA D**	----------
927622BEE120	**SURENDAR M**	—----------

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VISION AND MISSION OF THE INSTITUTION

VISION

To emerge as a leader among the top institutions in the field of technical education.

MISSION

- ✓ Produce smart technocrats with empirical knowledge who can surmount the global Challenges.
- ✓ Create a diverse, fully-engaged, learner - centric campus environment to provide Quality education to the students.
- ✓ Maintain mutually beneficial partnerships with our alumni, industry and Professional associations.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

VISION

To produce smart and dynamic professionals with profound theoretical and practical knowledge comparable with the best in the field.

MISSION

- ✓ Produce hi-tech professionals in the field of Electrical and Electronics Engineering by inculcating core knowledge.
- ✓ Produce highly competent professionals with thrust on research.
- ✓ Provide personalized training to the students for enriching their skills.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Graduates will have flourishing career in the core areas of Electrical Engineering and also allied disciplines.

PEO2: Graduates will pursue higher studies and succeed in academic/research careers

PEO3: Graduates will be a successful entrepreneur in creating jobs related to Electrical and Electronics Engineering /allied disciplines.

PEO4: Graduates will practice ethics and have habit of continuous learning for their success in the chosen career.

PROGRAMME OUTCOMES (POs)

After the successful completion of the B.E. Electrical and Electronics Engineering degree program, the students will be able to:

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: 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.

PO3: 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.

PO4: 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.

PO5: 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.

PO6: The Engineer and Society: Apply reasoning in formed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and ethical and effective settings and norms of the engineering in practice.

PO9: Individual and Team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multi-disciplinary settings.

PO10: 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.

PO11: Project Management and Finance: Demonstrate knowledge and 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 multi-disciplinary environments.

PO12: 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.

PROGRAM SPECIFIC OUTCOMES (PSOs)

The following are the Program Specific Outcomes of Engineering Students:

PSO1: Apply the basic concepts of mathematics and science to analyze and design circuits, controls, Electrical machines and drives to solve complex problems.

PSO2: Apply relevant models, resources and emerging tools and techniques to provide solutions to power and energy related issues & challenges.

PSO3: Design, Develop and implement methods and concepts to facilitate solutions for electrical and electronics engineering related real world problems.

Abstract (Key Words)	**Mapping of POs and PSOs**
Auto power cut off module Ammeter & Voltmeter Display Regulator	PO1, PO2, PO3, PO4, PO5, PO6, PO7. PO8, PO9, PO10, PO11, PO12. PSO1, PSO2, PSO3.

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We would like to express my deep gratitude to our Minor Project Guide **Mrs. R INDHUMATHI M.E., Assistant Professor, Department of Electrical and Electronics Engineering,** for her constant encouragement, kind co-operation, valuable suggestions and support rendered in making our project as success.

We offer our whole hearted thanks to our Minor project coordinator **Mrs. R INDHUMATHI M.E., Assistant Professor, Department of Electrical and Electronics Engineering,** for her constant encouragement, kind cooperation and valuable suggestions form making our project as success.

We glad to thank all the **Faculty Members** of **Department of Electrical and Electronics engineering** for extending a warm helping hand and valuable suggestions throughout the project. Words are boundless to thank **Our Parents and Friends** for their constant encouragement to complete this Minor project successfully.

TABLE OF CONTENTS

ABSTRACT

The overcharging of electrical devices, particularly smartphones, during nighttime can significantly reduce battery life and performance. This project aims to address this issue by developing an automated system that prevents overcharging, ensuring the longevity of mobile devices. The proposed solution uses an Auto Power Cut Module, Regulator, Arduino microcontroller, and a Battery to automatically disconnect the power supply once the phone reaches full charge. The system is designed to be installed between the device and its charger, where it monitors the phone's charging status. Upon detecting that the device has fully charged, the system triggers a power cut, stopping the charging process and protecting the battery from further charge cycles that could cause damage. This project is simple, cost-effective, and can be implemented easily in a home environment. The expected outcomes include a longer battery lifespan for electronic devices, reduced energy waste, and greater user convenience. By automating the charging process, this project provides a practical solution for everyday phone users, helping to extend the life and performance of their gadgets.

PROBLEM IDENTIFICATION

The main objective of our project is, to protect battery health prevent overcharging to extend the lifespan of the device's battery by ensuring it is not exposed to prolonged charging. Conserve Energy Reduce unnecessary power consumption by automatically disconnecting the charger once the charging time has elapsed. Enhance User Convenience Provide a hassle-free charging experience, particularly for users who may forget to unplug their devices after charging. Increase Safety Minimize the risk of overheating or potential hazards associated with continuous charging.

CHAPTER 1

LITERATURE REVIEW

This chapter says about the projects and their inferences which are related to the "AUTO POWER GUARD FOR ELECTRICAL GADGETS".

Paper 1: 12v Automatic Charger (Auto Cut OFF)

Inference: An automatic charger uses a microcontroller or other control circuitry to monitor the battery's voltage and current. It then adjusts the charging rate based on the battery's state of charge.

Paper 2: Battery Power Bank with Automatic Power Cut-Off

Inference: Create a portable power bank with built-in protection that automatically cuts off power when the connected device reaches 100% charge. The system would also prevent over-discharge of the power bank itself, optimizing its lifespan. The design can feature a digital display showing battery capacity, charging status, and time remaining for a full charge.

Paper 3: Automatic Power Cut-Off Circuit for Solar Charging Systems

Inference: Design a system where a solar panel charges a battery, but when the battery reaches full charge, the system cuts off the power to prevent overcharging. This system can be used in solar-powered lights, home energy systems, or remote power solutions. Incorporating a display or IoT for remote monitoring could add advanced functionality.

Paper 4: Smart Plug with Auto Power Cut-Off

Inference: The smart plug detects when a device, such as a laptop or smartphone, is fully charged and cuts off the power to save energy and protect the device's battery. The plug can be controlled remotely through a mobile app, which can also provide real-time charge data and allow users to set preferences for cut-off timing.

Paper 5: Overcharge Protection Circuit for Lithium-Ion Batteries

Inference: Design a circuit specifically for lithium-ion batteries that prevents overcharging by cutting off the power supply once the battery reaches the safe maximum voltage (typically 4.2V per cell). This project is especially relevant for devices like drones, RC cars, or small robots where battery safety is a priority.

CHAPTER 2

2.1 EXISTING SYSTEM

Basically, the cellphone charger is a current limited voltage source. Generally, cellphone battery packs require 3.6-6V DC and 180-200mA current for charging. These usually contain three NiCd cells, each having 1.2V rating. Current of 100mA is sufficient for charging the cellphone battery at a slow rate. A 12V battery containing eight pen cells gives sufficient current (1.8A) to charge the battery connected across the output terminals. The circuit also monitors the voltage level of the battery. It automatically cuts off the charging process when its output terminal voltage increases above the predetermined voltage level. Timer IC NE555 is used to charge and monitor the voltage level in the battery. Control voltage pin 5 of IC1 is provided with a reference voltage of 5.6V by zener diode ZD1. Threshold pin 6 is supplied with a voltage set by VR1 and trigger pin 2 is supplied with a voltage set by VR2. When the discharged cellphone battery is connected to the circuit, the voltage given to trigger pin 2 of IC1 is below 1/3Vcc and hence the flip-flop in the IC is switched on to take output pin 3 high. When the battery is fully charged, the output terminal voltage increases the voltage at pin 2 of IC1 above the trigger point threshold. This switches off the flip-flop and the output goes low to terminate the charging process. Threshold pin 6 of IC1 is referenced at 2/3Vcc set by VR1. Transistor T1 is used to enhance the charging current. Value of R3 is critical in providing the required current for charging. With the given value of 39-ohm the charging current is around 180 mA

PROPOSED METHODOLOGY

2.2 BLOCK DIAGRAM:

This chapter brings about the proposed methodology of the **"AUTO POWER GUARD FOR ELECTRICAL GADGETS"** project.

AUTO POWER GUARD FOR ELECTRICAL GADGETS:

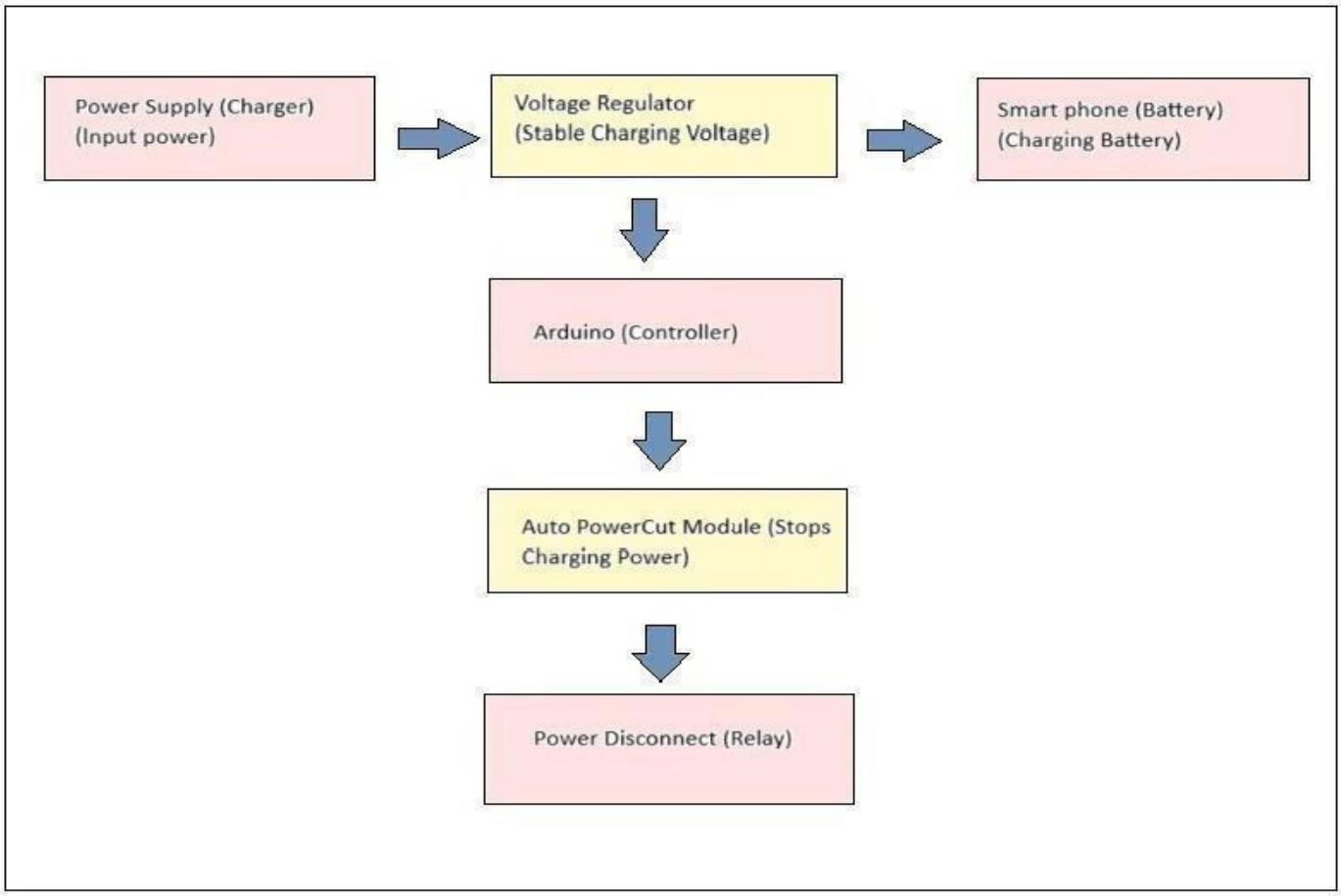


Fig: 2.1 Block diagram of Auto Power Guard for Electrical Gadgets.

SWITCH:

In an overcharging protection system, switches are used to control the connection between the battery and the charger based on the battery's charging state. They can be implemented in various forms, including mechanical switches, relays, and electronic switches such as MOSFETs or transistors. Here's how switches are used in different contexts within an overcharging protection system.

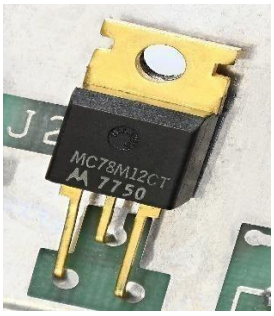
ARDUINO UNO:

In the Auto Power Guard for Electrical Gadgets project, the Arduino plays a crucial role in automatically managing the phone's charging process. It monitors the phone's battery voltage through a voltage divider circuit and continuously checks for the battery's charge level. Once the voltage reaches a predefined threshold (e.g., 4.2V for full charge), the Arduino triggers the Auto Power Cut Module to disconnect the charger and prevent overcharging. The Arduino's role is essential in ensuring that the phone is charged safely and the battery's lifespan is protected. Additionally, it provides a feedback mechanism for safe operation and ensures that no power is supplied once the phone reaches full charge.

AMMETER & VOLTMETER DISPLAY:

In the Auto Power Guard for Electrical Gadgets project, the voltmeter and ammeter displays are used to monitor the charging process. The voltmeter measures the smartphone's battery voltage, and the ammeter tracks the current being supplied. Both values are read by the Arduino, which displays them on an LCD screen in real-time. The voltmeter helps determine when the battery is fully charged (e.g., 4.2V), while the ammeter ensures the current stays within safe limits. Once the battery reaches full charge, the Arduino signals the Auto Power Cut Module to stop charging, preventing overcharging and extending the battery life.

REGULATOR:



The voltage regulator ensures that the smartphone receives a stable and safe charging voltage (typically 5v), even if the input voltage from the charger is higher. it prevents overvoltage by stepping down higher voltages (e.g., 9v or 12v) to a safe level for the phone. this consistent voltage helps maintain the phone's battery health. the regulator works in tandemwith the arduino to provide safe and efficient charging.

AUTO POWER CUTOFF MODULE:

The Auto Power Cutoff Module works by disconnecting the charger from the smartphone once it reaches full charge, preventing overcharging and protecting the battery. The Arduino continuously monitors the phone's battery voltage, and when it detects that the voltage has reached a predefined threshold (typically 4.2V), it triggers the Auto Power Cutoff Module. The Arduino sends a signal to the module (like a relay or MOSFET), which then cuts off the power supply to the phone. This automatic disconnection ensures that the phone is not overcharged, preserving the battery's health and extending its lifespan.

2.3 DESCRIPTION

The Auto Power Guard for Electrical Gadgets is an advanced safety mechanism designed to provide continuous protection for electrical devices against power irregularities such as overvoltage, undervoltage, power surges, and fluctuations. By constantly monitoring the voltage and current levels in the electrical supply, the system can detect any anomalies and automatically disconnect the power to prevent damage to connected devices. This ensures that valuable electrical gadgets, ranging from household appliances to sensitive industrial equipment, are safeguarded from unexpected electrical faults. In addition to protecting devices from damage, the system also contributes to energy efficiency by disconnecting idle or unused devices, helping to reduce unnecessary power consumption. The Auto Power Guard is equipped with a user-friendly interface, offering real-time alerts or indicators for power anomalies, making it easy for users to monitor the system's performance. Once the power levels return to normal, the system automatically restores the connection, ensuring minimal disruption to device operation. Ideal for homes, offices, and industrial settings, this project aims to enhance the longevity, safety, and performance of electrical gadgets in environments prone to unstable power supplies.

CHAPTER 3

RESULT & DISCUSSION

Fig : 3.1 Hardware Kit

OUTPUT:

The output of the Auto Guard for Electrical Gadgets project is a smart and automated charging system that ensures safe charging for smartphones. The system continuously monitors the battery voltage and current, displaying this information on an LCD screen. When the phone reaches full charge (around 4.2V), the Arduino triggers the Auto Power Cutoff Module, cutting off the charger to prevent overcharging. With the inclusion of a manual switch, users can control when the system is active, while advanced features like energy tracking or battery health monitoring can be added in the future. Overall, the project delivers an efficient, protective charging solution.

3.2 WORKING PRINCIPLE:

The Auto Power Guard for Electrical Gadgets operates by automating the charging process of smartphones to prevent overcharging and ensure the longevity of the battery. The Arduino constantly monitors the phone's battery voltage and charging current through a voltmeter and ammeter, respectively. When the battery reaches the set full charge level (typically around 4.2V), the Arduino activates the Auto Power Cutoff Module, which is controlled by a relay or MOSFET. This module disconnects the charger, halting further charging and preventing overcharging, which could damage the battery. Additionally, the system ensures that the charging current stays within safe limits to prevent overheating or excessive power draw. The ammeter and voltmeter displays provide real-time feedback to the user on the charging current and battery voltage. The manual switch allows the user to control the system, turning it on or off as needed. Overall, the project ensures that the smartphone charges safely, automatically disconnecting once full charge is achieved, thereby preserving the health of the battery.

CHAPTER 4

FUTURE SCOPE & CONCLUSION

4.1 FUTURE SCOPE:

The development of an auto power guard for electrical gadgets has promising future applications, especially in the context of energy efficiency, safety, and sustainability. Here are some key areas where this technology could have a significant impact:

SOME ASPECTS OF THE FUTURE SCOPE:

- ✓ Battery Life Extension
- ✓ Heat Reduction
- ✓ Energy Savings
- ✓ Battery Protection
- ✓ Energy Conservation in Factories.

4.2 CONCLUSION

In conclusion, the Auto Power Guard for Electrical Gadgets project provides an effective solution to prevent overcharging of smartphones, thereby extending battery life and enhancing safety during overnight charging. By integrating the Arduino, voltage regulator, ammeter, voltmeter display, Auto Power Cutoff Module, and switches, the system automatically monitors and controls the charging process. The Arduino continuously tracks the battery's voltage and current, ensuring that charging stops once the phone reaches full charge, protecting it from potential damage. This automated system not only improves user convenience by eliminating the need for manual intervention but also ensures the longevity and health of smartphone batteries. Overall, this project combines hardware and software components to offer a smart, efficient, and safe charging solution for everyday use.

CHAPTER 5

COST ESTIMATION

S.NO	COMPONENT	QUANTITY	COST
1	Auto Power cutoff Module	1	250
2	Regulator	1	50
3	Arduino	1	350
4	Display	1	250
5	12V BATTERY	1	300
6	Led Bulb	2	20
7	WIRES	As per required	10
		TOTAL	**1230**

Table 5 Cost Estimation Of Auto Power Guard ForElectrical Gadgets

CHAPTER 6

REFERENCE

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3. "Microcontroller-Based Automatic Battery Charging System with Overcharge Protection" by R. K. Singh et al., published in the International Journal of Emerging Trends in Engineering and Development (IJETED), Vol. 3, Issue 2, April 2013.

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5. "Design and Development of Automatic Battery Charging System with Cut-Off Facility Using Arduino" by A. K. Maurya et al., published in the International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering (IJAREEIE), Vol. 6, Issue 5, May 2017.

LINKS:

Instructables - Arduino Battery Charger

https://www.youtube.com/watch?v=MhXQALYzCqw

https://www.youtube.com/watch?v=1Fs4SfVSsLk

https://www.youtube.com/watch?v=uQi2NTp3ouk