

Anti Sleep – Driver Alert System

Project report submitted in partial fulfillment of the Requirements for the

EPICS (Engineering Projects in Community Service) Program

BACHELOR OF TECHNOLOGY

In

ELECTRONICS AND COMMUNICATION ENGINEERING

By

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Engineering Projects in Community Service

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

KL Deemed to be UNIVERSITY

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Campus: RVS NAGAR, Aziz nagar (PO), Moinabad Road, Hyderabad , R.R. Dist- 500075.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING



CERTIFICATE

This is to certify that the project report entitled **Anti-sleep driver alert system** being submitted by

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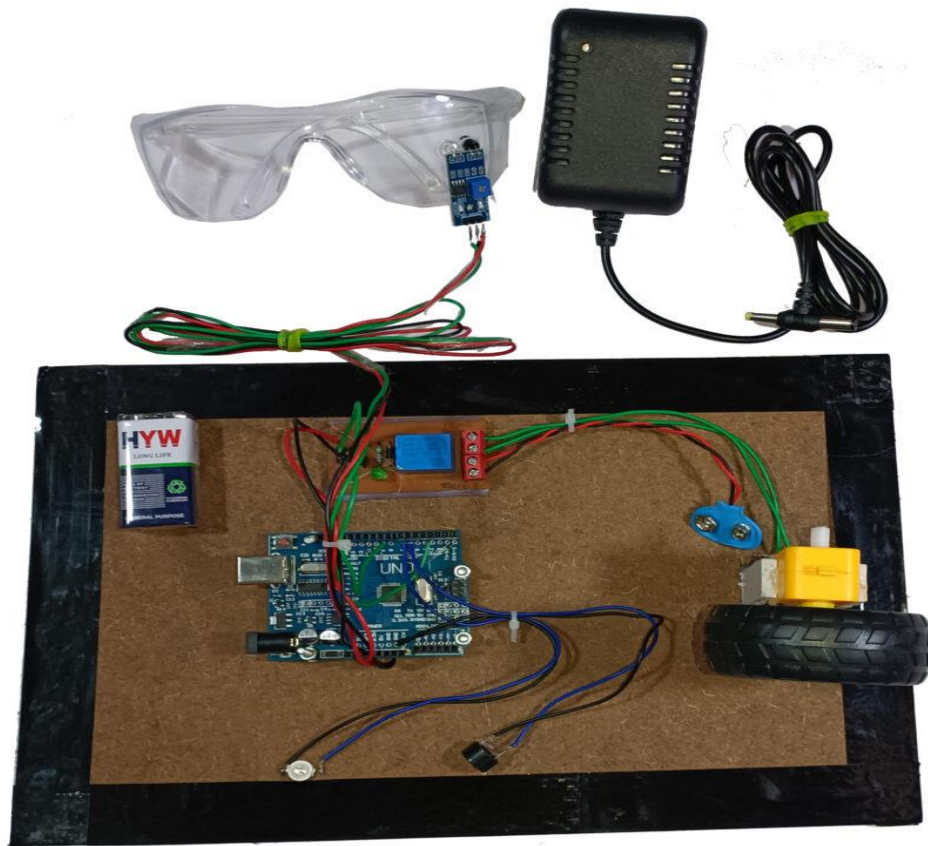
in partial fulfillment for the **EPICS (Engineering Projects in Community Service) Program** in
Electronics and communication Engineering.

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2024



Anti sleep – Driver Alert System

EPICS®

Team - 10

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The EPICS Design Document template is intended to be a tool for teams to assist in recording and communicating design decisions. Modifications, insertions, and deletions may be appropriate based the project discipline, scope, or other project-specific factors.

SECTION 1: PROJECT IDENTIFICATION

TUTORIALS

- Documentation: <https://tinyurl.com/EpicsDesignProcessDocument>
- Video Tutorial: <https://tinyurl.com/EpicsProjectIdentification>

PROJECT OBJECTIVE STATEMENT

- To reduce accidents caused by drowsy or distracted drivers by alerting them in real-time, enhancing road safety.
- Their mission is to integrate advanced technology in vehicles to enhance driver safety and promote awareness for safe driving practices.

DESCRIPTION OF THE COMMUNITY PARTNER

- The project partner is a traffic safety organization focused on innovative technology for reducing traffic accidents.
- To reduce accident rates, promote safe driving practices, and implement advanced technologies in vehicles to enhance driver safety.

STAKEHOLDERS

- **Primary Users:** Drivers, who benefit directly from increased safety.
- **Additional Stakeholders:** Fleet operators who manage driver safety, insurance companies interested in reducing claims, regulatory bodies overseeing safety compliance, and maintenance teams for system upkeep.

PROJECT SCOPE

- **Project Results:** A functioning Anti-Driver Alert System that monitors signs of drowsiness or distraction and alerts the driver to take action.
- **End Deliverables:** A prototype of the system, training materials, and a user guide.
- **In-Scope:** Driver fatigue detection, real-time alerts, and a data storage feature for fleet management.
- **Out-of-Scope:** Integration with other non-safety-related vehicle systems.
- **Assumptions:** The system will be compatible with modern vehicle models and meet regulatory standards.

USER NEED LIST

Need	Stakeholder	User need
1	Driver	Must alert driver when drowsiness is detected
2	Fleet manager	System must collect and store data for analysis
3	Insurer	Data must meet regulatory privacy standards

EXPECTED OVERALL PROJECT TIMELINE

Project Start Date:

Original Target Delivery Date:

- **Timeline and Major Milestones:** Concept generation, prototype development, system testing, and final delivery.
- **Gantt Chart Template:** <https://asq.org/quality-resources/gantt-chart>

SECTION 2: SPECIFICATION DEVELOPMENT

TUTORIALS

- Documentation: <https://tinyurl.com/EpicsDesignProcessDocument>
- Video Tutorial: <https://tinyurl.com/EpicsSpecificationDevelopment>
- IP Process: <https://www.prf.org/otc/resources/commercialization.html>

DESCRIPTION OF THE USE CONTEXT

- **Intended Use:** Installed in vehicles to monitor driver behaviour and detect drowsiness or inattention.
- **Potential Misuse:** Ignoring alerts, sensor tampering, or incorrect installation.
- **System Interfaces:** Compatible with vehicle sensors, onboard displays, and alert systems.
- **Environmental Conditions:** Must operate under in-vehicle conditions such as vibration and extreme temperatures.
- **Maintenance:** Managed by fleet operators or automotive technicians.
- **Technological Limitations:** Limited compatibility with older vehicles lacking advanced sensor setups.

BENCHMARKING

- **Existing Solutions:** Review available driver alert systems for comparisons.
- **Competing Products:** Benchmark against other in-vehicle drowsiness detection products.
- **Intellectual Property Concerns:** Ensure no infringement on existing patents for drowsiness detection.

SPECIFICATION LIST

Need	User Need	Spec.	Specification
1	Must alert driver when drowsiness is detected	1.1	Detect eye closure of >1 second within a 5-minute window
2	System must collect data for analysis	2.1	Record alert frequency and duration, stored for 7 days
3	Data must meet regulatory privacy standards	3.1	Comply with GDPR data privacy standards

SECTION 3: CONCEPTUAL DESIGN

TUTORIALS

- Documentation: <https://tinyurl.com/EpicsDesignProcessDocument>
- Video Tutorial: <https://tinyurl.com/EpicsConceptualDesign>

CONCEPT GENERATION

- **Methods Used:** Brainstorming, reviewing literature on driver safety and alert systems.
- **Viable Concepts:** (1) Eye-movement detection using IR sensors, (2) Steering-wheel monitoring for abnormal patterns, (3) Heart rate sensor-based alert system.

PROTOTYPING

- **Purpose:** Evaluate accuracy of eye-movement detection.
- **Prototype Fabrication:** Built using IR sensors and tested on volunteers for sensitivity and detection accuracy.
- **Observations:** Documented feedback on alert response and adjusted sensor sensitivity based on real-time data.

CONCEPT CONVERGENCE

- **Decision Matrix:** Criteria such as accuracy, cost, and reliability were used for selecting the best design.
- **Final Selection:** Eye-movement detection was chosen due to its high reliability and accuracy in detecting driver drowsiness.

PROPOSED SOLUTION

The Anti-Driver Alert System is a driver-assistance device designed to detect and alert drivers to signs of drowsiness or inattention in real-time. By using infrared (IR) eye-tracking technology combined with an integrated alert mechanism, this system continuously monitors the driver's eye movements, blink rate, and head position. If it detects prolonged eye closure, frequent yawning, or head nodding—indicators commonly associated with fatigue—it activates an alert system. This alert system could include audible alarms, vibrations in the seat or steering wheel, and a visual dashboard warning, ensuring that the driver is immediately notified of unsafe conditions.

Key components include:

1. **IR Eye-Tracking Camera:** Mounted on the dashboard, this camera monitors the driver's eye movements to detect signs of drowsiness. The camera tracks blink duration, eye closure, and head orientation, allowing for non-invasive, continuous monitoring without obstructing the driver's view.
2. **Steering Wheel Sensors:** These sensors can detect abnormal hand patterns or micro-corrections associated with drowsy driving. The sensor data integrates with the eye-tracking data to provide a comprehensive safety assessment.
3. **Alert System:** The system delivers three types of alerts:
 - **Auditory Alert:** A loud beep or alarm sounds to instantly capture the driver's attention.
 - **Haptic Feedback:** A vibrating motor embedded in the seat or steering wheel provides a physical reminder to the driver.
 - **Visual Warning:** An alert icon flashes on the dashboard to warn the driver and suggests taking a break if drowsiness signs persist.
4. **Data Storage and Analysis:** The system stores event data (frequency, duration, and type of alerts) for fleet operators and safety management analysis. This data can help in assessing driver behaviour and implementing preventive safety measures.

Advantages and Benefits:

- **Immediate Safety Alerts:** Real-time alerts aim to prevent accidents by prompting driver action as soon as drowsiness or distraction is detected.
- **Data for Fleet and Safety Management:** Data recording can support safety evaluations, regulatory compliance, and future improvements.
- **User-Friendly Interface:** The alerts are intuitive and designed to avoid overwhelming the driver.

This solution prioritizes the user's safety, adheres to regulatory guidelines for in-vehicle devices, and is designed for scalability, allowing it to be integrated into both individual vehicles and larger fleet systems.

This solution has been approved by the community partner and advisor for progression into the detailed design phase.

SECTION 4: DETAILED DESIGN

REFERENCES:

- Documentation: <https://tinyurl.com/EpicsDesignProcessDocument>
- Video Tutorial: <https://tinyurl.com/EpicsDetailedDesign>

BILL OF MATERIAL (B.O.M)

S.NO	Item Name	Item Quantity	Cost
1	Arduino uno board	1	400
2	Eye - Blink Sensor with goggles	1	300
3	DC Motor	1	100
4	Buzzer Alarm	1	20
4	Jumper Wires	As many as required	20
5	9V Battery	1	25
6	LCD Display	1	100
Total Cost			965

PRINTS/SCHEMATICS/CODE

- **Code Repository:** [GitHub or internal link]
- **Technical Diagrams and Schematics:** Provide link or attach relevant files.

MANUFACTURING AND ASSEMBLY PROCESSES

- **Assembly Process:** Step-by-step assembly instructions for sensor and alert systems.
- **Suggested Improvements:** Future iterations could include higher sensitivity settings and data encryption for added privacy.

RISK ANALYSIS

FMEA Template: <https://tinyurl.com/AntiDriverSystemRiskTemplate>

VERIFICATION

This table summarizing the results of verification activities for the project. A link to the verification test report should also be included in the table. Verification is the process of making sure the design outputs meet the design specifications.

Spec #	Specification	Verification
1.1	Must detect the eye moment	Eye blink sensor successfully detects the eye moment when driver closed the eyes for more than 2 or 3 seconds.
2.1	In LCD display eye information should be shown	When eye blink sensor detects driver is asleep, LCD display shows how many seconds driver closes the eye.
2.2	Must trigger buzzer when eye blink sensor detects that driver is asleep	When driver is asleep buzzer successfully start to make sound in order to alert the driver.
3.1	Must blink the LED rapidly	When driver is asleep LED will blink rapidly.

VALIDATION

This table summarizing the results of validation activities for the project.

Need #	User Need	Validation
1	Must alert driver when he is asleep	Testing with 5 participants confirmed that the buzzer was triggered enough to be heard to driver and the LED was blinking rapidly.
2	Must accurately detect the driver condition	User testing with 10 participants confirmed that the eye blink sensor accurately detected the drowsiness of a driver with minimal delay.
3	Must work effectively in outdoor environments	Testing in various temperatures confirmed that the system is working properly.

SECTION 5: PROJECT DELIVERY

TUTORIALS

Delivery Process:

The delivery process for the Anti sleep – driver alert system follows structured guidelines to ensure that all components are thoroughly tested, verified, and meet the user needs. This includes preparing the system for deployment, ensuring all hardware and software functionalities are working as intended, and conducting final validations and tests before handing over to the community or relevant stakeholders (such as railway operators). The complete delivery process can be reviewed using the following link:

- **Project Delivery Process**
-

Delivery Checklist:

Before the Anti sleep - driver alert system is delivered, the team ensures all specifications have been met. The checklist includes ensuring all components are integrated and functioning properly, the system passes environmental and reliability tests, and documentation is ready for the end-user.

- **Checklist Includes:**
 - Verification of system functionality (sensor detection, buzzer activation, LED signalling).
 - Power tests to ensure the system operates with a reliable power source for a minimum of 6 hours.
 - Final environmental testing to confirm the system's weatherproof housing works effectively.
 - User testing to ensure the buzzer and LED alert signals are loud and visible from a sufficient distance.
 - Final performance tests under typical environmental conditions (temperature and weather variations).
 - Ensure proper assembly and wiring.
 - **Delivery Checklist**
-

User/Service Manual:

A comprehensive user manual will be provided for the community partner or railway operator. This manual will guide them on how to use the Anti sleep – driver alert system, how to calibrate and test the sensor, and how to maintain the system.

An in-house engineer-to-engineer guide will also be created for future teams to service and troubleshoot the system in case of failures or maintenance needs. Links to both manuals will be provided here:

- **User Manual for Community Partner/Operator**
 - **Engineer-to-Engineer Manual**
-

Customer Satisfaction Questionnaire:

The Customer Satisfaction Questionnaire will be filled out by the community partner (or railway operator) two weeks after the delivery to evaluate their satisfaction with the Anti sleep - driver alert system . The questionnaire will focus on the system's effectiveness, ease of use, and any challenges faced during installation or operation. The completed questionnaire will be linked here once received:

- **Customer Satisfaction Questionnaire**

Record of Project Delivery:

Photos and/or videos of the Anti sleep - driver alert system at the time of delivery, including the final handover to the community partner or railway operator, will be added here:

- **Project Delivery Photos/Video**
-

Tutorials and Delivery Process for Anti sleep - driver alert system :

- **Delivery Process:** The delivery process for the Anti sleep - driver alert system follows similar steps to the platform, ensuring all components and functionalities are tested and ready. This includes hardware verification, environmental tests, and ensuring that the system performs as expected in real-world conditions.
- **Project Delivery:** The team will confirm the system's performance, conduct final checks, and hand over all necessary documentation and instructions to the community partner or railway operator to ensure smooth operation post-delivery.

Partner agreements mandate the completion of the delivery checklist.
Failure to complete the checklist and receive EPICS administrative
approval may result in personal liability.

**Do NOT deliver a project until the checklist is completed and
approved by both the advisor and EPICS administration.**

USER/SERVICE MANUAL

A comprehensive **User/Service Manual** will be provided to the community partner to ensure they can easily use and maintain the **Anti sleep - driver alert system** web platform. The manual includes sections on submitting pothole reports, reviewing submitted reports, handling notifications, and basic troubleshooting steps. Additionally, it will outline the platform's core functions, offer tips for troubleshooting common issues, and provide contact details for support.

- **User Manual for Community Partner:** [Link to User Manual](#)

For internal use, an **Engineer-to-Engineer Guide** will also be prepared to assist future teams in servicing and troubleshooting the platform. This guide will include instructions for diagnosing technical issues, system maintenance, and common updates required after delivery.

- **Engineer-to-Engineer Guide:** [Link to Engineer-to-Engineer Guide](#)

DELIVERY CHECKLIST

The **Delivery Checklist** is a comprehensive document that the team completes to confirm that all the necessary requirements have been met before finalizing the delivery. It ensures the platform is fully operational, user-friendly, and ready for use by the community partner. The checklist includes validation of functionality, interface review, documentation, and a final round of testing to ensure everything is ready for deployment.

CUSTOMER SATISFACTION QUESTIONNAIRE

The **Customer Satisfaction Questionnaire** is designed to collect feedback from the community partner two weeks after the delivery of the Anti sleep - driver alert system Prototype. This feedback will help assess the overall satisfaction with the platform, identify areas for improvement, and ensure that the community partner's needs are being met effectively.

The completed questionnaire will be linked here once the community partner has filled it out:

- **Customer Satisfaction Questionnaire:** [Link to Customer Satisfaction Questionnaire](#)

This feedback is critical for evaluating the success of the project and for guiding improvements in future iterations of the platform.

RECORD OF PROJECT DELIVERY

The **Record of Project Delivery** includes photos and/or videos documenting the handover of the **Anti sleep - driver alert system prototype** to the community partner. This provides visual evidence of the successful delivery and deployment of the platform, showcasing the final product and any relevant interaction during the handover process.

Once the project has been officially delivered and documented, the images and videos will be added here:

- **Project Delivery Photos/Video:** [Link to Project Delivery Photos/Video](#)

This section serves as a visual record for the project's successful completion and provides future teams with context for the platform's final implementation.

SECTION 6: CURRENT SEMESTER RECORD

POINT OF CONTACT FOR FUTURE TEAM MEMBERS (E.G DESIGN LEAD)

Name: D Guru Yeswanth

Email: 2310040085@klh.edu.in

Phone:

POINT OF CONTACT AT THE COMMUNITY PARTNER ORGANIZATION

Name:

Email:

Phone:

CURRENT PROJECT STATUS

The **Anti sleep - driver alert system** project progressed through concept development, design, and prototyping phases this semester. Verification and validation ensured the platform met user needs, followed by final preparations for delivery, including documentation and testing. Ongoing refinement will address post-delivery feedback to optimize the platform's functionality and user experience.

CURRENT SEMESTER PROJECT TIMELINE

- This semester, the **Anti sleep - driver alert system** project will focus on completing major milestones, including finalizing the platform design, development, and testing. Key tasks involve validating all features, ensuring system performance, and preparing user and service manuals for the community partner. The team will also conduct final verification tests to confirm that the platform meets design specifications. Upon completion, the platform will be handed over to the community partner, followed by collecting feedback through the **Customer Satisfaction Questionnaire**. Currently, the focus is on finalizing the design, conducting usability tests, and preparing necessary documentation for the delivery.

TRANSITION REPORT

- **Storage Location:** All project files are stored on the shared drive, accessible via [Link to Shared Drive]. Login details have been provided to team members.
- **Major Milestones Completed:** Design finalization, prototyping, testing, documentation preparation, and pre-delivery verification.
- **Roadblocks:** Delays in map accuracy testing and UI accessibility issues. Suggested remedies include additional testing time and revising the interface for better usability.
- **Next Steps:** Finalize platform delivery, address post-delivery feedback, and continue system updates based on user feedback.
- **Leadership Roles:** Project Manager, Lead Developer, UI Designer, and QA Lead roles established for the next semester's tea

