AMBALIKA INSTITUTE OF MANAGEMENT & TECHNOLOGY

PRAYOG

Theory into Practice

TECHNICAL MAGAZINE -2026

PUBLISHED BY:

DEPARTMENT OF CIVIL ENGINEERING

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WHY “PRAYOG” WORKS PERFECTLY

Academic + Practical Meaning

The word PRAYOG literally means *experiment, application, or practice*. In engineering education—especially in Civil Engineering—learning is incomplete without applying theoretical concepts to real-world problems.

PRAYOG symbolizes the transition from classroom knowledge to laboratory work, site execution, design implementation, and problem-solving, which is the core objective of engineering education.

Strong Indian Identity

PRAYOG is deeply rooted in the Indian academic and scientific tradition, where experimentation, observation, and practical validation have always been central to the learning process. The use of an Indian-origin name gives the magazine a distinct cultural identity and aligns it closely with Indian educational values that emphasize learning by doing. It also creates a strong sense of ownership and originality, making the publication uniquely representative of indigenous academic thought. Moreover, the name reflects the spirit of **Atmanirbhar Bharat** by promoting self-reliance, innovation, and indigenous knowledge systems in technical and engineering education.

Reflects Application of Theory

Civil Engineering is not limited to formulas and drawings—it involves design execution, material behavior, site management, safety practices, and sustainability.

The title PRAYOG clearly communicates that the magazine focuses on:

- Case studies
- Practical challenges
- Site experiences
- Innovative solutions
- Industry-based learning

The tagline *"Theory into Practice"* conveys some philosophies

Ideal for Engineering Education

Engineering students learn best when they understand how theory works in real conditions. PRAYOG encourages: Experimental thinking, Hands-on learning, Innovation and research, Analytical and practical skills

It motivates students to move beyond textbooks and engage in experimentation, observation, and application, which are essential qualities of a successful engineer.

Bridges Academia and Industry

PRAYOG serves as a platform connecting students, faculty, and alumni, where students share practical learning, faculty guide through theory and research and alumni contribute industry experience. This makes the magazine relevant, dynamic, and industry-oriented.

Timeless and Scalable Name

Unlike trendy names, PRAYOG is timeless. It can evolve with future editions, new technologies, and changing industry demands while maintaining its core identity.The name remains relevant for technical articles, research, innovation, and real-life engineering applications.

Magazine Credits

Dr. Shivangi

Mr. Aman

Ms. Akanksha

ABOUT

Ambalika Institute of Management and Technology

Welcome to Ambalika Institute of Management and Technology, a premier institution committed to shaping the next generation of leaders, innovators, and problem-solvers in the fields of engineering and management. These qualities make AIMT one of the best engineering colleges in Lucknow. With a strong emphasis on academic excellence, cutting-edge research, and experiential learning, we provide a dynamic environment where students gain the skills and knowledge needed to excel in today's fast-paced, ever-evolving global industries. Our distinguished faculty, state-of-the-art facilities, and strong industry collaborations ensure that every student receives a well-rounded education, preparing them for success in their careers and beyond. Join us at AIMT—where innovation meets opportunity and ideas turn into impact.

Chairman's Message

Mr. Ambika Misra

It gives me immense pleasure to introduce our Technical Magazine "PRAYOG", published by the Department of Civil Engineering. The magazine will be published bi-annually. Our students are highly innovative and always eager to learn new concepts. Apart from teaching, our faculty members are deeply engaged in research work, and both faculty and students regularly present their research findings at various academic conferences. This initiative will strengthen the documentation and research culture of the institute. One of our greatest strengths is our highly qualified and dedicated faculty members and staff. I congratulate the editorial team, faculty, staff members, and students for their valuable contributions to the maiden issue of "PRAYOG". This technical magazine is an effort to acquaint its readers with the latest technological developments in the field of Civil Engineering.

Director General's Message

Dr. Syed Qamar Abbas

It is a pleasure to note the publication of PRAYOG – Theory into Practice, the Technical Magazine of the Department of Civil Engineering. This initiative reflects the institute's commitment to promoting quality technical education through experiential learning, innovation, and industry relevance.

The magazine provides an effective platform for students, faculty, and alumni to document applied learning, research insights, and professional practices, thereby strengthening the academic ecosystem. Such efforts contribute significantly to outcome-based education and the holistic development of future engineers.

I congratulate the Department of Civil Engineering and the editorial team for their sincere efforts and wish them continued success in nurturing technically competent and socially responsible professionals.

Director's Message

Dr. Ashutosh Dwivedi

I feel honoured and grateful to introduce the next edition of our Technical Magazine **"PRAYOG"**, published by the **Department of Civil Engineering**. This magazine aims to enhance awareness and promote greater interaction in the field of Civil Engineering. It will not only serve the objective of creating technical responsiveness but also provide a platform for new ideas, innovation, progress, and creativity. I sincerely hope that this initiative will encourage faculty members, students, and researchers to contribute regularly, thereby making our magazine a continued success. I am confident that **"PRAYOG"** will reach greater heights in the years to come and significantly support academic growth, faculty development for **NBA accreditation**, and advancements in our laboratories and research centres.

Additional Director Message

Dr. Shweta Mishra

I am pleased to note the publication of PRAYOG – Theory into Practice, the Technical Magazine of the Department of Civil Engineering. This initiative reflects the department's focus on experiential learning, academic rigor, and continuous improvement in technical education.

The magazine provides a valuable platform for students, faculty, and alumni to share applied knowledge, research contributions, and industry insights. Such efforts enhance professional competence and strengthen the integration of theory with practice.

I appreciate the efforts of the Department of Civil Engineering and the editorial team and wish them continued success in their academic initiatives

HOD's Message

Dr. Shivangi

(B. Tech, M. Tech-Structure Engineering, Ph. D)

Head, Department of Civil Engineering
Ambalika Institute of Management & Technology

It gives me great pleasure to present **PRAYOG – Theory into Practice**, the Technical Magazine of the Department of Civil Engineering. This publication reflects our department's commitment to developing engineers who are academically strong and capable of applying theoretical knowledge to real-world engineering challenges.

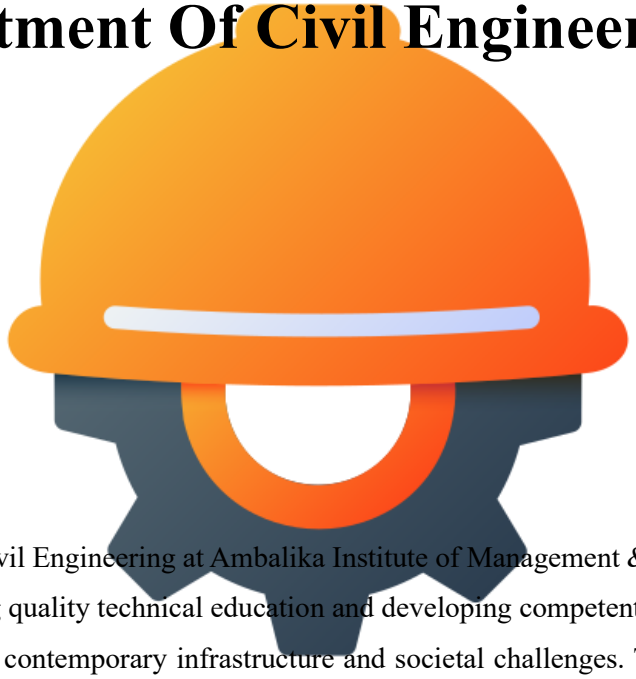
Civil Engineering plays a vital role in infrastructure development and societal progress. Through PRAYOG, students are encouraged to explore, experiment, and translate concepts into practical solutions that are safe, sustainable, innovative, and socially responsible. The magazine serves as a platform for students, faculty, and alumni to share technical knowledge, research insights, and industry experience, thereby strengthening academia–industry collaboration.

Experiential learning remains central to our academic approach. Through laboratory work, field exposure, research activities, and industry interaction, the department strives to prepare students to meet evolving professional demands. I appreciate the efforts of the editorial team and all contributors to this edition and am confident that PRAYOG will inspire innovation, critical thinking, and excellence in Civil Engineering.

I extend my best wishes to our students for a successful engineering journey and meaningful contributions to sustainable infrastructure and nation building.

ABOUT

Department Of Civil Engineering



The Department of Civil Engineering at Ambalika Institute of Management & Technology is dedicated to imparting quality technical education and developing competent civil engineers capable of addressing contemporary infrastructure and societal challenges. The department focuses on outcome-based education with an emphasis on strong fundamentals, practical application, and professional ethics.

The department offers comprehensive learning in core areas such as Structural Engineering, Geotechnical Engineering, Transportation Engineering, Environmental Engineering, and Construction Planning and Management, supported by qualified faculty members and well-equipped laboratories. Teaching–learning processes are designed to integrate classroom instruction with laboratory experiments, field exposure, site visits, internships, and project-based learning.

To bridge the gap between academia and industry, the department actively promotes industry interaction, alumni engagement, research activities, and experiential learning. Students are encouraged to participate in technical workshops, seminars, competitions, and innovation-driven projects to enhance technical competence, problem-solving ability, and employability.

The department also emphasizes sustainable development, safety, and social responsibility, aligning engineering solutions with environmental and societal needs. Through continuous improvement practices and stakeholder involvement, the Department of Civil Engineering at Ambalika Institute of Management & Technology strives to produce industry-ready, ethically responsible, and lifelong learners who contribute effectively to nation building.

DEPARTMENTAL VISION

To create high quality civil engineers with knowledge par excellence who may contribute in nation building with highest moral and ethical values as true citizens of a civilized society.

DEPARTMENTAL MISSION

- To adapt teaching and learning process that gives student power to think and to analyse.
- To impart practical knowledge by means of lab exposure and industrial interaction.
- To conduct co-curricular activities for updation of technological advancement
- To impart moral and ethical values by means of various program

Programme Educational Objective (PEO's)

PEO 1 – Professional Competence

Graduates will apply fundamental principles of Civil Engineering to analyze, design, and execute engineering projects using appropriate tools and techniques in professional practice.

PEO 2 – Industry Readiness and Lifelong Learning

Graduates will demonstrate readiness for employment, higher education, and professional certifications by engaging in continuous learning to adapt to emerging technologies and industry requirements.

PEO 3 – Ethical and Social Responsibility

Graduates will practice engineering with ethical responsibility, safety awareness, and consideration of environmental sustainability and societal needs.

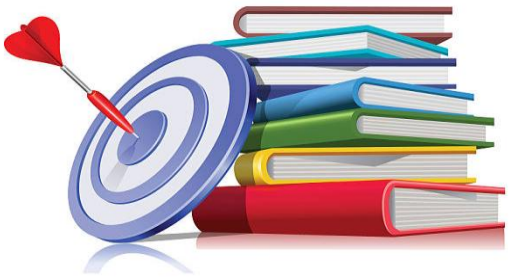
PEO 4 – Problem Solving and Innovation

Graduates will identify, analyze, and solve complex engineering problems using critical thinking, creativity, and research-oriented approaches.

PEO 5 – Professional Skills and Teamwork

Graduates will communicate effectively, work efficiently in multidisciplinary teams, and demonstrate leadership qualities in professional and organizational environments.

Programme Objectives(POs)



PO1 – Engineering Knowledge

Apply knowledge of mathematics, science, engineering fundamentals, and Civil Engineering principles to solve complex engineering problems.

PO2 – Problem Analysis

Identify, formulate, review research literature, and analyze complex Civil Engineering problems to reach substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3 – Design/Development of Solutions

Design solutions for complex Civil Engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental aspects.

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 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 Civil Engineering activities with an understanding of limitations.

PO6 – The Engineer and Society

Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to professional Civil Engineering practice.

PO7 – Environment and Sustainability

Understand the impact of professional Civil Engineering solutions in societal and environmental contexts and demonstrate knowledge of sustainable development.

PO8 – Ethics

Apply ethical principles and commit to professional ethics, responsibilities, and norms of Civil Engineering practice.

PO9 – Individual and Team Work

Function effectively as an individual, and as a member or leader in diverse and multidisciplinary teams.

PO10 – Communication

Communicate effectively on complex engineering activities with the engineering community and society at large, such as being able to comprehend and write effective reports, design documentation, make effective presentations, and give and receive clear instructions.

PO11 – Project Management and Finance

Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects in multidisciplinary 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.

FACULTIES WISDOM

WISDOM

Enhanced Durability of Hybrid Fiber-Reinforced Concrete in Acidic and Sulfated Environments

(SCI INDEXED: Journal of Structural Design and Construction Practice)

This study investigates the performance of hybrid fiber-reinforced concrete (HFRC) incorporating polypropylene and glass fibers under aggressive chemical environments. Concrete specimens of M30 grade were subjected to curing in sulfuric acid (H_2SO_4) and magnesium sulfate ($MgSO_4$) solutions, evaluating short- and long-term mechanical properties. HFRC demonstrated enhanced durability with reduced mass loss and superior resistance to acid-induced degradation compared to conventional concrete. Compressive strength, rebound hammer tests, and microstructural analyses using SEM and EDX highlighted the role of hybrid fibers in mitigating crack propagation, improving microstructure, and reducing porosity. Results confirmed that HFRC retained higher strength and mass stability under extended exposure to acidic and sulfate-rich conditions. This research underscores HFRC's potential for sustainable construction in chemically aggressive environments, ensuring enhanced durability and reduced maintenance costs for infrastructure applications. The study addresses gaps in chemical resistance, hybrid fiber synergy, varied curing conditions, and long-term durability, demonstrating hybrid fiber-reinforced concrete's superior performance in aggressive environments through advanced experimental analysis.

Dr. Shivangi
Civil Engineering

Optimizing Coated PZT Sensors for Structural Health Monitoring in Hybrid Fibre-Reinforced Concrete Beams

(SCI INDEXED: Iranian Journal of Science and Technology, Transactions of Civil Engineering)

This study investigates the integration of coated piezoelectric (PZT) sensors in hybrid fibre-reinforced concrete (HFRC) beams to assess their potential in structural health monitoring (SHM). The research focuses on the role of various sensor coatings—nitrocellulose-based nail polish (NP), quick-set epoxy resin (RE), and epoxy putty (EG)—and explores the impact of coating thicknesses on sensor performance. The HFRC beams, reinforced with glass and polypropylene fibres, were embedded with coated and uncoated sensors and evaluated for their impedance properties across curing periods and under mechanical stress. Results indicate that NP and RE coatings provided superior electrical insulation and signal stability compared to EG, which exhibited higher conductance and reduced sensitivity. Thicker coatings enhanced durability but diminished the ability to detect fine structural changes. Optimal performance was achieved with 2–2.5 mm coatings, offering a balance between sensitivity and sensor protection. Experimental analyses revealed distinct trends in frequency-conductance behavior before and after damage, validating the efficacy of PZT sensors in identifying fractures. The findings underscore the potential of integrating advanced sensor technology with optimized coatings in HFRC beams for real-time damage detection and enhanced durability. This work contributes to advancing SHM systems, promoting safer and longer-lasting concrete infrastructure.

Dr. Shivangi
Civil Engineering

Structural Health Monitoring of Heavy Infrastructure using Machine Learning

Modern economies are supported by substantial infrastructure, such as bridges, dams, tunnels, and offshore platforms. Because structural failures in these systems can result in significant human, environmental, and financial losses, it is essential to ensure their safety and resilience. When it comes to managing such structures' scale, complexity, and dynamic loading conditions, conventional inspection and monitoring methods frequently fall short. Artificial Intelligence (AI) and Machine Learning (ML) have emerged as transformative tools for enhancing Structural Health Monitoring (SHM). Vibration-based monitoring, crack detection, anomaly detection, and predictive maintenance are the primary focus of this review of cutting-edge Al and ML methods utilized in SHM of
heavy infrastructure. Long-span Bridge and dam case studies, as well as the uses of hybrid Al models, neural networks, and deep learning, are discussed. The findings suggest that Al-enabled SHM significantly improves damages detection accuracy, enables real-time monitoring, and reduces maintenance costs. Future directions are suggested in the direction of digital twin integration and IoT-based Al frameworks, in addition to highlighting difficulties like dataset limitations, model generalization, and large-scale deployment.

Mr. Aman Saini
M.Tech- Civil Engineering

STUDENTS CONTRIBUTION

STUDY ON FIBRE REINFORCED CONCRETE (FRC) STRUCTURES

Concrete is the most widely used construction material globally, but its brittle nature and low tensile strength present significant limitations in modern structural applications. Fiber Reinforced Concrete (FRC) has emerged as an effective solution to overcome these drawbacks. FRC is a composite material consisting of concrete and randomly distributed fibers such as steel, glass, synthetic, or natural fibers, which significantly enhance its mechanical performance. This project presents a comprehensive study on the behavior, properties, applications, and performance of FRC. The study includes a literature review of previous research, detailed analysis of fiber types, mechanical behavior, mix design considerations, and laboratory experiments involving compressive, tensile, and flexural strength testing. The results show that FRC exhibits improved crack control, ductility, impact resistance, and post-cracking performance compared to normal concrete. The study concludes that FRC is a viable and advanced material for various structural and infrastructural applications including pavements, industrial floors, earthquake-resistant structures, and precast components.

By : Aryan Jaiswal (B.TECH-CIVIL 3rd YEAR)

DESIGNING OF G+1 RESIDENTIAL BUILDING

This project presents the comprehensive planning, analysis, and structural design of a G+1 residential building intended for a medium-sized family. The work includes detailed architectural planning based on building by-laws, functional requirements, orientation, ventilation, and space utilization. The proposed structure consists of essential residential components such as bedrooms, living areas, kitchen, dining space, toilets, staircase, balcony, and an open terrace. Architectural drawings including floor plans, elevation, and sectional views are prepared to ensure proper spatial arrangement and aesthetic appearance. Structural design is carried out using Limit State Method as per IS 456:2000. Load calculations are performed using IS 875 (Part 1 & 2) to determine dead and live loads acting on slabs, beams, columns, and footings. Each structural component is designed to ensure adequate strength, stability, and serviceability. Reinforcement detailing is prepared following codal specifications. The footing is designed based on soil bearing capacity to ensure safe load transfer to the ground. An approximate estimation and cost analysis is also included to assess material requirements and project feasibility. This study provides hands-on experience in

architectural planning, structural analysis, and design principles essential for real-world civil engineering practice

By: Ankit Rai& Rajneesh Singh Dhangar (B.TECH-CIVIL 3rd YEAR)

DESIGING OF SOIL STABILISATION FOR PAVEMENT

Soil stabilization is used to improve weak subgrade soil for pavement construction. By using stabilizing agents such as lime, cement, or fly ash, the strength and durability of soil are increased while reducing plasticity and swelling. Properly stabilized soil enhances pavement performance and extends its service life. This method provides an economical and effective solution for road construction.

By: Arvind Maurya And Mohammad Salman (B.TECH-CIVIL 3rd YEAR)

EARTH QUAKE RESISTANCE BUILDING DESIGN

This project focuses on the comprehensive planning, analysis, and earthquake-resistant design of a G+1 (Ground + One Floor) residential building, developed in accordance with IS 1893:2016 for seismic analysis and IS 13920:2016 for ductile detailing of reinforced concrete structures. The primary objective of the project is to ensure that the building can safely withstand seismic forces while maintaining structural stability, durability, and occupant safety. In addition to seismic loads, dead loads and live loads are calculated as per IS 875 (Part 1 & Part 2), ensuring accurate load assessment and realistic structural modeling. This project aims to bridge theoretical seismic design concepts with practical application. It enhances student understanding of structural load paths, ductile behavior, seismic zoning, base shear calculation, and the integration of architectural and structural design. Overall, the study demonstrates how proper engineering practices, code compliance, and efficient planning can significantly increase the safety, resilience, and performance of residential buildings in earthquake-prone regions.

By: Shivam Maurya And Nishant Kumar (B.TECH-CIVIL 3rd YEAR)

3D DESIGN OF G+3 STORY RCC STRUCTURE USING REVIT

The rapid advancement of Building Information Modeling (BIM) has significantly transformed the design and visualization of reinforced cement concrete (RCC) structures. This project focuses on the 3D design and modeling of a G+3 storey RCC building using Autodesk Revit. The primary objective is to create an accurate and detailed structural model

incorporating architectural and structural components such as columns, beams, slabs, staircases, and foundations. Revit enables efficient planning, coordination, and modification through parametric modeling and real-time updates.

The structural elements are designed based on standard codal provisions and typical loading conditions to ensure safety and stability. The 3D model helps in better understanding of structural behavior, reduction of design errors, and improved collaboration among engineers. This study highlights the effectiveness of Revit in enhancing productivity, visualization, and documentation in modern construction practices. The project demonstrates that BIM-based 3D modeling is a reliable and time-saving approach for designing multi-storey RCC structures.

By: Ayush Yadav, Sarthak Yadav, Shivank Srivastava(B.TECH-CIVIL 3rd YEAR)

Design and Structural Analysis of an Elevated Circular Water Tank Using STAAD. Pro

Elevated water tanks are indispensable components of municipal and rural water supply systems, ensuring continuous availability of water while maintaining adequate pressure for gravity-based distribution. Due to their exposure to complex loading conditions such as hydrostatic pressure, wind forces, and self-weight, their structural design demands careful analysis and strict code compliance. This study presents the design and structural analysis of an elevated circular reinforced concrete water tank using STAAD.Pro. The tank is designed for a storage capacity of 300 m^3, considering domestic demand and fire-fighting requirements. A three-dimensional finite element model incorporating the tank shell, ring beams, staging columns, and bracing system is developed. Various load combinations are applied in accordance with Indian Standard codes, and structural responses such as stresses, internal forces, and displace-ments are evaluated. The results indicate that software-based analysis pro-vides a realistic representation of load transfer mechanisms and identifies critical stress zones more effectively than conventional approaches. The study confirms that the proposed de-sign satisfies both safety and service-ability criteria while

By: Ajaj Ahmed, Sunny Patel, Rishu Gautam (B. TECH-CIVIL 4th YEAR)

An Enhanced Experimental Investigation of the Mechanical Behaviour of Glass Fiber Reinforced Concrete (GFRC)

Glass Fiber Reinforced Concrete (GFRC) is primarily employed to overcome the poor tensile performance of conventional concrete. Ordinary concrete tends to crack and fail suddenly due to its brittle nature, and the inclusion of glass fibers helps in controlling this behavior by improving its resistance to tensile stresses. In the present work, M25 grade concrete was mixed with different amounts of alkali-resistant glass fibres, starting from 0% and going up to 1%. The purpose of adding fibres was to see how the basic strength properties, such as compressive, tensile, and flexural strength, change with fibre inclusion. During testing, it was observed that fibres helped in controlling cracks after loading and allowed the concrete to carry load even after initial cracking. The best overall performance was noticed when the fibre content was kept between 0.33% and 0.67%. When a higher fibre percentage was used, the concrete became difficult to handle and the fibres were not distributed properly, which finally reduced the strength. Based on the results, GFRC can be considered suitable for construction works where better toughness, ductility, and durability are required.

By: Kaushal Yadav, Aakash Dubey, Akash Sharma, Sourabh Verma

Design and Performance Study of Flexible Pavement with Coconut Shell Aggregate and Coir Fibre Reinforced Cement-Treated Base

The depletion of natural aggregates and increasing construction costs have encouraged the exploration of alternative materials for road construction. This project investigates the combined use of coconut shell (CS) as a partial replacement for coarse aggregate and coconut coir fibre (CF) as reinforcement in a cement-treated base (CTB) for flexible pavements. Laboratory tests were conducted to determine material characteristics and performance of different mixes: a control concrete mix (M20 grade), mixes with coconut shells as aggregate replacement, and mixes with coconut shells reinforced with coir fibre. Parameters studied included compressive strength, split tensile strength, and flexural strength. The study revealed that up to 24% replacement of coarse aggregate with coconut shells is feasible without major strength loss. Furthermore, incorporating 4% coir fibre (by weight of cement) significantly improved tensile and flexural strengths, enhanced ductility, and provided superior post-cracking behavior. Based on the optimized mix (26% CS + 5% CF), a flexible pavement crust was designed using IRC: 37-2018 guidelines. The design demonstrated structural adequacy for medium-traffic roads and highlighted the sustainability benefits of utilizing agricultural waste products in civil engineering.

STUDENTS PROJECT

Sufiyan, Nitin, Rahul
Under the Guidance of
Dr. Shivangi

OUR PATRONS

Chairman's Profile

Mr. Ambika Misra

Director General's Profile

Dr. Syed Qamar Abbas

Director General's Profile

Dr. Syed Qamar Abbas

Additional Director

Dr. Shweta Mishra


THANK
YOU