# Dr. AMBEDKAR INSTITUTE OF TECHNOLOGY



Estd.1980 (An Autonomous Institute Affiliated to Visvesvaraya Technological University, Belagavi, Accredited by NAAC, with ‘A+’ Grade)

BDA Outer Ring Road, Mallathalli, Bengaluru – 560056



### DEPARTMENT OF CIVIL ENGINEERING

A Project Report On

# “ Experimental study on jute-geosynthetic-reinforced bamboo-pile- supported embankment”

Submitted in partial fulfillment of the requirement for the award of the Degree of

## Bachelor of Engineering

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| --- | --- |
| **By** |  |
| **Name of students** | **USN** |
| CHETHAN KUMAR B | 1DA21CV022 |
| K V SUDEEP  MANJUNATH  POORVIKA | 1DA21CV035  1DA21CV044  1DA21CV091 |

### For the Academic year 2023-24

Under the Guidance of

### Dr. RAG

Assistant Professor,Department of Civil Engineering Dr.AIT, Bengaluru - 560056



Batch: 2021 - 2025

## Visvesvaraya Technological University

**JnanaSangama, Belagavi, Karnataka 590018**

**Dr. Ambedkar Institute of Technology**



**(An Autonomous Institute, Affiliated to Visvesvaraya Technological University, Belagavi,**

### Accredited by NAAC with A+ Grade)

**BDA Outer Ring Road, Mallathalli, Bengaluru-560056**

**DEPARTMENT OF CIVIL ENGINEERING**

**CERTIFICATE**

Certified that the major project work titled “**Experimental study on jute-geosynthetic-reinforced bamboo-pile-supported embankment**” carried out by bonafide students CHETHANKUMAR B - 1DA21CV022, K V SUDEEP- 1DA21CV035, MANJUNATH - 1DA21CV044, POORVIKA

- 1DA21CV091 of Dr. Ambedkar Institute of Technology, Bangalore, in partial fulfillment for the award of Degree in **BACHELOR OF ENGINEERING IN CIVIL ENGINEERING** of Dr. Ambedkar Institute of Technology during the year 2023-24. It is certified that all corrections/suggestions indicated during Internal Assessment have been incorporated in the report deposited in the department. The project report has been approved as it satisfies the academic requirements in respect of major project work prescribed for the said Degree.

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| --- | --- | --- |
| Signature of the Guide | Signature of the HOD | Signature of the Principal |
| **Viva-Voice Examination** |  |  |
| Name of the Examiners 1 |  | Signature with Date |
| 2. |  |  |

# Dr. AMBEDKAR INSTITUTE OF TECHNOLOGY



(An Autonomous Institute Affiliated to Visvesvaraya Technological University, Belagavi, Accredited by NAAC, with ‘A+’ Grade)

BDA Outer Ring Road, Mallathalli, Bengaluru – 560056



**Declaration**

We, **CHETHANKUMAR B** bearing USN 1DA21CV022, **K V SUDEEP** bearing USN 1DA21CV035,

**MANJUNATH** bearing USN 1DA21CV044, **POORVIKA VIJENDRA** bearing USN 1DA21CV091hereby declare that the project work titled **“Experimental study on jute-geosynthetic-reinforced bamboo-pile-supported embankment”** is independently carried out by us at Department of Civil Engineering, Dr. Ambedkar Institute of Technology, Bengaluru- 560056 under the guidance of **Dr. Radhika M Patel, Assistant Professor, Department of Civil Engineering, Dr. Ambedkar Institute of Technology.** The project work is carried out in partial fulfilment of the requirement for the award of degree of Bachelor of Engineering in Civil Engineering during the academic year 2023-2024.

Place: Bangalore Name and signature of students

Date: CHETHANKUMAR B -1DA2CV022

K V SUDEEP

MANJUNATH

POORVIKAVIJENDRA

## ACKNOWLEDGEMENT



Place: Date:

**ABSTRACT**



Traffic signal design at intersections is a critical aspect of traffic engineering, aimed at optimizing traffic flow and enhancing safety for all road users. This study reviews the principles, methodologies, and innovations in traffic signal design. Traditional approaches, such as fixed-time and actuated signals, are examined alongside adaptive signal control systems like SCATS and SCOOT, which adjust timings based on real-time data. Safety considerations, including red-light running countermeasures and pedestrian safety enhancements, are discussed. Innovations in intelligent transportation systems, green wave coordination, and multimodal signal control are highlighted. Case studies demonstrate the practical applications and benefits of optimized signal design in various urban and suburban settings. The review identifies current challenges, such as technological integration and environmental sustainability, and suggests future research directions to further improve intersection signal design. Through this comprehensive overview, the study underscores the importance of advanced traffic signal design in achieving efficient and safe inters

A literature review of signal design at intersections in traffic engineering involves examining various studies, reports, and guidelines to understand the principles, methodologies, and innovations that have been developed to optimize traffic flow and enhance safety. Below is a structured overview of key themes and findings in this area:

1. Introduction to Traffic Signal Design

Traffic signal design at intersections aims to manage traffic flow efficiently and safely. This involves determining signal timing, phases, and coordination to minimize delays and prevent accidents.

## 2. Principles of Signal Timing

2.1 Signal Phases and Cycles

- \*Signal Phases\*: Different movements (e.g., straight, left turn, right turn) are allocated specific phases.

- \*Cycle Length\*: Total time for a complete sequence of phases, affecting delay and queue lengths.

### 2.2 Fixed-Time vs. Actuated Signals

- \*Fixed-Time Signals\*: Preset timings regardless of traffic conditions.

- \*Actuated Signals\*: Adjust timings based on real-time traffic conditions, using sensors and detectors.

## 3. Methodologies for Signal Timing Optimization

### 3.1 Webster's Method

- Introduced by F.V. Webster in 1958, it provides a formula for calculating optimal cycle length based on traffic volumes and intersection geometry.

### 3.2 Traffic Simulation Models

- \*Software Tools\*: VISSIM, Synchro, and TRANSYT are commonly used for simulating traffic scenarios and optimizing signal timings.

### 3.3 Adaptive Signal Control

- Systems like SCATS (Sydney Coordinated Adaptive Traffic System) and SCOOT (Split Cycle Offset Optimization Technique) adjust signal timings dynamically based on real-time data.

## 4. Safety Considerations

### 4.1 Red-Light Running

- \*Countermeasures\*: Installation of red-light cameras and extending all-red phases to reduce accidents caused by red-light running.

### 4.2 Pedestrian Safety

- Incorporating pedestrian phases and signals, with considerations for crossing times and countdown timers.

### 4.3 Protected vs. Permissive Turns

- \*Protected Turns\*: Dedicated signal phases for turning movements to reduce conflicts.

- \*Permissive Turns\*: Allowing turns during specific phases, balancing safety and efficiency.

## 5. Innovations in Signal Design

### 5.1 Intelligent Transportation Systems (ITS)

- \*Connected Vehicles\*: Communicating with traffic signals to optimize signal timings and enhance safety.

- \*Smart Traffic Lights\*: Using AI and machine learning to predict traffic patterns and adjust signals.

### 5.2 Green Wave Systems

- Coordinating signals along a corridor to provide continuous green lights for platoons of vehicles, reducing stops and emissions.

### 5.3 Multimodal Signal Control

- Integrating signals for vehicles, pedestrians, cyclists, and public transit to create a more holistic approach to intersection management.

## 6. Case Studies and Practical Applications

### 6.1 Urban Intersections

- Studies showing the impact of signal optimization in cities, such as reduced delays and improved safety metrics.

### 6.2 Suburban and Rural Intersections

- Approaches for lower-volume intersections, including the use of flashing beacons and simpler signal systems.

### 6.3 Global Perspectives

- Comparing signal design practices in different countries, highlighting cultural and regulatory differences.

## 7. Challenges and Future Directions

### 7.1 Technological Integration

- \*Data Collection\*: Enhancing real-time data collection for better signal adjustments.

- \*Cybersecurity\*: Protecting signal systems from cyber threats.

### 7.2 Policy and Regulation

- Adapting regulations to support innovative signal design and ensuring interoperability between systems.

### 7.3 Environmental Considerations

- Designing signals to reduce emissions and support sustainable transportation goals.

## 8. Conclusion

Effective signal design at intersections is critical for optimizing traffic flow and enhancing safety. Ongoing research and technological advancements continue to refine methodologies, leading to smarter and more adaptive traffic management solutions.

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This literature review provides a comprehensive overview of the current state of signal design at intersections in traffic engineering. It highlights the principles, methodologies, innovations, and challenges faced in optimizing traffic signal operations. For a detailed examination, each of these topics can be further explored through specific research papers, guidelines, and case studies.

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**TABLE OF CONTENTS**



**LIST OF TABLES**

