K.S.R. COLLEGE OF ENGINEERING

CIVIL ENGINEERING - LATTICE

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K.S.R. COLLEGE OF ENGINEERING

An Autonomous Institution

(Approved by AICTE, Affiliated to Anna University, Accredited by NAAC A++)

K.S.R. Kalvi Nagar, Tiruchengode – 637 215, Namakkal District, Tamil Nadu

DEPARTMENT OF CIVIL ENGINEERING

LATTICE TECHNICAL MAGAZINE

2024 - 2025

With the Blessings of our Beloved Founder

Lion Dr. K. S. Rangasamy MJF

Founder, KSREI.

"Gone from our sight,
Never from our hearts —
Your vision lives on in every student's dream."

CHAIRMAN'S MESSAGE

SHRI.R. SRINIVASAN, CHAIRMAN
K.S.R EDUCATIONAL INSTITUTIONS

As we stand on the brink of new beginnings and boundless possibilities, I am filled with an immense sense of pride and optimism about what we can achieve together at KSR Educational Institutions. Our founder, Dr. K S Rangasamy, laid a strong foundation rooted in the belief that education is the most powerful tool to transform lives. Carrying forward his legacy, we remain committed to not just educating but empowering young minds to make a meaningful impact in the world. In today's fast-paced, technology-driven society, the challenges are as dynamic as the opportunities are great. It is imperative for education to transcend traditional learning and encompass the development of holistic, innovative, and critical thinking skills. At KSR, we strive to equip you, our students, with the capabilities to not only adapt to changes but to drive them. We are dedicated to nurturing a generation of leaders, innovators, and thinkers who are ready to take on global challenges with local sensibilities. Making an Impact is not just a phrase—it's our mission. It's about inspiring each one of you to pursue your passions with determination and a sense of responsibility towards the betterment of society. We encourage you to dream big, push boundaries, and question the status quo. Our campus is a melting pot of ideas where your creativity and ambitions are nurtured, allowing you to flourish in ways you never imagined.

DEAN'S MESSAGE

Dr. M. VENKATESAN,
DEAN – KSRCE

As the Dean of KSRCE, I actively strive to empower students to become exemplary academicians, researchers, and policy makers. I foster a diverse and inclusive work environment for my colleagues and support them in securing valuable collaborations with national and international agencies for the advancement of our Institution. Emphasizing a collaborative and integrated approach to teaching, learning, and research, we aim to nurture innovation and excellence in all academic pursuits.

I am proud of the Civil Engineering Department's initiative in publishing this magazine, which reflects the department's commitment to knowledge sharing, creative expression, and academic vibrancy. Such platforms serve as a testimony to the talents of our students and faculty, and I firmly believe they will inspire continued growth and recognition. With unity and vision, the KSRCE team will continue to overcome challenges and deliver impactful engineering solutions for the betterment of society.

PRINCIPAL'S MESSAGE

Dr. P. MEENAKSHI DEVI
Principal, KSRCE

It's a moment of great pride and joy to unveil the Department Magazine for the academic year **2024–2025!**

KSRCE today is more than just an institution it's a vibrant family, where educators, students, parents, alumni, and management come together with one shared vision: to grow, inspire, and achieve.

We believe in nurturing not just bright minds, but well rounded individual's industry ready, globally competent, and socially responsible citizens of tomorrow.

A big shoutout to Prof. Dr. S. Senthilkumar, HoD/Civil, and his dynamic team, whose creativity, effort, and dedication have brought this magazine to life. Kudos to their passion and teamwork!

HEAD'S MESSAGE

Dr. S. SENTHILKUMAR
Professor & Head, Civil, KSRCE

It gives us immense joy to present LATTICE 2025 a magazine crafted with passion and purpose, built as a stage for ideas, innovations, and inspiration.

Creativity begins with a dream a desire to express the talent within. That very dream powered our journey and brought LATTICE 2025 to life. We're deeply grateful to everyone who made this dream possible.

First, a heartfelt thank you to our visionary Chairman, whose constant support gave us the platform to shine. A special thanks to our motivating Principal, whose encouragement turned ideas into action.

This magazine wouldn't be what it is without our amazing editorial squad, who believed, collaborated, and created every page with dedication. To the student and faculty coordinators your enthusiasm and support were unmatched.

Thanks to all faculty members who pitched in with proofing and polishing our work.

VISION OF THE INSTITUTITON

To become a globally renowned institution in Engineering and Management, committed to providing holistic education that fosters research, innovation and sustainable development.

MISSION OF THE INSTITUTITON

Deliver value-based quality education through modern pedagogy and experiential learning.

Enrich Engineering and Managerial Skills through cutting-edge laboratories to meet evolving global demands.

Empower research and innovation by integrating collaboration, social responsibility and commitment to sustainable development.

VISION OF THE DEPARTMENT

To develop premier Civil Engineers through education, fostering innovation and research to create a sustainable environment.

MISSION OF THE DEPARTMENT

Provide value-based education using advanced teaching methods and experiential learning.

Prepare engineers for global challenges through state-of-the-art labs and advanced skills.

Promote research, foster innovation, and strengthen industry collaboration, addressing infrastructure challenges through sustainable solutions.

PROGRAMME EDUCATIONAL OBJECTIVES

PEO1	Core Competency: Apply comprehensive civil engineering knowledge to analyze, design, and solve real-world problems.
PEO2	Professionalism: Apply ethical principles, communicate effectively, and collaborate in multidisciplinary teams.
PEO3	Career Development: Attain professional success, embrace lifelong learning, and develop leadership skills to make a positive impact in their fields.

PROGRAMME OUTCOMES

PO1	Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
PO2	Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development.
PO3	Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/ components/ processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required.
PO4	Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions.
PO5	Engineering Tool Usage: Create, select, and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems.
PO6	The Engineer and the World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment.

PO7	Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion: adhere to national & international laws.
PO8	Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse / multi-disciplinary teams.
PO9	Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language and learning differences.
PO10	Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member in a team, and to manage projects and in multidisciplinary Environments.
PO11	Life-long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES

PSO1	Structural Analysis and Design: Plan and design structural systems that ensure safety, sustainability, and compliance with relevant codes and standards.
PSO2	Construction Planning and Management: Develop sustainable construction materials from waste, ensuring environmentally responsible waste management and complying with relevant regulations and standards.

ABOUT THE DEPARTMENT

Established in 2002, the Department aims to advance education quality, achieve academic excellence, and promote research and consultancy to benefit the community and industry. With advanced laboratories, skilled faculty, modern equipment, and professional software, the department offers B.E. Civil Engineering, M.E. - Structural Engineering, M.E. - Construction Engineering. The department features well-equipped laboratories designed to meet the requirements of both undergraduate and postgraduate programs, in addition to providing consultancy and material testing services.

Recognized as an authorized research centre by Anna University, Chennai, the department facilitates Ph.D. programs and advanced research, with 36 Ph.D. scholars successfully graduated.

Most of our alumni are serving in reputed government organizations, prestigious private sectors both in India and abroad, and leading academic and research institutions. The department exemplifies academic excellence and a commitment to innovation through active consultancy and research projects. Our initiatives support industry collaboration and student development in real-time problem-solving and product innovation. Notable clients include the District Rural Development Agency (DRDA), Public Works Department, Municipalities, Southern Railway, and various private and international organizations. We are dedicated to fostering societal and industrial progress through impactful research, global engagement, and collaborative development.

K.S.R. COLLEGE OF ENGINEERING

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LATTICE - 2025

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Design and Construction of Flexible Pavements Materials and Methods

Karankumar P, Gokul S, Jawaharnath T, III Year Civil, KSRCE

Flexible pavements, widely used in highways and urban roads, consist of multiple layers that distribute traffic loads. This abstract details the design considerations for flexible pavements using the California Bearing Ratio (CBR) and other methods. The role of bituminous materials—bitumen, asphalt concrete, and modified binders—is discussed in terms of stability, workability, and durability. Construction techniques including proper compaction, layer-wise quality control, and temperature regulation are emphasized. With innovations in warm mix asphalt and cold in-place recycling, flexible pavement construction is becoming more efficient and environmentally friendly.

Earthquake-Resistant Design of Reinforced Concrete Structures

Tamilarasan M, Aswin S, III Year Civil, KSRCE

Seismic activity continues to pose a significant threat to infrastructure in many regions worldwide. The field of structural engineering has responded with the development of earthquake-resistant design methodologies that prioritize life safety and structural integrity. This abstract explores key concepts such as ductility, energy dissipation, and base isolation systems. Advanced design codes like IS 1893 and IS 13920 offer structured guidance for implementing these measures. The integration of dynamic analysis, performance-based design, and retrofitting of existing structures has revolutionized our ability to construct buildings that can withstand moderate to severe earthquakes with minimal damage.

Finite Element Modeling and Simulation in Structural Design

Swati A, Saritha V, Ragavasri S S, IV Year Civil, KSRCE

Finite Element Method (FEM) has become a critical tool for analyzing complex structural behavior under varied loading conditions. Through discretization of structural components into elements, FEM allows for detailed stress-strain analysis, deformation patterns, and failure modes. This abstract highlights its applications in designing irregular geometries, tall structures, and dynamic analysis of frames. With the support of software platforms like ANSYS, STAAD.Pro, and ABAQUS, structural engineers are empowered to predict responses with high precision, ensuring optimized and safe designs.

Structural Health Monitoring: Advancing Maintenance Strategies

Logajeeth P, Pradeep K V, IV Year Civil, KSRCE

The increasing age of infrastructure assets necessitates advanced monitoring techniques to ensure public safety and service continuity. Structural Health Monitoring (SHM) involves the integration of sensors, data acquisition systems, and analysis algorithms to detect structural anomalies in real-time. This abstract discusses key SHM technologies such as strain gauges, fiber optic sensors, and wireless monitoring systems. It also covers their implementation in bridges, heritage structures, and skyscrapers. SHM not only facilitates timely maintenance and damage detection but also aids in post-disaster assessment and lifecycle cost reduction.

Innovations in Precast and Modular Construction Techniques

Mohanapriya S, Laksitha M, Soundarya S, III Year Civil, KSRCE

Precast and modular construction methods are redefining traditional building practices by offering speed, quality, and cost-effectiveness. This abstract explores the structural engineering implications of using prefabricated elements—beams, slabs, columns, and wall panels—that are manufactured off-site and assembled on-site. Innovations in connection detailing, lifting mechanisms and joint behavior have significantly improved the performance and safety of such structures. As urban areas face space and time constraints, these techniques are becoming increasingly indispensable, especially for mass housing, hospitals, and educational buildings.

Role of Composite Materials in Structural Strengthening

Ilakkiya. S, Sandhiya. K, Sreenithi. B, II Year Civil, KSRCE

Composite materials, particularly fiber-reinforced polymers (FRPs), have emerged as effective solutions for strengthening and retrofitting structural elements. This abstract explores how these materials—lightweight yet extremely strong—are bonded externally to beams, columns, and slabs to improve load-carrying capacity and ductility. The use of carbon, glass, and aramid fibers is discussed in the context of structural rehabilitation and seismic retrofitting. The ease of application, minimal addition of self-weight, and corrosion resistance make FRPs a preferred choice in modern strengthening practices.

Advanced Wastewater Treatment Technologies for Sustainable Water Management

Divya Prakash S, Akilan M K, Kavin P, III Year Civil, KSRCE

With growing urbanization and industrialization, the treatment and reuse of wastewater have become vital to ensure water security. This abstract explores advanced treatment technologies such as membrane bioreactors (MBRs), sequencing batch reactors (SBRs), moving bed biofilm reactors (MBBRs), and advanced oxidation processes (AOPs). These methods offer superior pollutant removal efficiency and compact plant design. The use of treated wastewater for landscaping, agriculture, and industrial processes also reduces dependency on freshwater sources, supporting a circular water economy. The integration of energy-efficient and low-carbon approaches further enhances the sustainability of wastewater management systems.

Air Pollution Monitoring and Control in Urban Environments

Madhumitha M, Kabithisha M, Rashniya S, I Year Civil, KSRCE

Air quality in urban areas is deteriorating due to vehicular emissions, industrial discharges, and construction activities. This abstract delves into the mechanisms of air pollutant dispersion, effects on human health and climate, and advanced monitoring techniques such as real-time sensors, remote sensing, and satellite imagery. Pollution control strategies including vehicular emission norms, green buffers, industrial stack filters, and dust suppression systems are discussed. The deployment of low-cost sensor networks and the integration of data analytics enable proactive management of urban air quality, making cities healthier and more livable.

Role of Environmental Impact Assessment (EIA) in Infrastructure Development

Roshan Karthik J, Hariprasanth N, IV Year Civil, KSRCE

Environmental Impact Assessment (EIA) is a critical regulatory tool to evaluate the potential environmental consequences of proposed projects before implementation. This abstract outlines the procedural framework of EIA, including screening, scoping, impact analysis, public consultation, and environmental management plans. The importance of EIA in minimizing ecological damage, promoting public participation, and ensuring sustainable development is emphasized. Case examples from highway, mining, and urban development projects illustrate how EIA contributes to environmentally responsible decision-making.

Intelligent Transportation Systems (ITS): Enhancing Traffic Efficiency and Safety

Darun Karthick K S, Gowtham P, Mahan M, III Year Civil, KSRCE

Intelligent Transportation Systems (ITS) integrate advanced technologies such as sensors, cameras, communication networks, and data analytics to improve traffic flow, safety, and travel experience. This abstract explores the implementation of ITS in urban traffic management, including real-time traffic monitoring, adaptive traffic signal control, electronic toll collection, and vehicle-to-infrastructure (V2I) communication. The benefits of ITS include reduced congestion, lower emissions, improved public transport reliability, and enhanced emergency response. The convergence of ITS with artificial intelligence and Internet of Things (IoT) technologies is paving the way for future-ready, autonomous mobility systems.

Public Transportation Systems: Design, Operation, and Modernization

Janarthanan. R, Mugilan. R, Guruprasath. A, II Year Civil, KSRCE

Public transport is vital for reducing private vehicle dependency, urban congestion, and pollution. This abstract explores the design and operational aspects of buses, metro rails, suburban trains, and modern transit systems like monorails and BRT. Topics include route planning, fleet management, passenger flow optimization, and fare integration. The role of smart ticketing, GPS tracking, and user-centric services in increasing ridership and system efficiency is emphasized. A well-planned public transport system is not only an economic necessity but also a catalyst for inclusive urban development.

Highway Geometric Design for Efficiency and Safety

Dhanush K, Monish S, Saravanakumar V, IV Year Civil, KSRCE

Highway geometric design is the foundational discipline within transportation engineering that determines the physical layout of roads, ensuring that they operate safely, efficiently, and comfortably for all road users. It encompasses the horizontal and vertical alignment, cross-section elements, sight distances, intersection layout, and roadway appurtenances—each meticulously designed to accommodate prevailing traffic volumes, vehicle types, terrain, and environmental conditions. Innovative tools such as AutoCAD Civil 3D, OpenRoads, and HDM-4 allow for the simulation and optimization of design alternatives, integrating geometric design with traffic modeling and safety analysis. Geometric design standards, such as those from the Indian Roads Congress (IRC), AASHTO, and MoRTH, provide guidelines to ensure

consistency, reliability, and international benchmarking in road infrastructure development. Ultimately, well-executed highway geometric design leads to reduced travel time, lower accident rates, fuel efficiency, and increased driver comfort—fulfilling the dual goals of efficiency and safety in modern roadway engineering.

Total Station and Electronic Distance Measurement, Integrating Optics and Computing

Harihara Sudhan. J, Navaneethan. S, Rohith Sriram. J, II Year Civil, KSRCE

Total Station, an advanced surveying instrument, represents a significant evolution in geospatial technology by integrating the principles of optical angle measurement and electronic distance measurement (EDM) with onboard computing capabilities. This integration enables civil engineers, land surveyors, and geomatics professionals to perform precise topographic data collection, construction layout, and infrastructure monitoring with high accuracy, speed, and efficiency. At its core, a Total Station combines a theodolite for angular measurements and an EDM unit for distance measurements, all coordinated through a microprocessor-based interface. The EDM component uses modulated infrared or laser signals to measure the slant distance between the instrument and the target (usually a prism). By capturing horizontal angles, vertical angles, and distances, the Total Station computes the three-dimensional coordinates (X, Y, Z) of any surveyed point with centimeter to millimeter-level accuracy. This data can be stored electronically and transferred for further processing using CAD or GIS software, eliminating manual errors and drastically reducing field-to-office time.

LiDAR Technology: High-Resolution 3D Mapping for Engineering Applications

Deepakkumar S, Karthick G, Thangamuthu, III Year Civil, KSRCE

Light Detection and Ranging (LiDAR) offers high-accuracy, three-dimensional mapping using laser pulses. This abstract explains the working principle of LiDAR—airborne, terrestrial, and mobile—and its ability to capture dense point clouds for terrain modelling, forest canopy analysis, and infrastructure assessment. LiDAR is especially useful in floodplain mapping, corridor design, and construction progress monitoring. The integration of LiDAR data with GIS and BIM platforms supports accurate planning and decision-making. Its capability to penetrate vegetation and work in low-light conditions makes it invaluable for civil engineering and environmental studies.

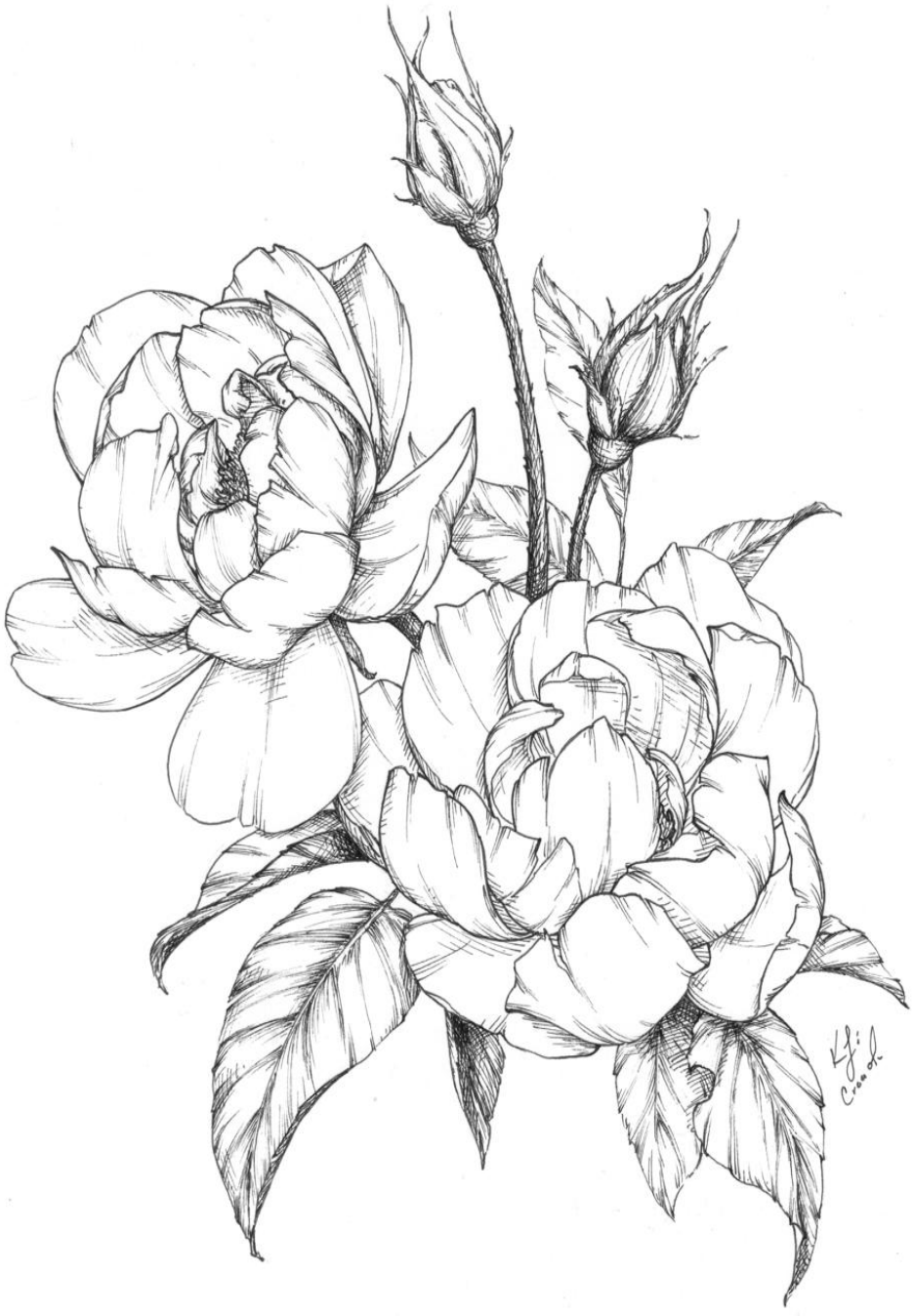
THE ART OF ENGINEERING MINDS

VAISHNAVI

II Year Civil

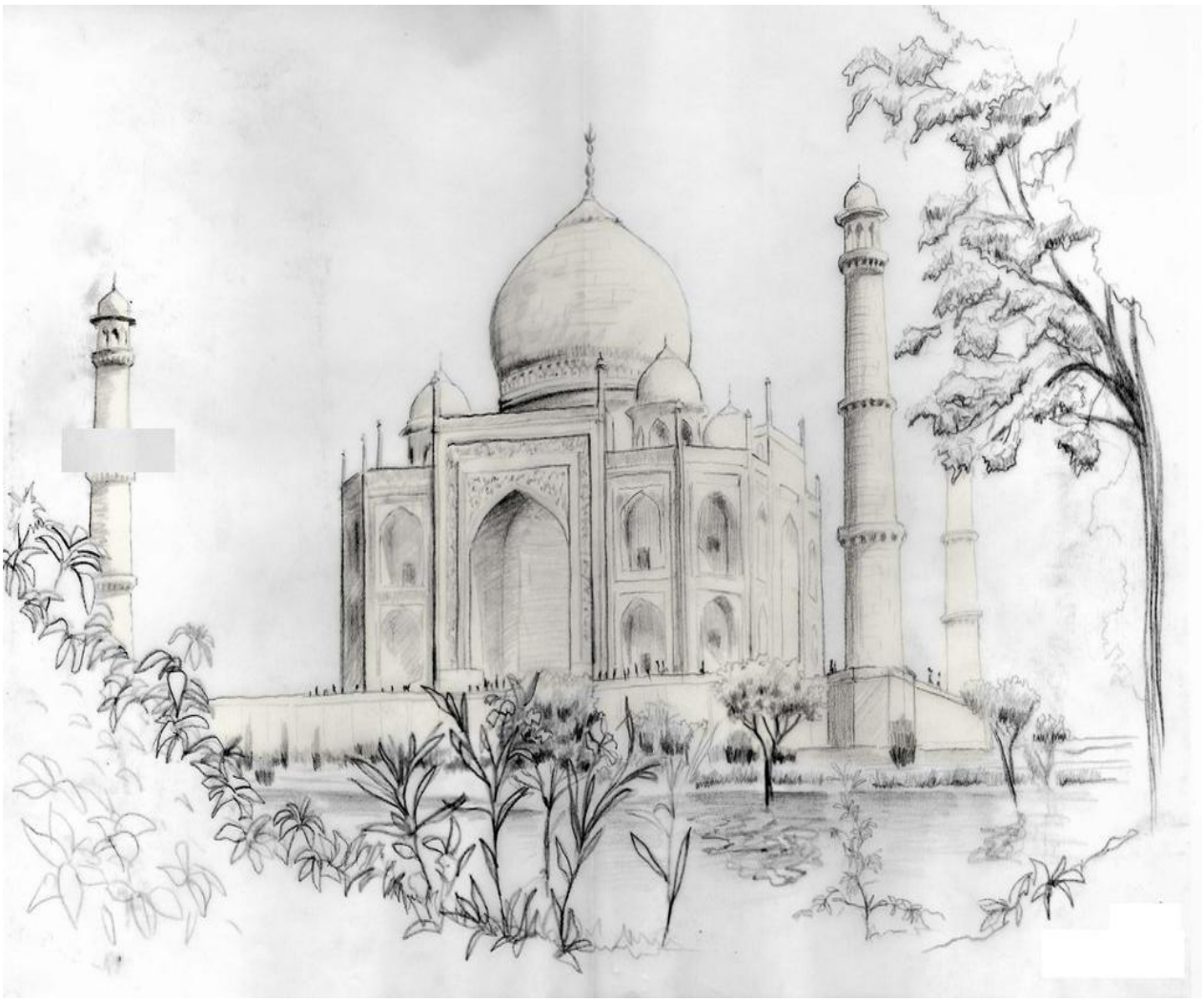
MOHANAPRIYA S

III Year Civil



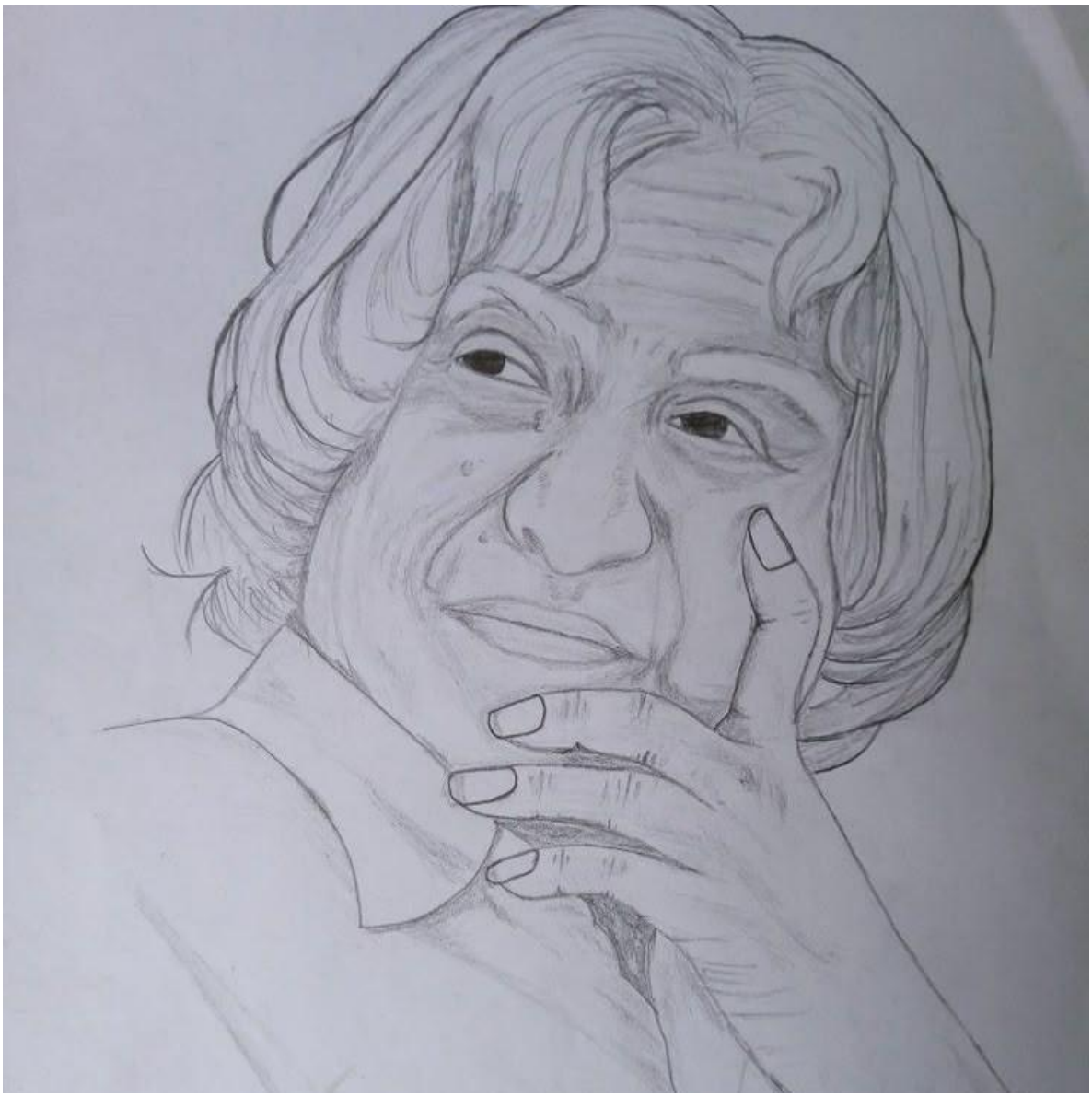
KABITHISHA

I Year Civil



SWATI A

IV Year Civil



NISHANTH

IV Year Civil

"Civil engineering is the art of directing the great sources of power in nature for the use and convenience of man."

— Thomas Tredgold