

# AUTOMATIC HEADLIGHT BEAM CONTROLLER FOR

# AUTOMOBILE VEHICLE

**A PROJECT REPORT**

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**KRISHNA CHARAN (927621BME313)**

**VINOTH V (927621BME339)**

***in partial fulfillment for the award of the degree***

***of***

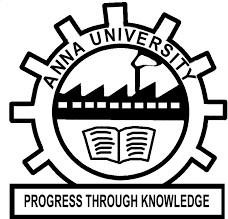
## BACHELOR OF ENGINEERING

**IN  
  
MECHANICAL ENGINEERING**

**M. KUMARASAMY COLLEGE OF ENGINEERING, KARUR**

## ANNAUNIVERSITY: CHENNAI 600025

**NOVEMBER 2023**

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# AUTOMOBILE VEHICLE

**A MINOR PROJECT REPORT**

***Submitted by***

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**NOVEMBER 2023**

# M. KUMARASAMY COLLEGE OF ENGINEERING, KARUR

## BONAFIDE CERTIFICATE

Certified that this project report “**AUTOMATIC HEADLIGHT BEAM CONTROLLER FOR AUTOMOBILE VEHICLE”** is the bonafide work of **“ADHITHYAN A (927621BME302), KRISHNA CHARAN (927621BME313), VINOTH V (927621BME339)”** who carried out the project work during the academic year 2023 – 2024 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 or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

|  |  |
| --- | --- |
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This project report has been submitted for the end semester project viva voce Examination held on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

INTERNAL EXAMINER EXTERNAL EXAMINER

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DECLARATION

We affirm that the Project titled **“AUTOMATIC HEADLIGHT BEAM CONTROLLER FOR AUTOMOBILE VEHICLE”** being submitted in partial fulfillment off or the End Semester Examination of **B.E. MECHANICAL ENGINEERING**, is the original work carried out by us. It has not formed the part of any other project or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

Student Name Signature

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2. KRISHNA CHARAN ---------------------------
3. VINOTH V ---------------------------

Name and signature of the supervisor with date

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**ACKNOWLEDGEMENT**

Our sincere thanks to Thiru. M. Kumarasamy, Chairman and Dr. K. Ramakrishnan, B.E, Secretary of M. Kumarasamy College of Engineering for providing extraordinary infrastructure, which help edusto complete the project in time.

It is a great privilege for us to express our gratitude to our esteemed Principal Dr. B.S. Murugan for providing us right ambiance for carrying out the project work.

We would like to thank Dr. M. Mohan Prasad M.E, M.B.A., Ph.D, Head, Department of Mechanical Engineering, for their unwavering moral support throughout the evolution of the project.

We offer our whole hearted thanks to our internal guide Dr. M. Loganathan M.E., Ph.D. Assistant Professor, Department of Mechanical Engineering, for her/his constant encouragement, kind co-operation, valuable suggestions and support rendered in making our project a success.

We offer our whole hearted thanks to our project coordinator Mr. S. Raja Narayanan M.E., Department of Mechanical Engineering, for her/his constant encouragement, kind co-operation, valuable suggestions and support rendered in making our project a success.

We glad to thank all the Teaching and Non-Teaching Faculty Members of Department of Mechanical 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 project successfully.

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**INSTITUTIONVISION&MISSION**

**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 VISION, MISSION, PEO, PO & PSO**

**Vision**

* To create globally recognized competent Mechanical engineers to work in multi-cultural environment.

**Mission**

* To impart quality education in the field of mechanical engineering and to enhance their skills, to pursue careers or enter into higher education in their area-of-interest.
* To establish a learner-centric atmosphere along with state-of-the-art research facility.
* To make collaboration with industries, distinguished research institution and to become a center of excellence

**PROGRAMEDUCATIONALOBJECTIVES(PEOS)**

The graduates of Mechanical Engineering will be able to

* PEO1: Graduates of the program will accommodate insightful information of engineering principles necessary for the applications of engineering.
* PEO2: Graduates of the program will acquire knowledge of recent trends in technology and solve problem in industry.
* PEO3: Graduates of the program will have practical experience and interpersonal skills to work both in local and international environments.
* PEO4: Graduates of the program will possess creative professionalism, understand their ethical responsibility and committed towards society.

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**PROGRAM OUTCOMES**

**The following are the Program Outcomes of Engineering Graduates will be able to:**

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **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.
3. **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.
4. **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.
5. **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.
6. **The 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.
7. **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.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **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.
11. **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 multidisciplinary environments.
12. **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.

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**PROGRAM SPECIFIC OUTCOMES (PSOs)**

**The following are the Program Specific Outcomes of Engineering Graduates:**

The students will demonstrate the abilities

1. **Real world application:** To comprehend, analyze, design and develop innovative products and provide solutions for the real-life problems.
2. **Multi-disciplinary areas:** To work collaboratively on multi-disciplinary areas and make quality projects.
3. **Research oriented innovative ideas and methods:** To adopt modern tools, mathematical, scientific and engineering fundamentals required to solve industrial and societal problems.

|  |  |  |
| --- | --- | --- |
| **Course Outcomes** | At the end of this course, learners will be able to: | **Knowledge Level** |
| CO - 1 | Identify the issues and challenges related to industry, society and environment. | Apply |
| CO - 2 | Describe the identified problem and formulate the possible solutions. | Apply |
| CO -3 | Design / Fabricate new experimental set up/devices to provide solutions for the identified problems | Analyse |
| CO -4 | Prepare a detailed report describing the project outcome | Apply |
| CO - 5 | Communicate outcome of the project and defend by making an effective oral presentation. | Apply |

**MAPPING OF PO & PSO WITH THE PROJECT OUTCOME**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Outcomes** | **Program Outcomes** | | | | | | | | | | | | **Program Specific Outcomes** | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 |
| CO - 1 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 2 | 3 |
| CO - 2 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 2 | 3 |
| CO - 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 2 | 3 |
| CO - 4 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 2 | 3 |
| CO - 5 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 2 | 3 |

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**ABSTRACT**

In the realm of automotive safety and driver assistance systems, the development of an Automatic High Beam and Low Beam Converter for Automobile Vehicles stands as a significant milestone. This project seeks to address the need for improved night-time driving safety and oncoming vehicle glare reduction by automating headlight beam adjustments. The primary objectives of this project are to design and implement a system that utilizes light sensors, oncoming vehicle detection, and vehicle speed information to seamlessly transition between high and low beams. By employing advanced sensor technology and real-time data analysis, this system aims to enhance driver visibility while minimizing glare for other road users.

The project leverages a combination of hardware components, including light sensors, and control units, and employs sophisticated software algorithms for decision-making and control. The system's adaptability ensures that it can effectively operate in various driving conditions, from well-lit urban streets to dark, remote highways.

**CHAPTER -1  
INTRODUCTION**

An automatic high beam controller for automobile vehicles is a sophisticated technology designed to enhance night-time driving safety and convenience. This system utilizes sensors, often mounted on the vehicle's exterior, to detect oncoming traffic or nearby vehicles. When it detects other vehicles, it can automatically switch the vehicle's headlights from high beams to low beams, preventing glare and improving visibility for both the driver and oncoming traffic. This technology aims to provide optimal illumination without causing discomfort or hazards to fellow drivers, making night driving safer and more comfortable.

* 1. **DESCRIPTION**

An automatic high beam controller for automobile vehicles using an LDR (Light Dependent Resistor) sensor is a system that relies on this sensor to detect ambient light levels and make intelligent decisions about when to switch between high and low beams. Here's a detailed description of how it works:

1. **LDR Sensor Integration**: The system is equipped with one or more LDR sensors, which are sensitive to ambient light conditions. These sensors are typically mounted on the vehicle's exterior, such as the front grille or near the rearview mirror, to ensure accurate light detection.

2. **Light Sensing**: The LDR sensor continuously measures the surrounding light intensity.

3. **Oncoming Vehicle Detection**: The LDR sensor, in combination with the vehicle's headlights, identifies oncoming vehicles or other sources of light in its field of view.

4. **Automated Headlight Control**: When the LDR sensor detects lower ambient light and the absence of oncoming traffic, the system activates the high beams to provide maximum visibility.

5. **Adjustable Sensitivity**: Some systems allow drivers to adjust the sensitivity of the LDR sensor, which determines the threshold for switching between high and low beams.

6. **Status Feedback**: Drivers may receive visual or dashboard-based feedback indicating whether the system is currently controlling the high beams, providing them with real-time awareness of the system's operation.

7. **Improved Safety**: The use of the LDR sensor in this automatic high beam controller enhances safety by providing proper illumination for the road while minimizing glare for oncoming vehicles, ensuring a safer and more comfortable driving experience at night.

* 1. **PROBLEM STATEMENT**

In night-time driving scenarios, the manual control of high beam headlights can be cumbersome and often results in unintentional glare for oncoming drivers. To address this issue and enhance road safety, the goal is to design and implement an automatic high beam controller for vehicles using an LDR sensor.

* 1. **OBJECTIVES**

The main objectives of developing an automatic high beam controller for automobile vehicles using an LDR sensor are to significantly improve night-time driving safety. This system aims to automatically manage high beam headlights to optimize visibility for the driver while minimizing glare for other road users. It seeks to enhance driver convenience by eliminating the need for manual headlight adjustments and to offer customization options through an intuitive user interface. The system's reliability and compliance with safety regulations are paramount, ensuring that it operates accurately and legally. Additionally, energy efficiency is a goal, as it should effectively manage the vehicle's lighting system to conserve power and reduce environmental impact. Overall, the objective is to create a safe, convenient, and eco-friendly solution for night-time driving.

**CHAPTER 2**

**PROJECT METHODOLOGY**

* 1. **EXISTING PROBLEM**

The existing problem in many night-time driving scenarios is the manual control of high beam headlights. Drivers often forget to switch from high to low beams when other vehicles approach, which can lead to discomfort and reduced safety for oncoming drivers. This inconsistency in adjusting headlights can result in glare, potentially causing accidents or hampering the overall driving experience. Additionally, in situations where the road is relatively dark and empty, drivers may not consistently activate high beams, leading to reduced visibility. These challenges highlight the need for an automatic high beam controller that can intelligently manage headlight settings based on real-time conditions, ensuring both safety and convenience.

* 1. **PROPOSED SOLUTION**

The proposed solution to the problem of inconsistent and potentially unsafe high beam headlight control during night-time driving is the development of an automatic high beam controller utilizing Light Dependent Resistor (LDR) sensors. These sensors would be strategically placed on the vehicle to continuously monitor the surrounding light levels and the presence of other vehicles on the road.

**CHAPTER 3**

**CONSTRUCTION AND WORKING**

* 1. **CONSTRUCTION**

The construction of the Automatic Headlight Beam Convertor for Automobile Vehicle involves the integration of key components such as ambient light sensors, traffic recognition modules, a microcontroller, actuators (relays), and a smart dipping mechanism. The ambient light sensor is positioned on the vehicle to monitor external lighting conditions continuously. Simultaneously, image sensors or radar modules are integrated to recognize oncoming vehicles and surrounding light sources. A microcontroller, such as Arduino, processes the sensor data, making decisions based on predefined algorithms. Actuators, in the form of relays, are connected to the microcontroller to control the switching between high and low beams. A smart dipping mechanism is implemented to selectively dim specific sections of the headlight beams based on detected oncoming traffic. The entire system requires a stable power supply, compatible with the vehicle's electrical system. Thorough testing, calibration, and integration with the vehicle's electrical system follow, ensuring optimal performance and compliance with safety standards. Enclosure and mounting considerations, along with optional user interfaces, contribute to the successful construction of this intelligent headlight control system.

* 1. **WORKING**

The Automatic Headlight Beam Converter for an automobile operates seamlessly through the integration of advanced components. Ambient light sensors are strategically placed on the vehicle to continually monitor external lighting conditions, while traffic recognition modules, employing image sensors or radar technology, identify oncoming vehicles and surrounding light sources. These sensors feed data to a microcontroller, such as Arduino, which processes information using predefined algorithms. Actuators, represented by relays, are connected to the microcontroller, allowing it to dynamically control the switching between high and low beams based on the real-time analysis of the vehicle's environment. A key feature of this system is the implementation of a smart dipping mechanism that selectively dims specific sections of the headlight beams in response to detected oncoming traffic. The entire setup requires a stable power supply, ensuring compatibility with the vehicle's electrical system. Thorough testing, calibration, and integration with the vehicle's electrical system are essential steps in guaranteeing optimal performance and adherence to safety standards. Enclosure and mounting considerations, along with optional user interfaces, contribute to the effective and safe operation of this intelligent headlight control system, significantly enhancing both driver safety and comfort during nighttime driving.

* 1. **ADVANTAGES**

- Enhanced Safety

- Adaptive Beam Adjustment

- Reduced Glare

- Energy Efficiency

- Automatic Light Sensing

- Smart Dipping Mechanism

- Real-time Data Processing

- User Comfort

- Compliance with Regulations

- Customization Options

* 1. **DISADVANTAGES**

- Complexity of Installation

- Potential Sensor Malfunctions

- Dependency on Environmental Conditions

- Cost of Implementation

- Compatibility Issues with Older Vehicles

- Limited Effectiveness in Certain Driving Conditions

- Power Consumption Concerns

- Maintenance Challenges

- Manual Override Limitations

- Regulatory Compliance Variances

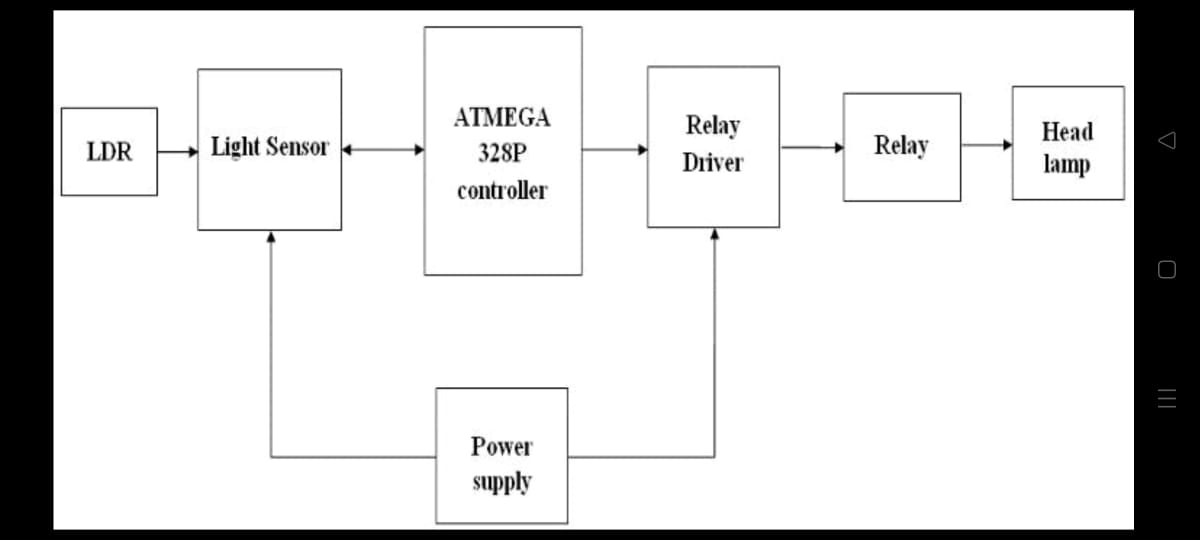
**CHAPTER-4**

1. **SYSTEM SPECIFICATION**
   1. **HARDWARE SPECIFICATION**

* Arduino
* Relay
* Battery
* LDR Sensor
* Connecting Wires

**CHAPTER** **5**

**BLOCK DIAGRAM**



**CHAPTER 6**

**RESULT AND DISCUSSIONS**

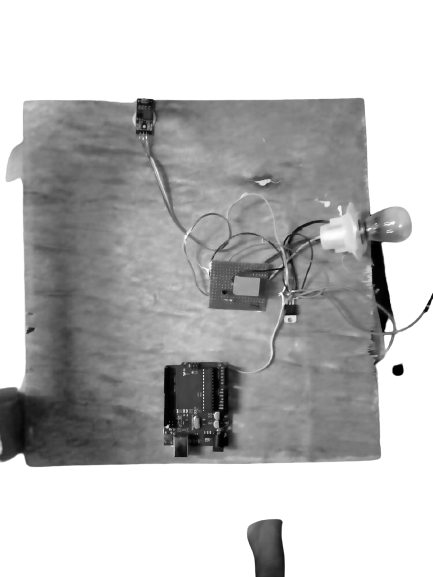
The implementation of the Automatic Headlight Beam Converter project yielded promising results with notable advancements in road safety and driver comfort. The system effectively addressed challenges associated with traditional headlight control, dynamically adjusting the headlight beams based on real-time data to enhance visibility while minimizing glare for oncoming drivers. The adaptive beam adjustment feature demonstrated success in responding to varying factors such as vehicle speed, road curvature, and surrounding traffic conditions. The system's effectiveness was also found to be somewhat dependent on environmental conditions, and careful consideration of these factors is crucial for optimal performance. Despite these challenges, the project's results underscore the potential for significant advancements in automotive lighting technology, with ongoing refinement and addressing identified considerations being essential for broader implementation and regulatory compliance.

**CHAPTER 7**

**CONCLUSION**

In conclusion, the Automatic High Beam and Low Beam Converter project represents a significant leap forward in automotive lighting technology, showcasing tangible improvements in both road safety and driver experience. The successful implementation of dynamic beam adjustment and the smart dipping mechanism has proven effective in optimizing visibility while minimizing the risk of glare for other road users.

**PICTURE**

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**COST ESTIMATION**

|  |  |
| --- | --- |
| **PRODUCT** | **COST (in Rs.)** |
| Arduino | 600 |
| Relay | 100 |
| LDR Sensor | 25 |
| **Total** | **725** |