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 SAFETY AND FIRE ENGINEERING

APEX SAFETY 2025

TECHNICAL MAGAZINE

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K.S.R. COLLEGE OF ENGINEERING

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Chairman Message

Thiru. R. Srinivasan, BBM., MISTE.,

Chairman, KSR 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.

With best wishes,

Thiru. R. Srinivasan,

Chairman, KSR Educational Institutions.

K.S.R. COLLEGE OF ENGINEERING

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Vice Chairman's Message

Mr. K. S. Sachin, Vice Chairman,

KSR Educational Institutions

At KSREI, we stand at the intersection of tradition and transformation, committed to shaping a future driven by knowledge, innovation, and values. While our roots are firmly grounded in a legacy of academic excellence, our vision extends beyond boundaries, preparing students to excel in an ever-evolving global landscape.

Our goal is to create a dynamic learning ecosystem that fosters critical thinking, technological prowess, and ethical leadership. We envision KSREI as a hub of intellectual growth, where students are empowered with 21st-century skills while embracing the timeless virtues of integrity, perseverance, and service.

Looking ahead, we aim to integrate cutting-edge advancements in education, strengthen industry collaborations, and expand global opportunities for our students. With a deep commitment to holistic development, we continue to nurture future leaders who will shape society with wisdom and purpose. Together, we build the future—rooted in values, driven by vision.

With best wishes,
Mr. K. S. Sachin,
Vice Chairman,
KSR Educational Institutions.

K.S.R. COLLEGE OF ENGINEERING

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Dean Message

Dr. M. Venkatesan, Dean, KSRCE

As a Dean of KSRCE, I actively play my role to facilitate students to become best academicians, researchers and policy makers. I provide a diverse and inclusive work environment to my colleagues and drive them wherever necessary to play a role in getting utmost national and international agencies support Institution. A collaborative and integrated approach towards teaching, learning and research will be emphasized. I strongly believe that the KSRCE team will overcome the constraints facing to deliver the best Engineering services to the society and reach the desired goals.

With best wishes,
Dr. M. Venkatesan
Dean, KSR College of Engineering.

K.S.R. COLLEGE OF ENGINEERING

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Principal Message

Dr. P. Meenakshi Devi, Principal

K.S.R. College of Engineering

My heartiest welcome to all the young budding Engineers who have joined in "K.S.R. College of Engineering". With the help of highly qualified and dedicated staff members, we will be moulding the students to the required shape which will make them employable. The composite unit of Students, Parents, and Society is our customer. The K.S.R. College of Engineering will strive hard to provide customer satisfaction. In our college, we give top priority to discipline. A series of tests and examinations will be conducted to achieve good performance in the university examinations. An effective Training and Placement (T&P) cell is formed to provide placement to all our students. Importance will be given to extra-curricular and co-curricular activities also.

Excellent infrastructure facilities and good learning atmosphere is an added advantage of this great Institute. I hope all the students admitted here will enjoy the four years of study. Let us all work hard to produce the most competent scientists, engineers, Entrepreneurs, Managers and researchers through Quality Education.

With best wishes,
Dr. P. Meenakshi Devi,
Principal,
K.S.R. College of Engineering.

K.S.R. COLLEGE OF ENGINEERING

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Head of the Department Message

Dr. M.Prabu, Professor and Head

Department of Safety and fire Engineering

Welcome to the Department of Safety and Fire Engineering! As HOD, I'm proud to lead a department dedicated to a paramount field. Our mission is to cultivate experts who champion safety and mitigate risks across all sectors. We offer a robust curriculum, covering fire dynamics, industrial safety, risk management, and emergency preparedness. Our programs are designed to equip you with both theoretical knowledge and crucial practical skills.

We emphasize hands-on learning, ensuring you're ready for real-world challenges. Our dedicated faculties, with vast industry experience, are committed to your success. You'll gain the expertise to safeguard lives, protect property, and ensure operational continuity. The global demand for skilled safety and fire engineers is continuously expanding, opening diverse and impactful career paths. Join us in making a tangible difference in the world. We actively pursue cutting-edge research to advance safety science. Your time here will empower you to become a responsible, proactive safety professional. Let's collaborate to build a safer, more resilient future for everyone.

With best wishes,
Dr. M.Prabu
Professor and Head
Department of Safety and fire Engineering
K.S.R. College of Engineering
Tiruchengode – 637215.

K.S.R. COLLEGE OF ENGINEERING

DEPARTMENT OF SAFETY & FIRE ENGINEERING

The Department of Safety and Fire Engineering was established in the year 2020 with an intake of 60 students. The Department of Safety and Fire Engineering was formed with the primary objective of providing world class education in the field of Safety and Fire Engineering, while addressing the problems of today and tomorrow. Right from its inception, the department has been offering excellent infrastructural facilities with various sectors like oil and gas, aerospace, chemical, assembly & manufacturing and construction of safety platforms for aspiring professional students to meet the growing demands of the safety-related concerns in the various industries by proper application of engineering methods for a safe work environment.

The department imparts world class training, research and provides state of the safety equipment's facilities to the students. The department offers the students with constant motivation and support to bring out their talents in curricular, co-curricular, and extra-curricular perspectives, thus, uplifting them into dynamic professionals. Our faculty and staff are our biggest strength, with industrial experience and exposure, specialized in engineering disciplines such as Chemical Engineering, Civil Engineering, Electrical Engineering, Mechanical Engineering and Safety, and Fire Engineering.

Vision of the Institution

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 Institution

- 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 produce recognized Safety and Fire Engineers with pioneering innovative solutions to enhance safety and promote sustainable development.

Mission of the Department

- Impart quality education through student-centered teaching approaches.
- Equip students with the cutting-edge knowledge and skills to address the emerging safety challenges.
- Enhance research and innovation in Safety and Fire Engineering, fostering a culture of safety and sustainability.

Program Educational Objectives (PEOs)

- **Core Competency:** Leverage engineering expertise in fire safety, occupational health, and risk management to provide sustainable solutions for Potential hazards.
- **Professionalism:** Graduates will demonstrate leadership, ethics and teamwork in managing emergency response systems and workplace safety.
- **Career Development:** Graduates will undertake higher studies, research and professional development to meet industry demands in Fire and Safety Engineering.

Program Outcomes (POs)	
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. (WK1to WK4)
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. (WK5)
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. (WK8).
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. (WK2 and WK6).
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. (WK1, WK5, and WK7).
PO7	**Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
PO8	**Individual and Collaborative 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 and leader 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. (WK8)
Program Specific Outcomes (PSOs)	
PSO1	**Occupational Health and Industrial Safety:** Identify, assess, and control workplace hazards using risk analysis, safety audit techniques, and legal compliance frameworks to ensure occupational health and safety in various industries.
PSO2	**Fire Protection Systems Design:** Apply principles of fire dynamics, combustion and implement effective fire protection and suppression systems in residential, commercial, and industrial environments.

K.S.R. COLLEGE OF ENGINEERING

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APEX SAFETY 2025

CHIEF PATRON

Thiru R.Srinivasan

Chairman, KSR Educational Institution

PATRONS

Dr. P. Meenakshi Devi

Principal

K.S.R. College of Engineering

ADVISOR

Dr.M.Prabu

Professor & Head, SFE, K.S.R. College of Engineering

EDITOR

Mr.R.Ashok Kumar

Assistant Professor

ENVIRONMENTAL SAFETY

Environmental safety is a crucial aspect of sustainable development, encompassing practices and policies aimed at protecting the natural world and human health. It involves the responsible management of resources, minimizing pollution, and promoting conservation efforts. Implementing eco-friendly technologies, waste reduction strategies, and renewable energy sources are essential components of environmental safety. Additionally, raising public awareness about environmental issues and encouraging environmentally conscious behaviors contribute significantly to a safer planet. Government regulations, corporate initiatives, and individual actions play pivotal roles in ensuring a clean and healthy environment for current and future generations. Embracing green practices in industries, adopting cleaner production methods, and supporting research for innovative environmental solutions are paramount. By fostering a collective commitment to environmental safety, society can mitigate the impact of climate change, preserve biodiversity, and create a sustainable future for all.

DHARANEESH. S R, III YEAR SFE,
K.S.R College of Engineering

FOOD SAFETY

Food safety is a critical concern for public health worldwide. Ensuring the safety of our food supply is essential to prevent foodborne illnesses and protect consumers. This abstract highlight key aspect of food safety, covering various dimensions of the topic. Food safety encompasses the entire food production chain, from farm to table. It involves practices and regulations to minimize the risk of contamination, microbial growth, chemical hazards, and allergens. Monitoring and inspection play a crucial role in identifying potential hazards and enforcing safety standards. Advanced technologies, such as DNA testing and block chain, are increasingly used to trace the origin of food products and enhance transparency. Globalization and changing consumer preferences have introduced new challenges, demanding international cooperation and harmonization of safety standards. Climate change and emerging pathogens also impact food safety. In conclusion, food safety is a dynamic field requiring continuous vigilance, research, and adaptation to protect public health and ensure safe and nutritious food for all.

JEEVA. M, III YEAR SFE,
K.S.R College of Engineering

AI IN SAFETY

In recent years, the integration of artificial intelligence (AI) technologies has revolutionized various sectors, including safety management. This abstract explores the pivotal role of AI in enhancing safety across diverse domains. AI-powered systems offer real-time monitoring, predictive analytics, and anomaly detection, ensuring proactive risk mitigation and incident prevention. Machine learning algorithms process vast datasets to identify patterns and trends, enabling timely interventions. Furthermore, AI-driven simulations and virtual reality facilitate immersive safety training, fostering a proactive safety culture among workers. Intelligent robotics, guided by AI algorithms, enhance workplace safety by automating hazardous tasks, minimizing human exposure to risk. Additionally, AI enables the development of smart safety equipment, such as wearable devices and sensors, enhancing situational awareness and emergency response. These abstract highlights the transformative impact of AI on safety, emphasizing its potential to save lives, reduce accidents, and create safer environments across industries.

KAVISHAL . L, III YEAR SFE,
K.S.R College of Engineering

AUTOMOBILE & ROAD TRANSPORTATION SAFETY

Ensuring the safety of automobile and road transportation systems is paramount in today's fast-paced world. This abstract delves into a comprehensive approach aimed at enhancing safety across various facets of transportation. We explore innovative technologies such as autonomous vehicles, advanced driver-assistance systems, and real-time traffic monitoring, which play pivotal roles in preventing accidents and reducing fatalities. Additionally, the abstract discusses the importance of robust road infrastructure, proper signage, and efficient traffic management to create safer environments for all road users. Furthermore, the integration of artificial intelligence and machine learning algorithms in analyzing traffic patterns and predicting potential hazards is examined. The abstract also emphasizes the significance of public awareness campaigns, stringent regulations, and stringent enforcement mechanisms in promoting responsible driving behavior. By addressing these critical aspects, this research contributes to the ongoing efforts to create a secure and sustainable future for automobile and road transportation.

LAVANYA. M, III YEAR SFE,
K.S.R College of Engineering

FIRE TECHNOLOGY & PROTECTION SYSTEM

Fire technology and protection systems play a crucial role in safeguarding lives and property from the devastating effects of fires. With the increasing complexity of modern infrastructures, it is imperative to implement advanced fire protection measures. This abstract explores the innovative advancements in fire technology and protection systems, focusing on their integration, efficiency, and sustainability. Cutting-edge technologies such as fire detection sensors, smart extinguishing agents, and artificial intelligence-based monitoring systems are revolutionizing the way fires are detected, controlled, and prevented. Moreover, sustainable fire protection solutions, including eco-friendly extinguishing agents and energy-efficient fire suppression systems, are gaining prominence, aligning with global environmental initiatives. This abstract delves into the interdisciplinary approach of combining engineering, materials science, and computer technology to develop robust fire protection strategies. By understanding the latest developments in fire technology, industries and communities can enhance their preparedness, minimize losses.

ROSHAN AKTHAR. G, III YEAR SFE,
K.S.R College of Engineering

ELECTRICAL SAFETY

Electrical safety is paramount in ensuring the well-being of individuals and the smooth functioning of various industries. This abstract focuses on the critical aspects of electrical safety, emphasizing its significance in both residential and industrial settings. It explores the principles of safe electrical practices, highlighting the importance of proper installation, maintenance, and inspection of electrical systems. The abstract discusses essential safety measures, such as the use of insulated tools, protective gear, and adherence to regulations and standards. It also delves into the significance of raising awareness about electrical hazards and promoting education and training programs to mitigate risks effectively. By addressing these key elements, this abstract underscore the importance of electrical safety in preventing accidents, injuries, and fatalities, thereby creating a safety environment for everyone.

HARISH A, II YEAR SFE,
K.S.R College of Engineering

SAFETY MANAGEMENT IN SOFTWARE ENGINEERING

Safety management in software engineering is a critical aspect of ensuring the reliability and security of software systems. In today's digital age, software applications are pervasive, powering everything from medical devices to autonomous vehicles. Consequently, ensuring the safety of these systems is paramount. This abstract explores the principles and practices of safety management in software engineering, emphasizing the identification, analysis, and mitigation of potential hazards and risks. It discusses various safety standards, such as ISO 26262 and IEC 61508, that provide guidelines for developing safety-critical software. The abstract also highlights the importance of rigorous testing, validation, and verification processes to guarantee software safety. Additionally, it delves into the role of safety cultures within development teams, emphasizing collaboration, transparency, and continuous improvement. By implementing effective safety management practices, software engineers can enhance the reliability and trustworthiness of software systems, ensuring they meet stringent safety requirements and protect users from potential harm.

SRIRAMULU. G, III YEAR SFE,
K.S.R College of Engineering

FOOD SAFETY

Food safety is a critical aspect of public health and a major concern worldwide. Ensuring the safety of the food supply chain is essential to prevent foodborne illnesses and protect consumers. This abstract discusses key principles and practices related to food safety. It emphasizes the importance of proper food handling, storage, and preparation to prevent contamination and the spread of foodborne pathogens. The abstract also highlights the significance of stringent regulations, regular inspections, and monitoring of food production processes to maintain high standards of food safety. Additionally, it explores the role of consumer education and awareness in promoting safe food practices at home and in food service establishments. The abstract underscores the need for collaboration among governments, food industries, and consumers to establish and maintain effective food safety measures, ensuring that the food people consume is safe, wholesome, and free from harmful contaminants. Implementing robust food safety protocols is crucial to safeguarding public health and fostering trust in the food supply chain.

LATHIKA A, II YEAR SFE,
K.S.R College of Engineering

ENVIRONMENTAL SAFETY

Environmental safety is a critical concern in today's world as the planet faces unprecedented challenges from pollution, climate change, and habitat destruction. It encompasses various practices and measures aimed at preserving and protecting the environment from harmful human activities. These initiatives include waste management, recycling programs, sustainable energy practices, and conservation efforts to safeguard natural resources and biodiversity. Moreover, environmental safety involves the responsible use of chemicals, reducing emissions, and promoting eco-friendly technologies to minimize the ecological footprint.

Addressing environmental safety concerns requires global cooperation, stringent regulations, and public awareness campaigns. By promoting eco-conscious behaviors and fostering a culture of environmental responsibility, societies can mitigate the adverse impacts on ecosystems and wildlife. Additionally, investing in research and innovation for green technologies, promoting sustainable agriculture, and implementing renewable energy solutions are vital steps toward a cleaner, healthier planet.

KAVIYADHARSHINI V, II YEAR SFE,
K.S.R College of Engineering

ENVIRONMENTAL SAFETY

Environmental safety is paramount in our efforts to maintain a healthy planet. It involves safeguarding our environment from harmful pollutants, conserving resources, and promoting sustainable practices. By implementing eco-friendly technologies, efficient waste management, and renewable energy sources, we can reduce our ecological impact. Additionally, fostering awareness about environmental issues and enforcing stringent regulations are crucial steps. Preserving biodiversity, protecting natural habitats, and reducing carbon emissions are integral components of environmental safety. Through global collaboration and individual responsibility, we can create a greener future for generations to come. Prioritizing environmental safety is not just a choice but a necessity to ensure the well-being of both the planet and its inhabitants.

DHARSAN S, II YEAR SFE,
K.S.R College of Engineering

FIRE TUBE SUPRESSION SYSTEMS

Fire tube suppression systems play a pivotal role in ensuring fire safety by swiftly detecting, containing, and extinguishing fires in various environments. These systems utilize a network of pipes and nozzles strategically placed throughout buildings, facilities, or industrial spaces. When a fire is detected, the system releases a suppression agent, such as water, foam, or gas, directly onto the source, swiftly quelling the flames and preventing the fire from spreading further. The design of fire tube suppression systems considers the specific risks of the environment they protect, ensuring rapid response and minimal damage. These systems are crucial for safeguarding lives, property, and valuable assets, making them integral components of fire safety strategies in commercial, residential, and industrial settings. As technology advances, innovations in fire tube suppression systems continue to enhance their efficiency, making them indispensable tools in modern fire prevention and protection efforts.

AUGUSTIN RONALD C, II YEAR SFE,
K.S.R College of Engineering

Dynamic and Advanced Beam Anchor in Industrial and Construction Application

This study aims to evaluate the performance of an innovative beam anchor system compared to existing methods in improving worker safety, ease of use, and load-bearing capacity in height-related industries. Materials and Methods: The experiment was conducted in the Occupational Health and First Aid Lab using load-testing equipment. Two groups were tested: Group 1 is the aluminum beam anchor and Group 2 is the dynamic and advanced beam anchor, with 10 samples each. Key parameters analyzed included installation time, load capacity, and failure modes.

Statistical analysis was performed using SPSS to compare performance variations. The proposed beam anchor system significantly outperformed the existing method, with an average load capacity of 27.8 kN compared to 15.2 kN in the existing system. Installation time was reduced from 5.3 minutes to 3.1 minutes. Unlike the existing system, which showed slippage and deformation, the proposed system demonstrated secure attachment with no failure during testing.

Ragul Prakash. D, IV YEAR SFE,
K.S.R College of Engineering

Intelligent Confined Space Health and Safety System

This Study aims to evaluate the performance of a Smart Confined Space Monitoring Rescue System Storage tanks, pipelines, and tunnels are examples of confined spaces that present serious safety risks because of their limited accessibility, hazardous gas concentrations, and restricted ventilation. This research investigates the development of a smart confined space monitoring and rescue system utilizing IoT and multi-sensor technology for enhanced safety in hazardous environments.

The experiment was conducted in a controlled lab setup at KSRCE, using real-time data from confined spaces such as pipelines and underground tanks. The system integrates gas sensors for detecting harmful gases, temperature and humidity sensors for environmental monitoring, and IoT modules for wireless data transmission. Two groups were tested: Group 1 used a conventional gas detection system with 50 readings, and Group 2 tested the proposed IoT-based system with multi-sensor fusion, also with 50 readings.

Key parameters, including gas concentration, temperature, humidity, and response time, were measured. The results indicated that the proposed system achieved a 30% reduction in response time, a 25% improvement in gas detection accuracy, and a 40% increase in communication range compared to conventional methods. Statistical analysis using SPSS revealed a significant improvement ($p < 0.05$) in the system's performance, validating its effectiveness in improving safety and rescue operations in confined spaces.

Hariharan. M, IV YEAR SFE,
K.S.R College of Engineering

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— R. S. சௌமியா
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by.
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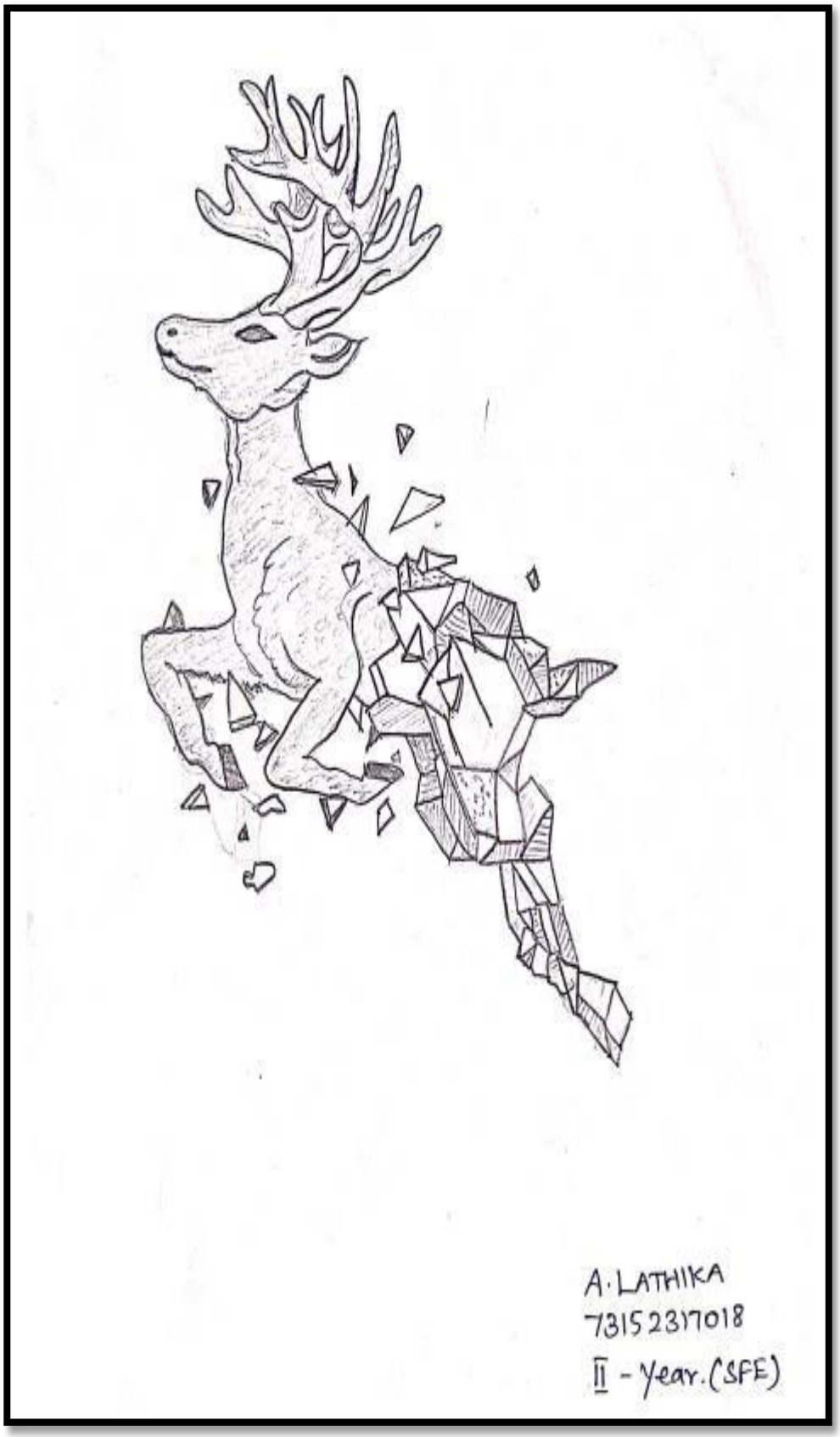

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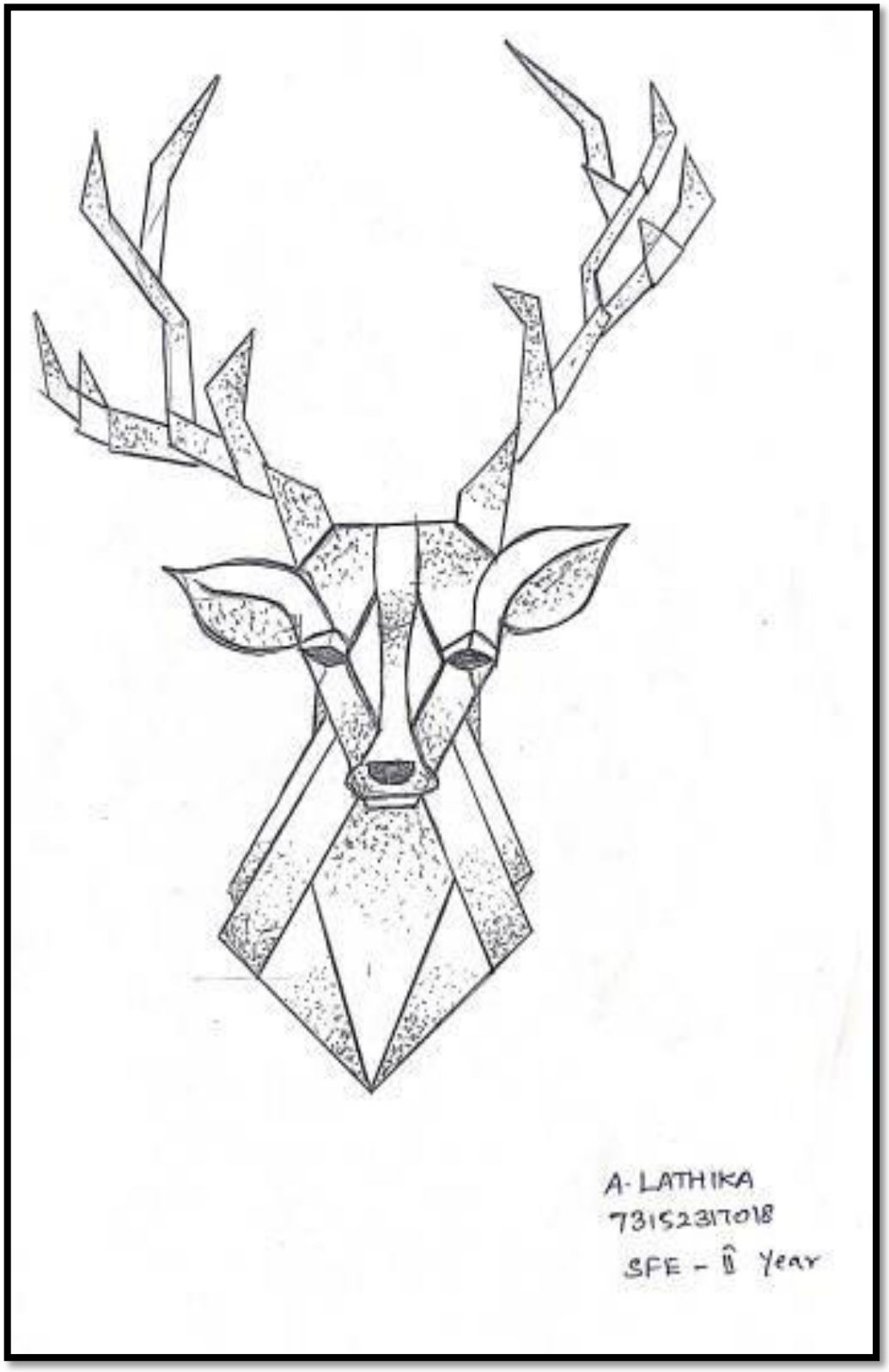
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