



RESEARCH
INNOVATION
DESIGN
ENTREPRENEURSHIP

RiDE

DIGEST

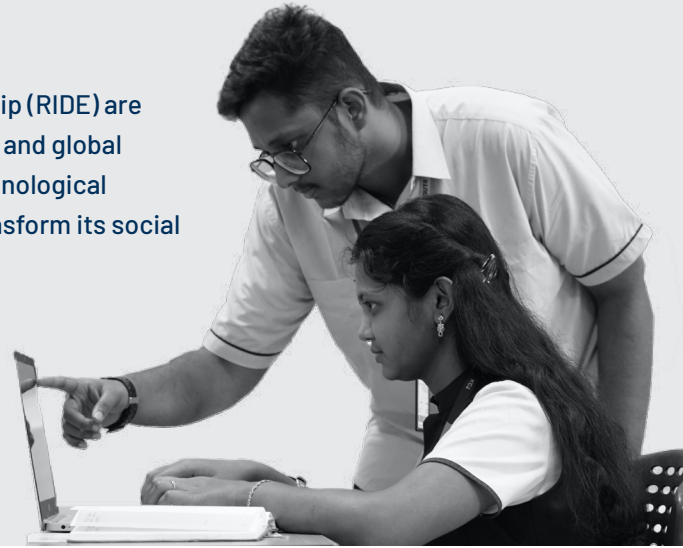
EDITION 1 | NOV 2024

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The Significance of RIDE in India

In the VUCA world, Research, Innovation, Design, and Entrepreneurship (RIDE) are critical pillars that form the bedrock of a nation's progress, resilience and global standing. India, with its vast demographic potential and growing technological prowess, stands at a critical juncture where harnessing RIDE can transform its social and economic fabric. Through cutting-edge research, sustainable innovation, and thriving entrepreneurial ecosystems, RIDE drives job creation, technological advancement, and solutions to pressing societal issues. Empowering young minds with the tools and opportunities to excel in these areas is essential for building a future-ready nation, resilient against global challenges.



RIDE at Kumaraguru: A Thriving Ecosystem of Possibilities

At Kumaraguru Institutions, RIDE is not just a concept but a lived reality, seamlessly woven into the institution's ethos. The ecosystem at Kumaraguru thrives on the synergy of these four pillars, creating an environment where students, faculty, and industry partners converge to explore, create, and transform thereby becoming creative thinkers, problem-solvers, and changemakers. With state-of-the-art research centers, innovation hubs, industry partnerships, and incubation cells, Kumaraguru empowers its students and faculty to explore new frontiers and bring impactful ideas to life.

R

Research at Kumaraguru spans diverse domains, addressing real-world challenges through interdisciplinary collaboration.

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Innovation is celebrated as a way of life, with students encouraged to think differently and explore uncharted paths.

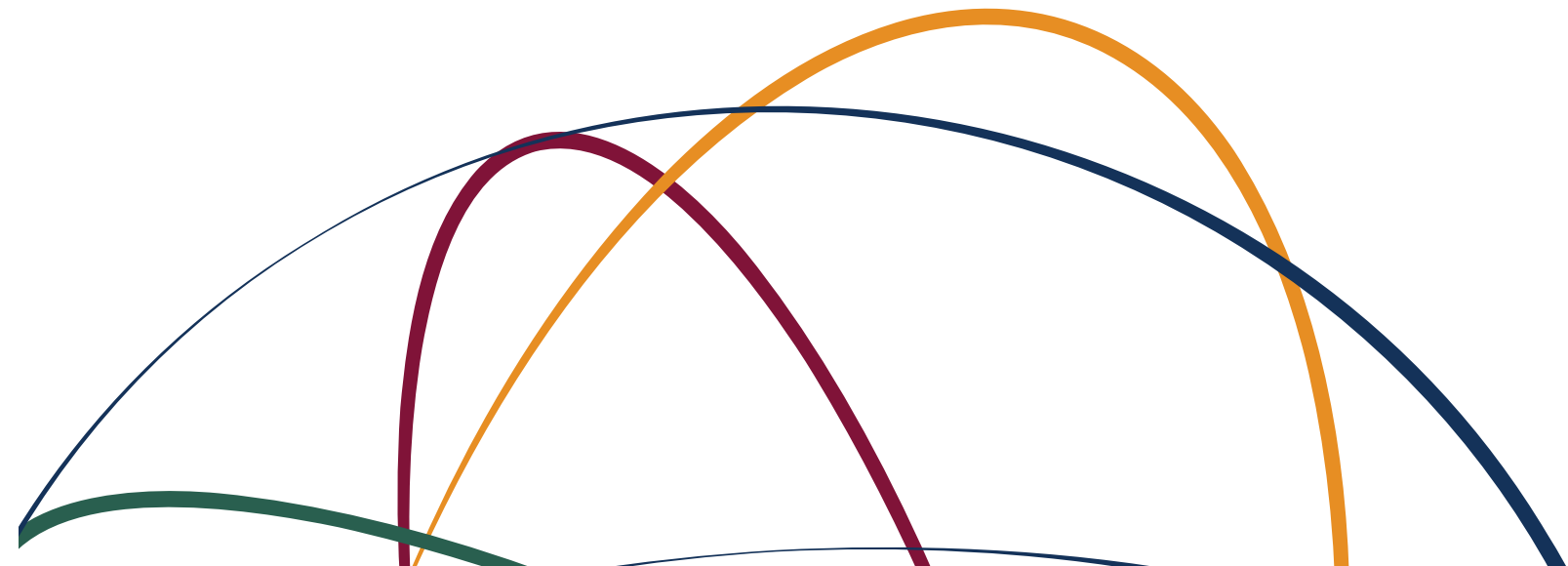
D

Design transforms visionary concepts into functional and impactful outcomes, empowering institutions, industries and enhancing societal well-being.

E

Entrepreneurship culture thrives, with incubated startups gaining support from mentors, industry experts, and resources, ultimately creating market-ready solutions and economic value.

Kumaraguru's RiDE Synergy





KI CENTERS FOR EXCELLENCE

Centres of Excellence provide a platform for advanced research and innovation enabling students to gain hands-on experience with state-of-the-art technologies, and thereby foster a culture of continuous learning and development. By collaborating with industry leaders, KCT has established 14 Centres of Excellence which enhance student learning through access to cutting-edge facilities and real-world projects; foster innovation by encouraging collaborative research and development; strengthen industry ties, leading to better internship and job placement opportunities for students and position KCT as a valuable partner to the industry.

DELL Technologies

Offers cutting-edge resources in data analytics and cloud computing, enabling students to work with the latest technologies in data management and computational analysis.

Centre for Automotives



Focuses on automotive technologies, fostering innovation in vehicle design, manufacturing, and testing. This center provides hands-on experience with industry-standard automotive systems.



Dedicated to textile machinery, supporting research and development in advanced textile manufacturing processes, and promoting innovation in the textile industry.

TI Lab for Signal Processing & Embedded Systems

Provides resources for the study & application of signal processing and embedded system technologies, essential for modern electronic and communication systems.



NDT Lab

Specializes in non-destructive testing (NDT) technologies, providing advanced training and research opportunities to ensure materials and components meet industry standards without causing damage.



Wireless Technologies

Equipped with state-of-the-art facilities for wireless communication technologies, enhancing research and development in this rapidly evolving field.

YOKOGAWA

Focuses on distributed control systems (DCS), providing training and research opportunities in automation and control engineering, critical for industrial processes.

FLUKE®

Offers calibration services and training, ensuring precision in engineering measurements and supporting high standards in technical education and research.

Salzer Innovation Lab



Encourages innovation and creativity in engineering and technology, providing resources and support for the development of new ideas and products.

Capegemini Centre for PLM

Specializes in product lifecycle management (PLM), offering advanced tools and training for managing the entire lifecycle of a product from inception to disposal.



Specializes in Internet of Things (IoT) and long-range communication technologies, promoting advancements in connected devices and smart systems.

Lectra-Speed Step Centre for Design

Focuses on design and production technologies in fashion and textiles, promoting creative and efficient manufacturing processes, and supporting the fashion industry's technological needs.

Capegemini Centre for New Product Development

Supports the development of new products, driving innovation and efficiency in product design and manufacturing, and bridging the gap between academic research and industrial application.

SIEMENS

Dedicated to industrial automation technologies, fostering innovation in automated systems and processes, and providing hands-on experience with industry-leading automation tools.

PROFESSIONAL SOCIETIES & CHAPTER

Professional chapters at Kumaraguru provide students and faculty members with opportunities to engage with professionals, gain insights into industry trends, and develop technical and soft skills. These chapters organize technical events, workshops, and seminars that facilitate the exchange of knowledge and ideas between students and industry experts.

- Association of Computing & Machineries AIDAT
- Clothing Manufacturers' Association of India
- Coimbatore Management Association
- Coimbatore Productivity Council
- Computer Society of India
- ICTACT
- Indian Concrete Institute
- Institution of Engineers India
- IEEE

- Institution of Electronics & Telecommunication Engineers
- Instrumentation Society of India
- Indian Welding Society
- Indian Society for Technical Education
- Indian Technical Textile Association
- SAE INDIA
- Textile Association of India



OTHER SIGNIFICANT ENGAGEMENTS

Mentorship by Industry Experts

KI regularly organizes mentorship sessions delivered by industry experts, providing students with insights into industry trends, challenges, and opportunities, enriching their learning experience.

Conferences, Workshops and Seminars

KI hosts numerous conferences, workshops, and seminars, with 125+ resource persons from the industry for knowledge exchange and networking, fostering between academia and industry

Alumni Connect

The institution maintains strong ties with its alumni, organizing guest talks providing valuable career advice and industry insights.

Placement Connect

KI has established a robust placement cell, facilitating 372 placement connections with leading companies every year. Ensuring students align to their career aspirations.

Adjunct Faculty and Professors of Practice

KI engages 100+ adjunct faculty and professors of practice from the industry. These professionals enrich the learning experience for students sharing their experience & insights.

Research and Consultancy

KCT has undertaken 50+ research and consultancy projects in collaboration with multiple industries. These projects solve real-world challenges and enable technological advancements in the industry.

Training for Industry

KI provides training programs for industry personnel, to foster a culture of continuous learning. In June 24, KI organised a Knowledge Transfer Program for Bosch professionals. KCT runs a one year PG Diploma in Design Engineering for Oil and Gas Industry for Mechanical Engineers since 2014 in partnership with Cameron Manufacturing India Pvt Ltd, a Schlumberger Company.



Ré, iQube & Garage is a collective ecosystem for Research, Innovations and Design. With our mission set on promoting STEM we ensure that students are equipped with cutting edge knowledge and skills to thrive in this dynamic world, while helping established organizations adapt and maintain their competitive edge. We also focus and develop various market based futuristic tech, curate ideologies. Our core value is to ensure students gain advanced knowledge and practical skills in real world problem solving and bridge the gap between academia learning and Industry. By fostering a collaborative environment, Ré, iQube & Garage empowers individuals and serve as a launchpad for next gen's Leaders.

RiG Ecosystem

Our ecosystem exclusively offers students hands on experience, industrial exposure, internship and project funding support. We incubate groundbreaking work, with students regularly engaging in and winning national and international competitions, driving innovation through patented projects, and contributing to global research through paper publications. We work in collaboration with tech societies and industries to organize events, workshops, hackathons, ideathons, and expos that foster a culture of research and innovation among students.

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Founded in 2016, the Student Research Development Center at our university is dedicated to building a vibrant culture of curiosity and purpose, where students and faculty collaborate to develop innovative solutions for real-world challenges. This center serves as a dynamic hub that unites over 100 research professors and 1,000 active student researchers, encouraging cross-disciplinary exploration in a broad range of fields, from energy engineering and bioscience to advanced vehicle design and sustainable systems. Supported by an annual research budget of 40 lakh, the center funds around 30 new student projects each year, allowing students to not only refine their technical skills but also to develop critical problem-solving abilities. These hands-on projects immerse students in impactful research from the very beginning, fostering an academic environment where theory translates into practical innovation. Inspired by our commitment to bridging knowledge with impact, we align many of our projects with the United Nations Sustainable Development Goals, aiming to address the needs of society and industry alike. Through this approach, our center nurtures future leaders who are prepared to shape meaningful change in their respective fields.

OUTCOMES & ACCOMPLISHMENTS

Projects Funded Annually: 30	Budget Allocated for Research: 40 lakh annually	Total Grants Distributed: Over 2 crore
Startups Registered: 2	Patents Filed: 10+	Students Impacted: 3,000+
Research Papers Published: 100+		



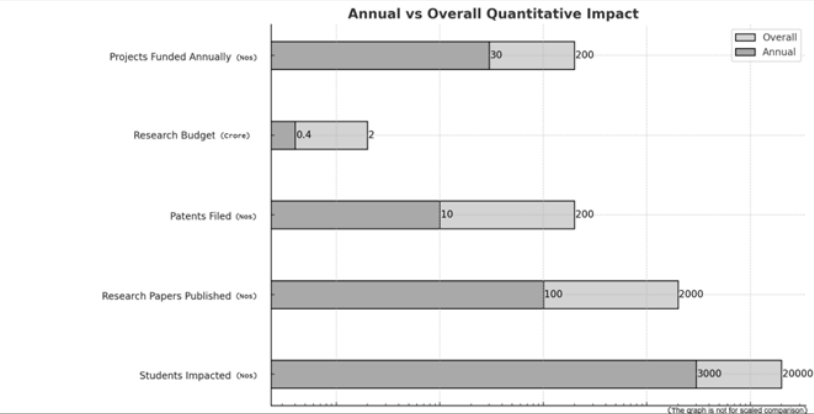
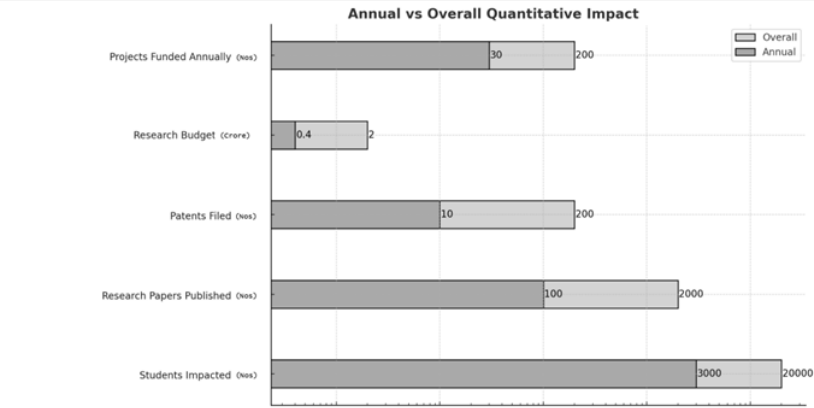
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A Culture of Exploration and Excellence

Our center’s mission goes beyond traditional academic research; we are committed to nurturing a mindset of lifelong learning and adaptability, essential in today’s rapidly evolving landscape. By encouraging students to explore emerging fields and cross-disciplinary ideas, we provide an environment where they can discover their unique passions and innovate without limitations. This ecosystem fosters an inclusive research culture that is accessible to students from diverse backgrounds and levels of expertise, allowing each participant to thrive within a supportive, collaborative network. Our partnerships with prominent industries and research institutions create invaluable opportunities for students to gain real-world experience, whether through internships, workshops, or collaborative projects. Each year, we host a range of events, including masterclasses, tech talks, hackathons, and boot camps, all designed to refine our students’ skills and broaden their perspectives. As we continue to evolve, the Student Research Development Center remains dedicated to advancing research that not only meets international standards but also responds to the most pressing challenges of our time. Together, we are shaping a future where innovation knows no bounds and where every student has the opportunity to leave a meaningful impact on the world.

Our Impact and Achievements

The Student Research Development Center has cultivated a thriving research ecosystem that consistently achieves remarkable results. Through strategic partnerships with leading industries and close collaborations with esteemed organizations, we have created a supportive network that enhances student learning and accelerates project success. Since its inception, the center has facilitated the establishment of two startups, filed over 10 patents, and contributed more than 100 research papers to national and international journals, strengthening our institution's reputation as a hub for pioneering research. Furthermore, our center's dedication to interdisciplinary projects has impacted over 3,000 students, embedding a research culture aligned with global standards and national priorities. Our research spans various impactful domains, including sustainable energy solutions, bio-science innovations, and intelligent vehicle designs, addressing real-world issues with creativity and expertise. The center's funding initiatives extend to all levels, having awarded over 2 crore in grants to date, attracting additional support from government and industry sources that share our vision. We prioritize accessible, high-quality research experiences, aiming to create a foundation where students are equipped to make lasting contributions both locally and globally.





iQube is one of the key innovation centers in Kumaraguru institutions instigated in 2013 with an aim to inculcate the culture of exploring and experiencing technologies in real-time. iQube is an innovation Centre for every tech enthusiast who aims to bring out the explorer and maker within. It further helps tech enthusiasts to convert their innovative ideas into commercially viable or technically challenging prototypes. It also provides guidance and mentorship in finding a path to achieve what one always dreamt of. This eminent platform has 40+ yearly members, exhibits 10+ yearly projects, has gained 30+ prestigious recognitions for its projects and people, has educated 1000+ people, and has got strong student Alumni mentor support.

OUTCOMES & ACCOMPLISHMENTS

Domains: 8	Events hosted: 70+	Workshops conducted: 100+
Projects: 90+	Budget Allocated for Innovation: 30 lakhs annually	Total Grant: 3 crores
Tech Startups Registered: 4	Alumni Connect: 400+	Students Impacted: 10,000+

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Vision

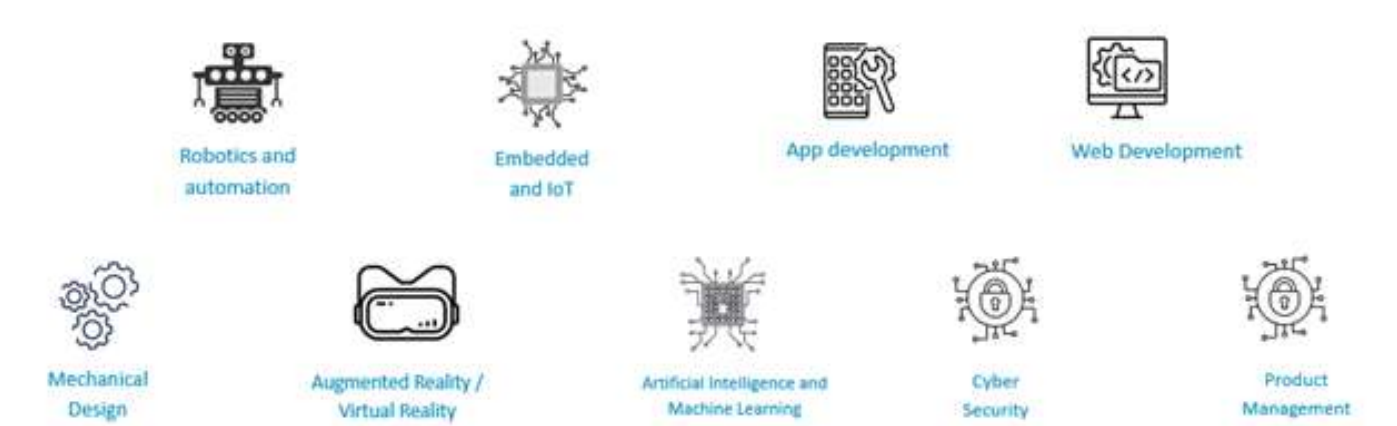
iQube is set out with a vision to create opportunities for the young technology aspirants and let them realize their potential and contribute to the development of India by Innovation, Incubation and Incorporation

Mission

- iQube has also got its mission statements which goes as follows:
- Trains aspirants in their fields of interest.
 - Real time understanding by hands on training sessions.
 - Evaluation of technical skills through competitions.
 - Incubate concepts to build effective products.
 - Helps to get into industries for projects, internships etc

Our Ecosystem:

Empowering young technology aspirants to unleash their potential and drive India’s development through hands-on training, innovative incubation, and industry integration.



Projects:

S.NO	PROJECT TITLE	CLIENT
1	Emerald Design Compare	Emerald industries
2	Ideal auto tech app	Ideal Auto Tech
3	Bearing defect detection	WelVision
4	Knowinmy	Knowinmy
5	Onefinity	Onefinity
6	iAutomate	RJ Traders
7	Plant disease monitoring system	IEEE

TEAM NOVA CYBER SECURITY

Team NOVA is an elite student cybersecurity team from Kumaraguru College of Technology, dedicated to excelling in competitive cybersecurity, ethical hacking and real-world digital defense. Our team is driven by a passion for securing the digital landscape, from local collaborations to global recognition.

Community Contributions

- OWASP KCT Student Chapter – Leading workshops on OT security, penetration testing, and red teaming

- Offering hands-on training and mentorship to students, guiding them into the cybersecurity field

- Hosting NOVA CTF annually, promoting hands-on learning in cybersecurity Achievements & Competitions

- Top 20 Worldwide on Hack the Box (International Level Hacking competition)

- Top 10 in the Great AppSec Hackathon by CCOE Cybersecurity Centre of Excellence (International Level Hacking competition)

- AIR 5 in Pentathon-24 (National Level Hacking Competition)

- Finalists in major competitions like TN-Police CTF, Karnataka-Police Hackathon, YUKTHI CTF 2023 - TN POLICE and more (National Level Hacking Competition)

- Ranked AIR 4 in Indian Army Cybersecurity Competition, Got internship guided by the Army (National Level Hacking Competition.

Q-BOTIX ROBOTICS & AUTOMATION

Team QBotix is a leading robotics team from Kumaraguru College of Technology driving excellence by setting new standards in engineering to lead and inspire the domain. A group of 50+ students working passionately towards cutting-edge robotic technologies, driven by dedication, technical expertise, and commitment to innovation, proudly stands as contenders at ABU ROBOCON, an international techno-sport cum robotics event conducted every year by the Asia-Pacific Broadcasting Union.

Community Contributions

- Mechanical, Electrocore, AI & ROS, and Management working on real time robotic systems
- Students develop their knowledge in robot design, fabrication, and testing, gaining hands-on experience in programming, PCB design, and sensor integration while working on actuations and power management systems.
- They enhance their skills in automation and AI by working on image processing, camera integration, and ROS for autonomous navigation, all while learning to troubleshoot and optimize performance.
- Along with technical expertise, students build leadership and management skills by handling team coordination, finances, sponsorships, and logistics, ensuring smooth operation across all domains.



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KCT Garage serves as an advanced innovation and development laboratory dedicated to pioneering next-generation mobility solutions and supporting high-caliber student-led automotive teams on a national scale. Emphasizing a multidisciplinary approach, the Garage offers immersive learning experiences in automotive engineering fundamentals, electric vehicles (EVs), and alternative transport technologies, facilitating hands-on research and project work in cutting-edge fields such as EV charging infrastructure, solar energy integration, supercapacitors, hydrogen fuel cells, and retrofitting internal combustion vehicles for sustainability.

KCT Garage is dedicated to academic excellence, with members publishing numerous research papers annually in esteemed journals like IEEE, advancing automotive science and sustainable engineering. The 6000-square-foot facility, hosting over 200 students, operates 24/7 to support ambitious projects with extensive resources. It fosters continuous learning through workshops, events, and industry collaborations.

Beyond technical learning, KCT Garage provides real-world experience in project management and manufacturing, including additive manufacturing technology. This dynamic environment cultivates technical expertise and hones leadership and innovation skills essential for future industry leaders.

OUTCOMES & ACCOMPLISHMENTS

Projects Funded Annually: 8	Budget Allocated for Vehicle development: 1.5 crores Annually	Total Grants Distributed: Over 7 Crores
Vehicle Developed: 35+	Patents Filed: 10+	Research Papers Published: 100+
Students Impacted: 3,000+	Alumni Connect: 400+	



Ecosystem:

KCT Garage is a student-driven automotive design and prototyping center, uniting highly skilled students with expertise across key domains, including mechanical engineering, electrical systems, design, and advanced software tools. This diverse group brings a specialized focus to each area of vehicle engineering, pushing boundaries in research and development of sustainable mobility solutions.

Driven by a shared vision for cleaner, greener energy, students at KCT Garage are committed to advancing eco-friendly transportation. Their projects emphasize innovation in electric vehicles (EVs), Sustainable mobility and all-terrain vehicles (ATVs), showcasing a strong commitment to developing vehicles that reduce environmental impact in line with Sustainable Development Goals. Each vehicle is designed and constructed with precision, utilizing cutting-edge technology to embody the future of sustainable transport.

KCT Garage serves as a hub of creativity and learning, fostering a collaborative ecosystem where aspiring engineers can apply their skills to real-world challenges. The center encourages exploration and experimentation, offering an environment rich in resources and mentorship to empower students to excel in advanced automotive design and prototyping. By integrating sustainability into the core of its initiatives, KCT Garage not only promotes technical excellence but also nurtures responsible innovation that aligns with global sustainability goals.

MOBILITY

MOTORSPORTS

ADVENTURE

SUSTAINABILITY

Pioneering
Mobility Solutions

Talent
Development

Academic
Contributions

State-of-the
Art Facilities

Industry
Partnerships

Project
Management
Skills

Innovation
in Additive
Manufacturing

Collaborative
Learning
Ecosystem

Eco-Friendly
Vehicle
Projects

Sustainable
Engineering
Focus



ZEALL RACING

Established in 2014 - Zeall Racing provides hands-on experience in both electric and Internal Combustion (IC) engine go-kart manufacturing, fostering a passion for motorsports and engineering.
Innovations: Development of both electric and IC engine go-karts, focusing on performance optimization, powertrain efficiency, and vehicle dynamics.

MOTO KCT

Moto KCT is the elite racing team of Kumaraguru Institutions, established in 2019 and dedicated to crafting high-performance racing bikes. Specializing in both Internal Combustion Engine (ICE) and 100% Electric Propulsion System bikes, we combine innovation and precision engineering to excel in motorsports. Our team is committed to advancing racing technology, offering hands-on experience, and inspiring a new generation of engineering talent.

E-BLITZ

Established in 2014 - Dedicated to designing electric ATVs, focusing on sustainable mobility and environmental impact. Design of electric All-Terrain Vehicles (ATVs), incorporating robust energy storage systems, enhanced motors.

TEAM SAKTHI RACING

Established in 2014 - Designing and racing a Formula Student car, showcasing engineering expertise on a global stage. Design of an open-style Formula Student race car, incorporating cutting-edge aerodynamics, powertrain systems, and lightweight materials for enhanced performance.

TEAM SEA SAKTHI

Established in 2020, Team Sea Sakthi is a dynamic powerhouse in the maritime domain. With three years of unwavering dedication, we have achieved groundbreaking milestones, particularly in the prestigious Monaco Energy Boat Challenge. Our team is driven by a passion for innovation, engineering excellence, and sustainability, pushing the boundaries of maritime technology and contributing to a cleaner, greener future in marine engineering. Notably, the team is the first and only Indian Team to participate and win accolades in the Monaco Energy Boat Challenge.

TEAM RENEW

Established in 2022, Team ReNew is a dedicated motorsport team competing in the Shell Eco-marathon with a mission to create the most energy-efficient vehicle in the Hydrogen Fuel Cell Prototype category. Our goal is to set new benchmarks for performance and efficiency, pushing the limits of sustainable engineering in one of the most challenging and prestigious competitions in the industry. Committed to innovation and environmental responsibility, Team ReNew is determined to shape the future of energy-efficient mobility. Notably, Team ReNew rewrote history as the first team from India to compete in the Prototype class within the Hydrogen Fuel Cell category to participate in the Shell Eco-Marathon.

RIDE ACCOLADES



DESIGN PRIZE
TOWN HALL CUP
INNOVATION PRIZE
COMMUNICATION PRIZE



Season 4
Overall Championship



2 Mitacs Gonalink
Research Interns



eLearnSecurity
Certified Professional
Penetration Tester -
Team Nova



Season 2
Overall Championship



First Team in India to
Participate in Hydrogen
Fuel Cell category



Nasa Hall of Fame
-Team Nova



Vishwakarma
Award 2018



A student start-up
launched by Coimbatore
City Commissioner



Robocon'24- AIR 17



Winner
IIT Mandi HST challenge



SIH winner
4 year consecutive



Runner Up
Mega ATV

FACULTY AWARDS & RECOGNITIONS



Educators are the driving force behind any academic institution, harnessing the transformative power of knowledge to shape the minds and futures of their students.

Their unwavering dedication, deep expertise, and commitment to fostering an enriching learning environment are vital to the success and vibrancy of our academic community. By celebrating the achievements and contributions of educators, we create an environment that fosters innovation, inspires collaboration, and encourages continuous improvement.

The Kumaraguru Academic Excellence Awards 2024 as part of the 41st Foundation Day Celebrations of Kumaraguru Institutions on September 27, 2024 recognized faculty contribution in various domains including Innovation, Technology & Entrepreneurship.

This event is dedicated to honouring the exceptional contributions of our faculty members, reflecting the enduring legacy of our Founder Chairman, Arutchelvar Dr. N Mahalingam Ayya, whose vision for academic excellence and appreciation of faculty commitment has laid the foundation for a culture of recognition within our institution.



DYNAMIC FACULTY RESEARCHERS

Dr.G.Ramakrishnan
*Professor, Fashion
Technology*

Winner -Best Societal
Innovation Award from
National Research
Development Corporation
& Recipient of a research
grant of INR 85 lakhs from
DST, AICTE



Dr.Bharathi Dhurai
*Professor, Fashion
Technology*

Recipient of a research
grant of INR 74 lakhs from
Ministry of Textiles and
MHRD, GoI

Dr.SA.Pasupathi
*Professor,
Mechatronics
Engineering*

Recipient of a research
grant of INR 100 lakhs
from MeitY and
IITH, GoI



Dr.Premkumar
*Associate professor,
Aeronautical
Engineering*

Recipient of a research
grant of INR 90 lakhs
from DRDO, UGC and
DST, GoI

**Dr.PS.Samuel
Ratnakumar**
*Asst. professor III,
Mechanical
Engineering*

Recipient of a research
grant of INR 50 lakhs from
DRDO, GoI and University of
South Africa



Dr.R.Baskar
*Associate
Professor,
Biotechnology*

Recipient of a
research grant of
INR 33 lakhs
from DBT, GoI

FORGE 
Innovation & Ventures



Forge Innovation & Ventures (Forge), is a vertically integrated enterprise for building and operating a national-scale Open Innovation Network to catalyse talent, technology and ventures with the core purpose of powering India's innovation economy in the industrial digital age.

We make Open Innovation happen, at national scale, working with and for Industry, Academia & Government, to ultimately drive transformation through the success of startups.

Forge operates in the entire innovation value chain covering talent transformation, technology labs, product innovation, startup incubation, venture acceleration, and seed investments - enabling transformation of India's industrial sectors through programs with academia, industry, and government. Among India's top incubators and accelerators, Forge implements open innovation to deliver transformation by enabling public sector (government-owned industries & enterprises) and private sector (small-medium enterprises to large industrial majors) to collaborate with startups as strategic partners.

From Forge.Academy - a comprehensive and unique portfolio of University Accredited/Affiliated graduate education programs and professional development courses in Innovation & Entrepreneurship,

... to **Forge.Labs** - a network of Industrial Innovation Labs (7 Forge.Labs in 7 different cities of Tamil Nadu - the largest network of Fab Labs accredited by Fab Foundation, MIT/USA) that deliver India's ONLY university-accredited Innovation Practicum,

... to **Forge.Foundry** - a portfolio of Open Innovation programs enabling technology-powered transformation of Indian public sectors at provincial, regional and national levels by harnessing entrepreneurial innovation and venture capital,

... to **Forge.Fund** - the most comprehensive suite of startup catalysis services offered exclusively to Hardware startups in India - innovation grants, product acceleration, startup investments, market access, strategic advisory, and venture acceleration,

... to **Forge.Lighthouse (Future Factories Launchpad)** - an open industrial innovation platform that bridges industrial companies pursuing innovation powered transformation with startups offering technology powered solutions,

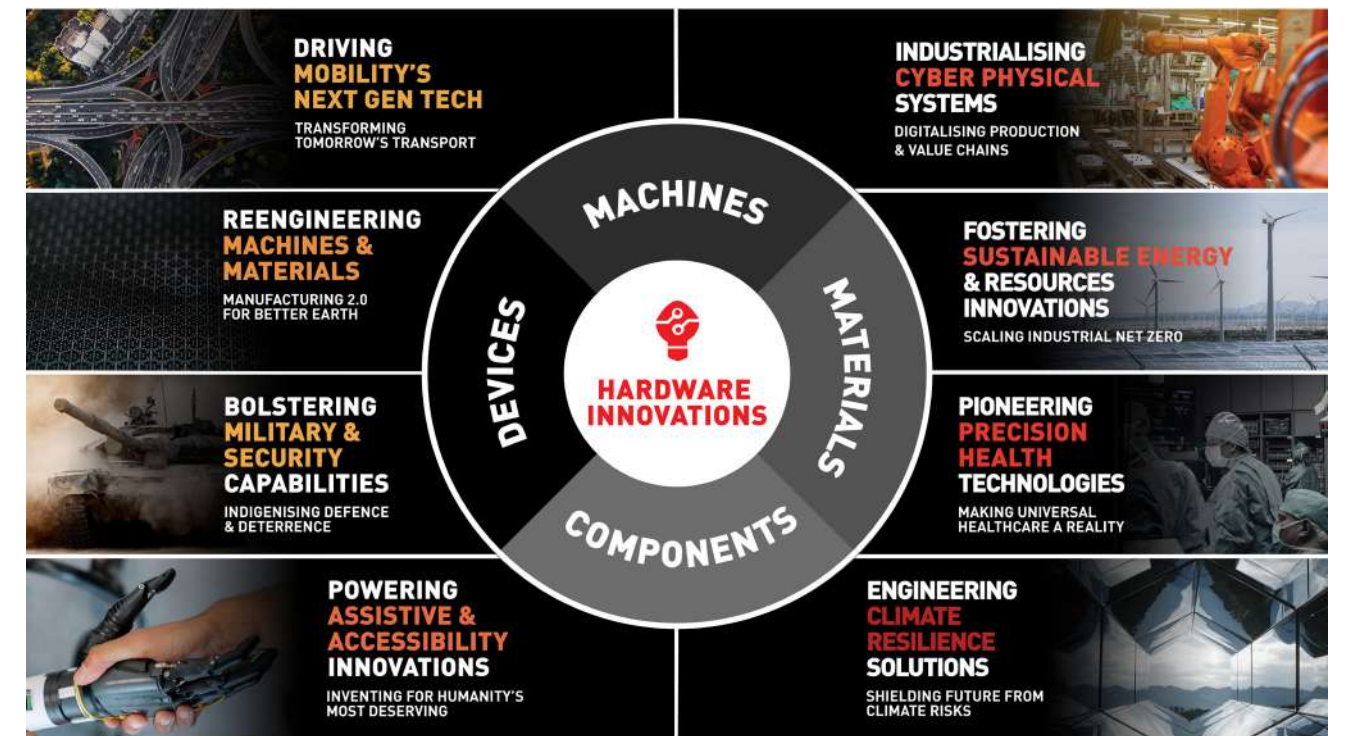
... and to **Forge.Fast Venture Studio** - a full-stack Corporate Venture Studio managed services program enabling Industrial Majors to unlock business value and gain strategic advantages across the lifecycle of seeding, accelerating, and scaling industrial tech ventures.

In over 9 years since its launch in Mar'2015, Forge has pioneered the establishment and execution of several pathbreaking programs in strategic partnerships with:

(1) Govt of India - iDEX - Min. of Defence, India's largest open innovation platform & program bridges over 40 agencies & enterprises of India's defence establishment with Indian tech startups, offering Innovation Grants up to \$3M USD; & CiX - Min. of Urban Affairs, national-scale open innovation platform that directly connects 4500+ cities & towns with India's tech startups for facilitating accelerated discovery, validation & procurement of technologically advanced innovative solutions;

(2) Govt of Tamil Nadu - FORT - JV with SIPCOT, Industries Department, FORT.Hosur & FORT.Chennai (Sriperumbudur) are operated inside industrial parks to strengthen industry-startup collaborations - FORT. Madurai is in the works set for launch in 18 months; & InnovateTN - Dept of Technical Education & TN Startup & Innovation Mission) - 4 Industrial Innovation Labs established in Govt Engineering/Polytechnic colleges in Salem, Madurai, Trichy & Tirunelveli, bringing world-class innovation education to students & educators, generating the Talent to achieve the TN = \$1Tn goal by 2030;

(3) Vedanta - Vedanta Spark, as its Knowledge & Capabilities Partner Forge led the planning and execution of the vertically integrated Corporate Venture Studio model of combining Open Innovation & Startup Accelerator with Corporate Strategy, after enabling several Global Industrial Majors to execute their startup engagement programs, including Bosch, Honeywell, Airbus, Siemens, Schneider, Daimler etc.



BASE

BASEs are full-stack Industrial Innovation Centres offering the full range of Forge's strategic engagement programs spanning deep technical infrastructure, services and resources to seed, nurture, accelerate **Phy**gital tech ventures and accelerate technology-enabled, innovation-catalysed Industrial Transformation.



HUB

HUBs focus on implementing Corporate Venture Studio programs with industrial majors as well as startup catalysis services to help startups win at every stage of the venture lifecycle.



NODE

NODEs are innovation centres operated inside University campuses or Industrial Parks aimed at Capability Building and Product Development

FORT.Chennai (BASE) Sriperumbudur | 45,000 sq. ft.

Set in the heart of South Asia's largest auto manufacturing hub, the FORT.Chennai centre is aimed at supporting startups in the development of technologies in future mobility - thereby driving the transformation of Chennai's manufacturing sector from components suppliers to tech majors in mobility and aerospace, to make it the undisputed Industrial-Tech capital of Asia.

FORT.Hosur (BASE) Hosur | 60,000 sq. ft.

Located 40 kms east of Bangalore - the startup capital of India, the FORT.Hosur centre is the ideal launchpad to bridge the manufacturing industry with technology startups to co-create Advanced Manufacturing solutions and enable the MSME sector to achieve manufacturing excellence.

Forge.Factory (BASE) Coimbatore | 27,000 sq. ft.

Forge's headquarters in TN's foremost industrial hub offers a comprehensive suite of infra, facilities and services including coworking spaces & product innovation labs aimed accelerating hardware and tech innovation, and creating enterprises that harness hardware, software, and computing technologies to solve real-world problems, drive economic growth, and deliver social impact.

Forge.Fast Accelerator (HUB) Chennai | 3000 sq. ft.

Forge.Fast is a dynamic 6-month accelerator initiative housed at the prestigious IIT-M Research Park in Chennai for Industrial Hardware Startups - with a cohort of 20-25 startups, including 8-10 in residence. The centre is aimed at driving startup success, offering Forge's entire stack of value additions to expedite their path toward achieving product-market fit.

INNOVATE TN NODES

The InnovateTN labs across 4 cities in TN operate as self-contained Integrated Industrial Innovation Labs, creating a robust innovation ecosystem in and around these industrial hubs. by leveraging an Open Innovation Model for government, MSMEs, technology providers, academia, R&D, innovators & startup entrepreneurs, investors, and incubators to collaborate and co-create industry-oriented cutting-edge technology solutions.

Forge.Lab (L2 NODE) Salem | 10,000 sq. ft.

Forge.Lab (L2 NODE) Trichy | 10,000 sq. ft.

Forge.Lab (L2 NODE) Madurai | 15,000 sq. ft.

Forge.Lab (L2 NODE) Tirunelveli | 10,000 sq. ft.

1. TALENT GENERATION & DEVELOPMENT

Building Innovation-Capable Industrial Workforce & Entrepreneurial Talent

Forge.Academy

Forge's Talent Generation & Development initiatives offers a comprehensive and unique portfolio of University Accredited/Affiliated graduate education programs and professional development courses in Innovation & Entrepreneurship for industrial workforce, students, and technical educators.

A. Talent Enrichment In Industry – Innovation Practicum for Industrial Workforce (IP-IW)

Forge helps industrial companies upgrade their present skilled workforce, from operators to executives, into future-ready innovative talent, with practical tools and mindset of Innovation & Technology Management. IP-IW equips industries with innovation & technological skills at all levels (trainees, operators, engineers). This structured program builds internal technological capabilities, enabling faster and better product development, ultimately driving sustained industry leadership.

A. User (Level 1) – Understanding and Utilising Tools

Gain foundational skills to utilise tools through practical learning.

B. Engineer (Level 2) – Managing and Maintaining Systems

Deepen understanding of systems to manage complexity & drive transformations.

C. Innovator (Level 3) – Building and Engineering Systems

Attain subject matter expertise to design, build, & implement innovative products & solutions.

B. Talent Creation in Technical Education – Innovation Practicum for Technical Education (IP-TE)

Forge’s Innovation Practicum is a curriculum-integrated framework, strategically focused on driving trans-disciplinary innovation through multidisciplinary student teams. IP-TE transforms aspiring engineers into Innovation Engineers: problem-solvers unbound by traditional limitations. Through interdisciplinary collaboration and hands-on prototyping, they forge Minimum Usable Prototypes—real-world solutions for real-world problems. Through a structured, tiered framework, this program equips students, educators, graduates, and researchers to leverage technology and develop impactful solutions to national and industrial challenges.

1. Foundational Courses: Sprints

IP-TE begins with four foundational Sprints, each a 6-day intensive course focusing on a critical stage of problem-solving:

- **Engineering Sprint**
- **Design Sprint**
- **Innovation Sprint**
- **Ideation Sprint**

These sprints equip students and educators with practical innovation skills, embedding a culture of continuous improvement and creative problem-solving.

2.Specialisation Courses: Technology-Driven Innovation

3. Certification Courses: Graduate Innovation Engineer – ProtoSem

4. Certified Innovation Professional Program for Technical Educators

C. Entrepreneurial Research Talent In Academia – Innovation Practicum for Academic Research (IP-AR)

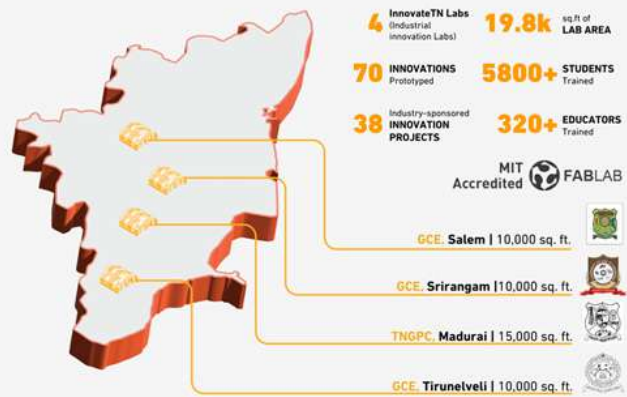
Academia brims with untapped talent and R&D prowess but doesn’t produce many breakthrough innovations. Forge bridges the gap to channel the powerhouse potential of Academia into real-world solutions for solving the industry’s toughest technology challenges. IP-AR harnesses Academic Research for Industrial Breakthroughs by empowering academic teams to think and act like startups, translating their scientific research into tangible innovation projects that emerge as dominant technologies, creating new markets and dominating existing markets.



INNOVATETN

Forging A Million Innovation Engineers & Accelerating to a \$1 Trillion TN Economy

A joint venture between the Department of Technical Education (DoTE) & TANSIM, Govt. of Tamil Nadu, and Forge Innovation & Ventures to offer Forge’s expansive Innovation Practicum for Technical Education outlined above across TN’s engineering colleges and polytechnic institutes – generating future-ready talent with futuristic skills to realise and accelerate towards Tamil Nadu’s ambitious vision of becoming a \$1 Trillion economy by 2030.



MASTER’S IN INNOVATION

Masters in Technology Management

Integrated Post-Graduate Program for Industry Professionals

MTM is an AICTE-approved post-graduate (M.Tech) program designed to transform the industrial workforce into technology leaders with innovation & design skills – leveraging Forge’s state-of-the-art industrial innovation labs and resident expertise & resources to enable participants to design, develop, demo & deploy industrial-grade process and product innovations.

Industry-Driven Curriculum

Master emerging technologies to solve real-world factory challenges.

Expertise in Tech, Business, & Operations

Lead manufacturing innovation with advanced technical, strategic, and operational skills.

Immersive Industry 4.0 Experience

Implement Industry 4.0 through hands-on projects and industry-focused programs.

Lead Digital Transformation

Drive technology adoption and spearhead digital transformation in industrial operations.



**MASTERS IN BUSINESS ADMINISTRATION
INNOVATION, ENTREPRENEURSHIP & VENTURE DEVELOPMENT**
Experiential Program to transform Innovators into Entrepreneurs

Forge’s MBA in Innovation, Entrepreneurship & Venture Development (IEV) is India’s first-of-its-kind, two-year, full-time program dedicated to fostering technology-driven, innovation-led entrepreneurship. This transformative journey equips aspiring innovators with essential skills and frameworks to move systematically from concept to commercialisation, cultivating the next generation of tech entrepreneurs.

Designed as an intensive 2 year, 104-credit curriculum spanning Product Management, Enterprise Creation, and Entrepreneurial Leadership, the 4-semester course empowers students to develop impactful, scalable ventures poised to meet tomorrow’s challenges with agility, resilience, and a drive for measurable impact.

2. TECHNOLOGY ADVANCEMENT & PRODUCT DEVELOPMENT

Developing, Advancing, Applying Discoveries & Breakthroughs To Drive Innovation-Catalysed, Enduring Competitive Advantages

Forge.Labs

The aggregate of Forge.Labs’ technology infrastructure & resources offers tools, resources and expertise to translate innovative ideas into factory-scale industrial-grade solutions faster, better and cheaper. These Industrial Innovation Labs have state-of-the-art lab facilities accredited by MIT’s Center for Bits and Atoms, Cambridge, USA – FAB Foundation; equipped with advanced digital fabrication tools such as 3D printers, laser cutters, CNC machines, and electronics prototyping equipment with the primary objective to democratise access to manufacturing technologies.

A similar technical infrastructure will be established at SIIC Madurai and will seek FAB Foundation Accreditation, focusing on sustainable energy, climate resilience, advanced digital production, and food production & processing.

SIIC Madurai shall comprise of Product Innovation and Product Compliance Labs to support the needs of startups and industrial companies across the Madurai region.

A. PRODUCT INNOVATION LABS

Product Innovation Labs shall help startups, industrial companies, and student innovators with product design & development of industrial solutions. The Product Innovation Labs shall comprise of machineries & equipments.

B. PRODUCT COMPLIANCE LABS

Product Compliance Lab provides the necessary resources and services to verify, validate, and pre-certify products, ensuring they meet regulatory & industry standards. By facilitating rigorous testing and compliance checks, the lab helps innovators and startups navigate the complex approval processes efficiently, reducing time to market and mitigating risks associated with non-compliance.

Forge.Lighthouse

Open Industrial Innovation Platform that bridges industrial companies pursuing innovation powered transformation with startups offering technology powered solutions. Forge.Lighthouse enables industrial enterprises to Discover, Validate and Partner/Procure innovative & technologically advanced innovations & solutions from startups via direct procurement, joint-product development and/or joint-industrialisation /GTM partnerships with these tech ventures.

This platform provides tailored innovation pathways suited to the technical complexity and readiness level of the required solutions, each designed to meet specific needs of industrial companies.

1. Startup Pilot Projects (SPP)

2. Managed Innovation Services

3. Academic Research Projects (ARP)

4. Industry Co-Creation Projects

Forge will offer this platform to industries in the Madurai region through regular Forge Demand Days/Weeks at SIIC Madurai. These events will facilitate seamless adoption of hardware technologies from startups by showcasing their transformative potential, enabling industry executives to identify ideal partners for long-term growth and transformation.

3. VENTURE CREATION & SCALING

Harnessing The Power Of Entrepreneurial Innovation & High-Growth Companies

Forge.Fund

A comprehensive suite of startup catalysis services offered exclusively to Hardware startups—innovation grants, product acceleration, startup investments, market access, strategic advisory, and venture acceleration.

Forge.Fund fuels startup success by providing critical programmatic interventions across the entire lifecycle of hardware tech ventures – spanning innovation, production, industrialisation and commercialisation – to ensure that its startups win at every stage.

- **Strategic Advisory**
- **Industrialisation & Commercialisation Partnerships**
- **Market Access Pathways**
- **Product Acceleration & Tech**
- **Infrastructure**
- **Investment Pathways**

Forge.Fund also provides catalytic capital via innovation grants and seed investments for hardware tech startups – funding product development in product-stage startups and commercialisation & growth in market and growth-stage startups.

- Innovation Grants for product development, enabling promising prototypes to mature into market-ready solutions;
- Pilot Grants to subsidise pilot deployments for the buyers/beneficiaries/users of startups, reducing adoption risks while stimulating traction for industrial and impact innovations;
- Growth Grants & Seed Investments to fuel product commercialisation, to scale GTM and vertically integrated operations.

To supplement this, Forge provides its startups with a structured Incubation-Acceleration process with expert guidance at every stage through Forge’s Grant Management process—rooted in Innovation/Product Management principles and tracked by milestones and metrics, ensures process-driven execution excellence and efficient fund utilisation for maximum impact, ensuring that these startups win.

Forge.Foundry

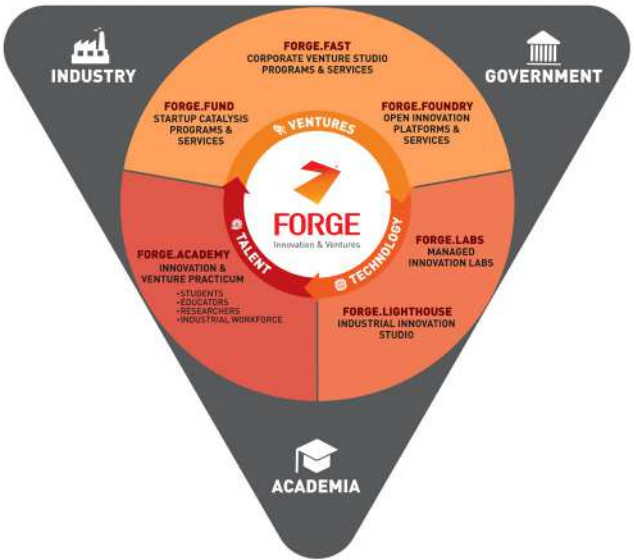
A Portfolio of Open Innovation programs enabling technology-powered transformation of public sectors at provincial, regional and national levels by harnessing entrepreneurial innovation and venture capital.

Forge provides Managed Open Innovation Services to public sector and impact enterprises, bringing together public corporations, government agencies, and departments to engage with high-growth tech startups. Through an accelerated pathway for co-development, certification, and procurement, Forge enables the adoption of breakthrough technologies and innovative solutions, driving transformation powered by technology and catalysed by innovation.

Forge.Fast

A full-stack Corporate Venture Studio managed services program enabling Industrial Majors to unlock business value and gain strategic advantages across the lifecycle of seeding, accelerating and scaling industrial tech ventures.

Forge.Fast leverages proven strategies and operating models namely Open Innovation, Startup Innovation, Venture Building and Venture Capital, and their convergence with Corporate Strategy for unlocking business value and gaining competitive advantage across the lifecycle of seeding, accelerating, and scaling industrial tech ventures – offered to industrial companies under a Corporate Venture Studio-as-a-Service model.



KUMARAGURU **KC.IRI** CENTRE FOR INDUSTRIAL RESEARCH & INNOVATION

Kumaraguru Centre for Industrial Research and Innovation (KC.IRI) is a focused Research & Innovation Eco System as part of KI, in collaboration with Industries for promotion of Industry-specific Research & Innovative Product Development established in 2017.

The Kumaraguru Centre for Industrial Research and Innovation (KC.IRI) at Kumaraguru College of Technology (KCT) is a premier research hub focused on fostering collaboration between academia, industry, and government agencies. Its mission is to promote applied research, innovative product development, and skill enhancement in critical engineering and technological fields, with a strong focus on indigenization through partnerships with DRDO, DPSUs, and other government research organizations.

RESEARCH & CONSULTANCY PROJECTS

- Re-engineering
- Structural analysis and simulation
- Computational Fluid Dynamics

INNOVATIVE PRODUCT DEVELOPMENT

- Autonomous Vehicles
- Electric Vehicles
- Industry 4.0 and IIoT

SKILL DEVELOPMENT PROGRAMS

- New Product Development
- E-Mobility
- Defence Technology

KUMARAGURU **KC.IRI** CENTRE FOR INDUSTRIAL RESEARCH & INNOVATION

KCIRI PRODUCT DEVELOPMENT CENTRE



DESIGN

- Engineering Design
- 3D Modelling
- Simulation & Analysis
- Manufacturing
- Reliability



TESTING & CERTIFICATION

- Material
- Thermal / Vibration
- Shock / Bump / Fatigue
- EMI/EMC
- Certification



DEVELOPMENT

- Fabrication
- Assembly & Integration
- Prototype Development
- Documentation
- Software Development



MODIFICATION / UPGRADATION

- Product Life Estimation
- Test Rigs Development
- Critical Components Sourcing



OVERVIEW

Kumaraguru Centre for Industrial Research and Innovation (KC.IRI) is a focused Research & Innovation Eco System as part of KI, in collaboration with Industries for promotion of Industry-specific Research & Innovative Product Development established in 2017 with:

- Dedicated Technical & Project Management Team
- Industry & Defence experts as Technical Consultants & Advisors
- Supported by Faculty Experts & Student Interns

Industrial Research Projects:

- Re-engineering
- Structural analysis and simulation
- Computational Fluid Dynamics
- Product Design and Development

Innovative Product Development

- Autonomous Vehicles and Industrial BOTs
- Electric Vehicles Conversion & Retro fitment
- Suspension systems for Automotive
- Lead Lag Dampers for Helicopters
- Defence Products Indigenization, Repair, Modification & Upgradation
- Test Rigs for Automotive & Aerospace

Research , Development & Testing Centres:

- Centre of Excellence in Advanced Design
- Centre for Research in Renewable Energy
- DRDO funded Centres for Aerospace, Mechanical, Materials & Propulsion Systems
- Industry supported Technology Centres for Product Development and Testing

DEFENCE PRODUCT DEVELOPMENT CENTRE

Initiatives for Accelerating Defence & Aerospace Industry in TN Defence Industrial Corridor to drive "Atma Nirbhar Bharat"

- Specialized Consultancy Services by KCIRI technical team
- Panel of technical experts from DRDO, Defence Services, DGQA, & DPSUs
- Technical support to MSMEs for RFP, Development, Testing and Certification
- Modelling, Analysis, & Simulation for Prototype Design and Development
- Setting up Industry Supported Testing & Evaluation facilities
- Specialized Training programs in Advanced Defence Systems & Technologies

KCIRI

KI, FORGE, Faculty, Students

Defence Services

Airforce, Army, Navy, DRDO, DPSUs, DGQA

Government & Industry Associations

TIDCO, TIIC, CDIIC, AIDAT

Defence Industries

L&T, LMW, TASL, ASTRA, MSMEs

CENTRES OPERATING UNDER KC.IRI

- Centre of Excellence in Advanced Design – CEAD
- DRDO Centre for Surface Coating and Nanotechnology
- DRDO Centre for Propulsion System
- DRDO Centre for Aerospace & Mechanical Systems
- KEnTec – Industry supported Technology Centre for Product Development and Testing
- KCT – Ezon Centre for Research in Renewable Energy

KC.IRI PROJECTS / PRODUCTS FOR AEROSPACE, AUTOMOTIVE & DEFENCE

ORGANIZATION	CUSTOMERS	PROPOSALS VALUE
DRDO – Aerospace Consultancy	ADE, CABS, DRDL, AR&DB	130 Lakhs
Defence Services : Airforce / Army / Navy – Indigenisation, Repairs & Upgrades	5BRD, 8BRD, ADB, iDEX, INS Rajali	250 Lakhs
DRDO / DPSU – Product Development, Indigenisation	ARDE, HAL, Brahmos, CVRDE	300 Lakhs
Industries – Product Development & Test Rigs	Artemon, AMIGO, BHFlux, Slumberg, Bosch, Altran, Pricol	200 lakhs
Industries – Consultancy Projects	AEPL, LMW, Sigmaflow, Ezon, SKF	20 Lakhs



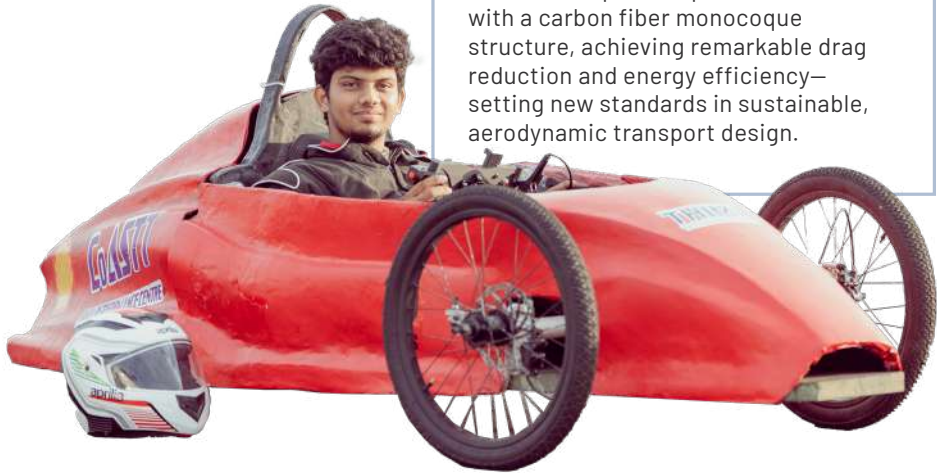
RiDE

RESEARCH INNOVATION

DESIGN ENTREPRENEURSHIP

REVIEW

THE ARTICLES



**Aerodynamic Innovations
in Velomobile Design:
Bio-Inspired Monocoque
Structures Based on
Dolphin Morphology**

54

Pioneers dolphin-inspired velomobiles with a carbon fiber monocoque structure, achieving remarkable drag reduction and energy efficiency—setting new standards in sustainable, aerodynamic transport design.

**Eco-Friendly Innovations
in Home Textiles:
Harnessing Natural Dyes
for Sustainable Jute
Fabrics**

48

Natural dyes from annatto and neem on jute fabric yield eco-friendly home textiles with strong color retention and thermal resistance, presenting a sustainable, aesthetic alternative in the textile industry.

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EDITORIAL TEAM**

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**DEPARTMENT OF
COMMUNICATION SERVICES**

PHOTO CREDITS: STUDIOKCT

**Innovative Design And
Development Of Cantilever
Wheel Hubs For Trikes:
A Focus On The
Shell Eco-Marathon**

58

Innovative cantilever wheel hubs for trikes offer lightweight, resilient designs that enhance aerodynamics, energy efficiency, and structural integrity—paving the way for sustainable urban mobility advancements.

**Exploring the Mechanical
Properties of Pineapple
Fiber Composites for
Boat Cockpits**

36

Pineapple leaf fiber composites offer a sustainable, strong, and lightweight alternative for boat cockpits, combining eco-friendliness with high tensile, flexural, and impact strength—ideal for marine applications.

**A New Era In Turbine Design: The Extraordinary Potential
Of Hybrid High Entropy Alloys**

60

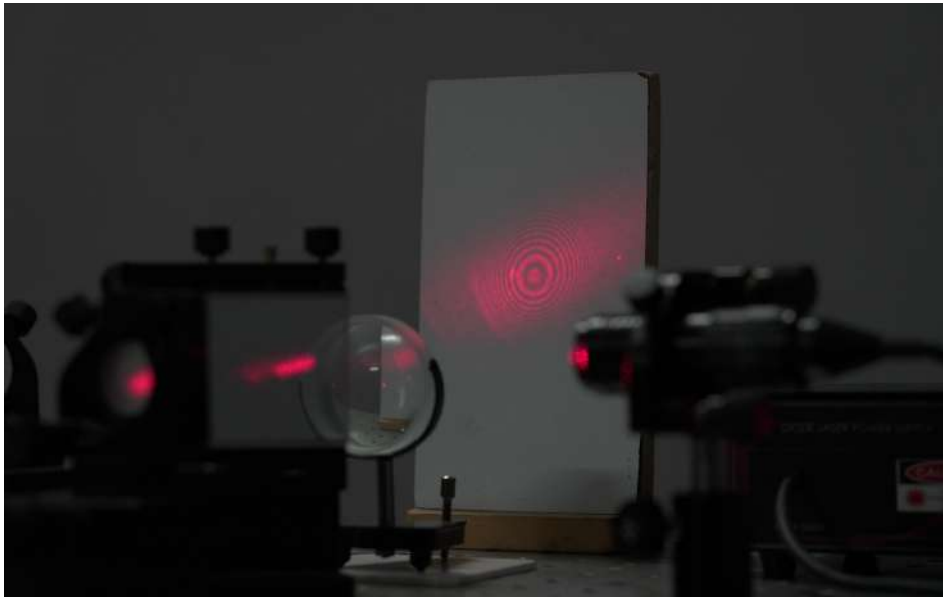
Hybrid High Entropy Alloys (HEAs) enhanced with carbon nanotubes promise groundbreaking advances in turbine blades, delivering exceptional strength, corrosion resistance, and thermal stability for aerospace applications.



**Exploring the Strength
and Sustainability of Bio-
Composites
Made from Jute and
Sugarcane Bagasse Fibers**

38

Jute and sugarcane bagasse fiber bio-composites present sustainable, high-strength alternatives for automotive thermal insulation, combining renewable resources with robust mechanical and thermal properties for eco-friendly applications.



**Smart Water
Stewardship:
Leveraging Machine
Learning For Predictive
Leakage Detection In
Pipeline Systems**

50

Machine learning enhances water distribution by enabling real-time leak detection, reducing water loss, and optimizing resource management. This scalable approach promotes sustainable, efficient water stewardship worldwide.

**Revolutionizing Construction:
The Benefits of Geopolymer Bricks Made from
Industrial By-Products**

62

Geopolymer-based red mud bricks, made from industrial by-products, offer a sustainable, eco-friendly alternative to traditional clay bricks, reducing emissions and promoting a circular economy in construction.

**Indoor Industrial Electric Trike:
Revolutionizing Mobility in Spinning Mills**

66

This research optimizes NiB nanocrystalline coatings electroplated onto steel substrates, improving wear, corrosion, and erosion resistance, with enhanced durability through optimized plating conditions and post-deposition annealing.

**Shining a Light on
Surface Roughness:
The Laser Speckle
Technique Unveiled**

40

The laser speckle technique offers an innovative method for measuring surface roughness in nanostructured TiO2 thin films, enhancing understanding of their properties for applications in coatings, sensors, and photocatalysts.

**Optimization and Characterization of Electroplated
NiB Nanocrystalline Coatings for Enhanced Erosion
and Corrosion Resistance**

44

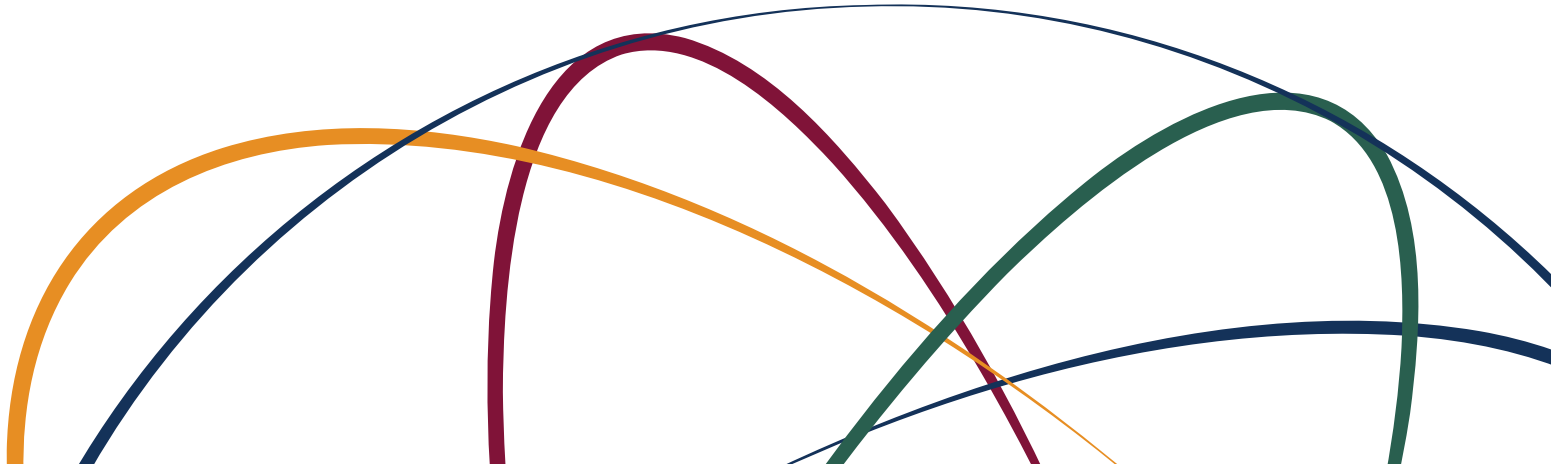
The “Trike 2π” is an eco-friendly electric industrial trike designed for spinning mills, improving worker mobility, reducing downtime, and enhancing production efficiency with its compact, agile, and emission-free design.



**Enhancing Electric Vehicle
Battery Performance Using
Composites: Unlocking the
Future of Battery Cooling**

42

Innovative composite-based phase change materials (CPCMs) enhance electric vehicle battery cooling by improving heat transfer, addressing thermal challenges, and ensuring long-term performance and safety in EV batteries.



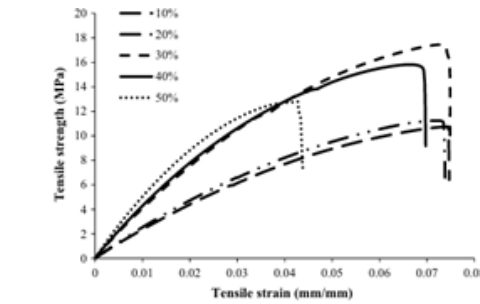
Exploring the Mechanical Properties of Pineapple Fiber Composites for Boat Cockpits

In recent years, a shift toward sustainable materials has gained momentum in industries across the world. As environmental concerns rise and regulations grow stricter, manufacturers are seeking eco-friendly alternatives to traditional synthetic fibers such as glass and carbon fibers. Enter natural fibers—lighter, strong, and Greener, biodegradable materials sourced from plants. Among these fibers, one in particular has been gaining traction: pineapple leaf fiber (PALF).

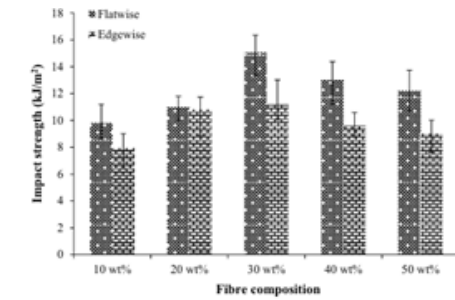
PALF is biodegradable, meaning it breaks down naturally over time without leaving harmful residues in the environment. This is particularly important in industries like marine and automotive, where materials are exposed to harsh environments and eventually need to be replaced. The use of PALF composites in boat cockpits, for example, could significantly reduce the environmental impact of the boating industry, which often relies on non-recyclable synthetic composites.

In addition to tensile strength, PALF exhibits strong flexural and impact properties. Flexural strength refers to the material's ability to resist deformation under a load, essentially measuring how well it can bend without breaking.

Impact strength is another crucial factor. It measures how well a material can absorb energy from a sudden force or impact without breaking. Research showed that PALF composites with 30 wt% fiber content exhibited the highest impact strength, meaning they can absorb more energy from impacts than many other natural fiber composites.



Stress-strain curves of PALF-reinforced PP composites



Impact strength of PALF-reinforced composites in flatwise and edgewise orientations

Once the fibres are prepared, they are mixed with a bio-polymer matrix, which enhances their eco-friendliness. These Pineapple fibres are then combined with carbon fibre in a sandwich construction method, providing improved bonding and integration. By employing induction vacuum moulding, the materials are fused together under controlled conditions, resulting in superior structural strength and stability. The use of the sandwich method significantly increases the material's overall performance by distributing stress more evenly across layers, making it ideal for applications requiring lightweight yet strong components.

One of the most groundbreaking aspects of this cockpit design is the materials used in its construction. The design team conducted extensive research into sustainable materials that could deliver the necessary performance without compromising on environmental responsibility. This research explored a range of natural fibers, including flax, hemp, bamboo, and pineapple, in conjunction with high-performance carbon fiber. Ultimately, the innovative decision was made to use a carbon fiber-pineapple composite for the cockpit's structure.



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LIGHTER,
STRONG,
GREENER

”

“

PINEAPPLE FIBRES ARE THEN COMBINED WITH CARBON FIBRE IN A SANDWICH CONSTRUCTION METHOD, PROVIDING IMPROVED BONDING AND INTEGRATION

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Exploring the Strength and Sustainability of Bio-Composites Made from Jute and Sugarcane Bagasse Fibers



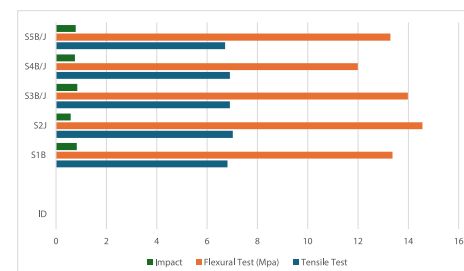
This study delves into the innovative development of bio-composites utilizing jute and sugarcane bagasse fibres, specifically for applications in automotive thermal insulation. As the automotive industry increasingly seeks sustainable materials to reduce its environmental footprint, natural fibres have emerged as viable alternatives to traditional synthetic materials. Jute and bagasse, both renewable resources, offer significant ecological advantages and mechanical benefits when combined with biodegradable polyvinyl acetate (PVA) resin.

The study's findings were significant. Among the various composite formulations tested, the S2J composite, which comprised 70% jute and 30% bagasse, stood out by demonstrating the highest tensile and flexural strength. This composite not only exhibited robust mechanical performance but also provided excellent thermal insulation properties, making it particularly suitable for automotive applications where thermal management is crucial.

The extraction of bagasse fibres begins with the collection of sugarcane residues post-sugar extraction. Bagasse, the fibrous by-product of sugarcane processing, offers a rich source of natural fibres. To enhance the properties of these fibres, a chemical treatment is employed. In this study, the bagasse fibres are immersed in a 12% sodium hydroxide (NaOH) solution for a duration of three hours at elevated temperatures of 70-80°C.

This treatment serves multiple purposes: it helps to remove lignin, hemicellulose, and other impurities, thereby improving the overall mechanical properties of the fibres.

The extraction of jute fibres involves harvesting the fibres from Corchorus plants, specifically *C. capsularis*. The extraction process typically involves retting, where the jute stalks are submerged in water to facilitate the separation of fibres from the stem. Once the retting is complete, the fibres are washed, dried, and processed for use in composite applications.



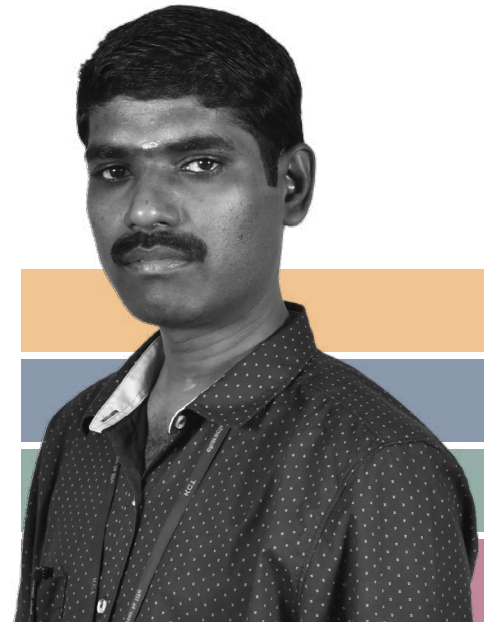
JUTE AND SUGARCANE BAGASSE FIBRE-REINFORCED COMPOSITES AS SUSTAINABLE ALTERNATIVES TO TRADITIONAL MATERIALS

To form the composite plates, compression moulding is employed, integrating the treated jute and bagasse fibres with a biodegradable polyvinyl acetate (PVA) resin as the binding matrix. This process involves placing the fibre mixture and resin into a mold, which is then subjected to heat and pressure. Compression moulding ensures uniform distribution of the fibres within the resin matrix, enhancing the interfacial bonding, which is crucial for optimizing the mechanical properties of the composites.

Overall, the experimental evaluation of these mechanical properties illustrates the potential of jute and sugarcane bagasse fiber-reinforced composites as sustainable alternatives to traditional materials in various applications.

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Shining a Light on Surface Roughness: The Laser Speckle Technique Unveiled

The study investigates the surface roughness characteristics of nanostructured titanium dioxide (TiO₂) thin films utilizing the laser speckle technique, focusing on how these properties vary with different annealing temperatures. Titanium dioxide is widely recognized for its unique properties, including photocatalytic activity, high chemical stability, and environmental safety. These attributes make TiO₂ an attractive candidate for various applications, including coatings, sensors, and photocatalysts. Understanding the surface morphology of TiO₂ thin films is critical to optimizing their performance in these applications.

Surface roughness is a crucial parameter influencing the functional properties of materials across various fields, including manufacturing, optics, and tribology. It directly impacts characteristics such as adhesion, wear resistance, and optical clarity, making accurate measurement essential for quality control and performance optimization.

The principle behind laser speckle methods is relatively straightforward yet highly effective. When a coherent laser beam is directed at a rough surface, the incident light scatters in numerous directions due to the surface irregularities. This scattering results in an interference pattern known as a speckle pattern, characterized by its granular appearance. Each speckle represents the collective effect of multiple scattered light waves, encoding valuable information about the microstructure of the surface.

The beauty of the laser speckle technique lies in its ability to capture and analyze the statistical properties of the speckle pattern. Parameters such as contrast, intensity distribution, and autocorrelation can be extracted and are directly related to the surface's roughness characteristics.

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**GREY WATER
REFURBISHING
SYSTEM, WHICH
UTILIZES
A SOLAR-
POWERED
DISTILLATION
PROCESS TO
PURIFY THE
GREYWATER
EFFICIENTLY.**

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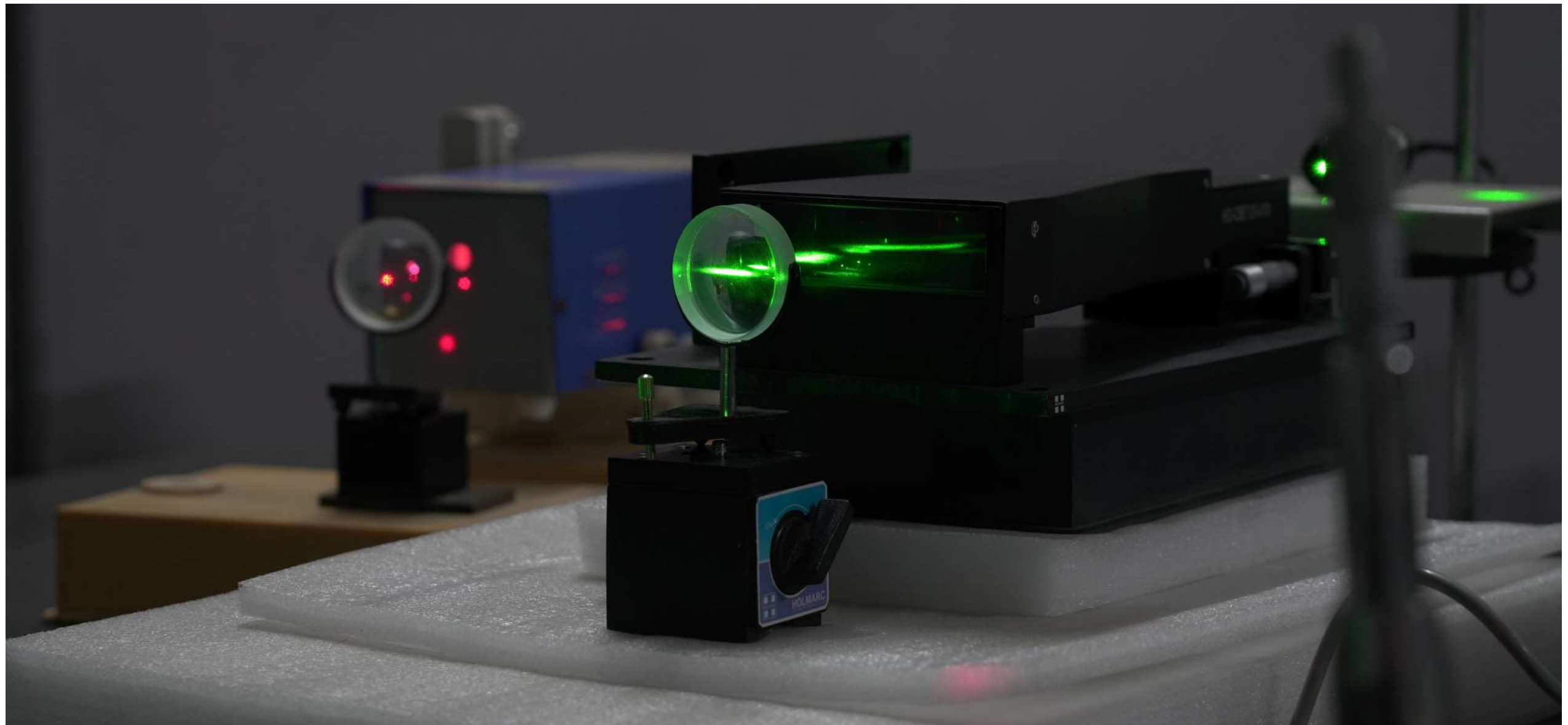
A coherent light source, such as a Helium-Neon (He-Ne) or diode laser, plays a pivotal role in the laser speckle technique for surface roughness characterization. The selection of the laser wavelength is critical and must be carefully considered based on the surface

roughness being measured. To capture the speckle pattern, a high-resolution charge-coupled device (CCD) camera is employed. Once the speckle patterns are captured, they undergo processing using specialized software designed for statistical analysis. The contrast of the speckle pattern indicates the extent of variation in intensity, which correlates with surface roughness. Higher contrast values typically suggest greater roughness due to increased light scattering from surface irregularities.

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**THE BEAUTY
OF THE LASER
SPECKLE
TECHNIQUE LIES
IN ITS ABILITY TO
CAPTURE AND
ANALYZE THE
STATISTICAL
PROPERTIES OF
THE SPECKLE
PATTERN**

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Enhancing Electric Vehicle Battery Performance Using Composites:

Unlocking the Future of Battery Cooling

Electric vehicles (EVs) are often hailed as the future of transportation, and rightfully so. They offer a cleaner, more sustainable alternative to traditional gasoline-powered vehicles, which contribute significantly to global pollution. By eliminating tailpipe emissions and relying on electric power, EVs help reduce carbon footprints, making them a crucial part of efforts to combat climate change. But beyond their environmental benefits, EVs also represent a significant leap in vehicle technology, promising lower maintenance costs, improved efficiency, and a more comfortable driving experience.

As electric vehicles gain popularity, ensuring the long-term performance and safety of their batteries has become a top priority for researchers and manufacturers alike. The main concern is the thermal management of lithium-ion batteries. Excessive heat can lead to a range of issues, from reduced battery efficiency to dangerous thermal runaway, where the battery overheats to the point of catching fire or releasing toxic gases. To address these challenges, this article delves into an innovative solution: composite-based phase change materials (CPCMs) that enhance battery cooling in EVs.

So, how can we make Phase Change Materials more effective at cooling EV batteries? The answer lies in Composite-Based PCMs (CPCMs)**. By mixing PCMs with high-thermal-conductivity additives, we can improve their ability to transfer heat, making them far more effective for thermal management in electric vehicles.

A COMMON PCM USED IN BATTERY COOLING:

Carbon Black: A form of carbon with excellent thermal and electrical conductivity.

Aluminum Oxide (Al₂O₃): A ceramic material known for its ability to withstand high temperatures and transfer heat efficiently.

Expanded Graphite (EG): A highly porous material with exceptional thermal conductivity, making it an ideal candidate for enhancing PCMs.

One of the most critical aspects of the experiment was the discharge rate. Batteries can discharge at different rates depending on the power demand. A 1C discharge rate means that the battery discharges its full capacity in one hour, while a 3C discharge rate, which was used in this experiment, means that the battery discharges in just 20 minutes. This rapid discharge generates significant heat, pushing the thermal management system to its limits.

Using thermal sensors, we monitored the temperature distribution within the battery modules as they underwent the 3C discharge test. We compared the performance of pure paraffin wax against the composite PCMs to see how effectively each material managed the heat generated by the battery.

“
**EVS HELP
REDUCE CARBON
FOOTPRINTS,
MAKING THEM A
CRUCIAL PART
OF EFFORTS
TO COMBAT
CLIMATE
CHANGE**
”

In conclusion, the future of electric vehicles is bright, but it's also hot – literally. Managing the heat generated by powerful lithium-ion batteries is one of the greatest challenges facing the EV industry today. However, as this study shows, by embracing Composite-based Phase Change Materials and continuing to innovate in thermal management, we can overcome this challenge and unlock the full potential of electric vehicles.

The road ahead is clear. With the right cooling solutions in place, the electric vehicle revolution is well on its way to becoming a reality for millions of drivers worldwide.

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The experiment demonstrated that composite phase change materials (PCMs) significantly enhanced battery thermal management compared to pure paraffin wax. Carbon black reduced the battery's maximum temperature by 1.1°C, improving heat distribution and reducing hot spots. Aluminium oxide (Al₂O₃) provided a greater reduction of 1.9°C, leveraging its ceramic properties for efficient heat transfer. However, expanded graphite (EG) was the most effective, lowering the maximum temperature by 4°C and maintaining an optimal operating temperature of 28°C. These results show the potential of nano-additives in composite PCMs to significantly enhance battery cooling and performance.



Optimization and Characterization of Electroplated NiB Nanocrystalline Coatings for Enhanced Erosion & Corrosion Resistance

Summary

This research explores the synthesis and performance of NiB nanocrystalline coatings electroplated onto steel substrates under various plating conditions. Key parameters such as bath temperature, plating time, and current density were optimized. The structural and mechanical properties were evaluated using SEM, EDAX, and XRD, with testing focused on wear, corrosion resistance, and high-temperature performance. The results indicate improved durability, particularly in erosion-resistant applications.

Introduction

In modern manufacturing, protective coatings are essential for enhancing the durability of metallic components. Electroplating offers a versatile method for improving corrosion and wear resistance. This study focuses on NiB nanocomposite coatings, exploring how electrodeposition parameters like bath temperature and current density affect their structural and mechanical properties. The goal is to develop coatings with enhanced wear and corrosion resistance, ideal for high-stress, erosion-prone environments.

Methodology

The NiB nanocomposite coatings were electroplated onto EN19 steel substrates. A five-step cleaning procedure, including ultrasonic treatment, was applied to ensure substrate readiness. The electroplating process was optimized by varying factors such as electrolyte concentration, current density, and bath temperature. Post-deposition annealing was performed to improve adhesion and mechanical performance.



Figure 1: Schematic of the electrodeposition process for NiB nanocrystalline coatings

Structural analysis was carried out using SEM for surface morphology, XRD for crystalline structure, and EDAX for chemical composition. Mechanical properties such as hardness, wear resistance, and corrosion behaviour were evaluated through various standardized tests, including Vickers Hardness, salt spray, and pin-on-disc wear tests. High-temperature erosion resistance was tested using a gas-jet erosion apparatus.



Key Findings

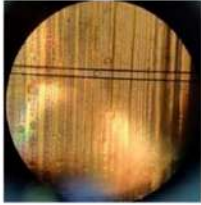
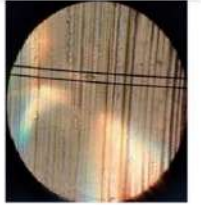
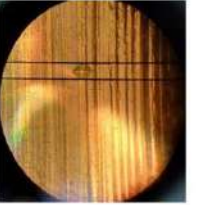
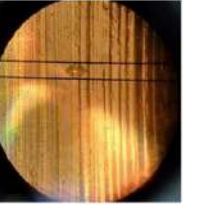
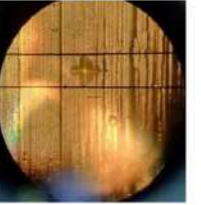
NiB coatings were successfully applied on EN19 steel with uniform thickness and adhesion. Optimizing bath temperature and current density achieved a coating thickness of approximately 20 μm . XRD and SEM analyses confirmed the nanocrystalline nature of the coatings. EDAX revealed a consistent chemical composition across the surface, with no significant defects

Observations and Future Scope

The optimized electroplating of NiB nanocrystalline coatings onto steel substrates has demonstrated significant improvements in mechanical properties, including enhanced hardness, corrosion resistance, and wear performance. These coatings are highly suitable for erosion-prone applications in harsh environments.

Future work should focus on refining the electrodeposition process, exploring new additives to further enhance performance, and conducting long-term durability tests under varied environmental conditions.

or impurities. Hardness testing showed a remarkable increase in Vickers hardness for NiB-coated substrates (1260 VHN), compared to the uncoated steel (365 VHN). The corrosion resistance of NiB coatings was significantly enhanced, with a corrosion rate of 3×10^{-4} mm/year, as opposed to the uncoated substrate's 8.89×10^{-2} mm/year, based on salt spray tests.

S.No.	Load – 1N	Load – 2N	Load – 3N	Load – 5N	Load – 10N
NiB annealed sample					
Average Hardness	1267HV	1175HV	1166HV	1149HV	1057HV

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3. Gopi, K. R., Prasad, K. K., & Surendran, K. P. (2022). "A review on the development and applications of nickel-boron (Ni-B) coatings: Electrodeposition and electroless techniques." Journal of Coatings Technology and Research, 19(4), pp. 815-830.

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Eco-Friendly Innovations in Home Textiles: Harnessing Natural Dyes for Sustainable Jute Fabrics

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ANNATTO AND
NEEM ON JUTE
FABRIC, TO
CREATE ECO-
FRIENDLY
HOME
TEXTILES

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In an era of increasing environmental consciousness, the textile industry stands at a crossroads, facing significant scrutiny over its contributions to pollution and waste. From harmful emissions during production to the long-term environmental toll of plastic-based products, the call for sustainable alternatives has never been more urgent.

Amid this backdrop, the use of natural dyes extracted from annatto and neem on jute fabric, to create eco-friendly home textiles, aiming to combine sustainability with aesthetic appeal.

Jute emerges as a prime candidate for creating sustainable home textiles. Its compatibility with natural dyes further enhances its appeal, allowing production of aesthetically pleasing and environmentally friendly products.

Here, hydrogen peroxide was chosen as the bleaching agent. Hydrogen peroxide is used due to its effectiveness and relatively low environmental impact compared to other bleaching agents. The choice of hydrogen peroxide as a bleaching agent aligns with the study's eco-friendly objectives. Unlike chlorine-based bleaches, hydrogen peroxide breaks down into water and oxygen, leaving no harmful residues in the environment.

The process involves treating the grey jute fabric with a solution of hydrogen peroxide, trisodium phosphate, and sodium hydroxide at elevated temperatures. The bleaching is conducted in a closed vessel at temperatures between 80°C and 85°C for 90 minutes. The result is a clean, white fabric ready for the dyeing process.

Sublimation fastness refers to the fabric's ability to retain its color when exposed to high temperatures. The sublimation fastness of the dyed jute fabric was tested using the AATCC Test Method 117-2004, which is a standard test for evaluating the resistance of dyed fabrics to sublimation. The results showed that the dyed jute fabric exhibited excellent sublimation fastness, with negligible or no change in color even at temperatures as high as 150°C.



Thermal resistance is a measure of the fabric's ability to insulate against heat. The thermal resistance of the dyed jute fabric was tested using a method that involves heating the fabric to body temperature (33°C - 35°C) and measuring the difference in heat flow with and without the fabric sample. The results indicated that the dyed jute fabric has good thermal resistance, with an average value of 43.9 m²/W.

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Smart Water Stewardship: Leveraging Machine Learning For Predictive Leakage Detection In Pipeline Systems

Abstract

This study presents a machine learning framework for real-time leak detection in water distribution networks, tackling the critical issue of water loss. By leveraging hydraulic simulations and Wireless Sensor Network data, we implement algorithms to effectively identify leaks and optimize water management.

Water Distribution Networks (WDNs) are essential for supplying potable water to communities, yet they grapple with significant leakage, resulting in losses of up to 40% of the distributed supply. This not only strains financial resources but also worsens water scarcity. To address this pressing issue, we leverage machine learning for real-time leak detection, thereby enhancing the efficiency and sustainability of WDNs.

Our methodology begins with EPANET, an advanced hydraulic modeling platform that simulates pressure dynamics under various leakage scenarios, establishing benchmarks for identifying anomalies. By integrating real-time data from Wireless Sensor Networks (WSNs) and utilizing cloud computing for extensive data analytics, we detect trends and irregularities effectively.

“
**GRAPPLE WITH
SIGNIFICANT
LEAKAGE,
RESULTING IN
LOSSES OF UP
TO 40% OF THE
DISTRIBUTED
SUPPLY**
”

We employ three sophisticated machine learning algorithms—Logistic Regression, Support Vector Machine (SVM), and Decision Tree—each offering distinct advantages for accurate data analysis. This high accuracy equips WDN operators to respond proactively, conserving vital water resources. Ultimately, our pioneering approach minimizes dependence on manual inspections and offers scalability suitable for networks of varying sizes. By integrating machine learning into contemporary water management practices, we promote a more sustainable and resilient future for global water distribution systems, ensuring the continued availability and accessibility of this essential resource for all.

Beyond WDNs, our leak detection approach can be applied to oil pipelines, where unnoticed leaks can lead to severe environmental impacts. Similarly, in sewage systems of developing countries, automation through sensor networks and machine learning enhances safety and efficiency.

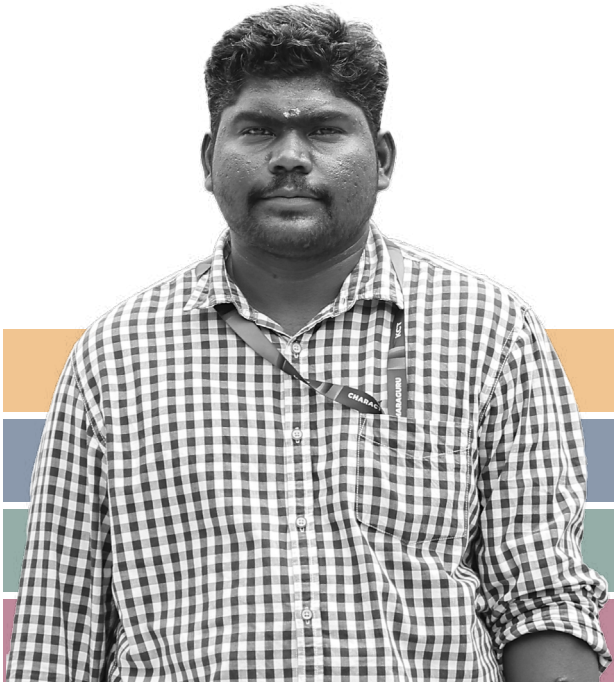
Additionally, real-time water quality monitoring can safeguard public health in rural areas by ensuring immediate detection of contamination. This adaptable methodology also extends to underground liquid transportation systems across various industries, highlighting its transformative potential for increased resilience and efficiency.

This approach to leak detection in water distribution networks (WDNs) holds significant promise for addressing various real-world challenges across multiple sectors. For instance, similar machine learning models and sensor-based systems can be effectively deployed for leakage detection in oil pipelines, which traverse vast and often remote terrains.

These pipelines are prone to unnoticed leaks that can lead to severe environmental degradation and substantial financial losses. Implementing early detection systems based on our methodology could significantly mitigate such risks.

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**REAL-TIME
INFORMATION
FROM WIRELESS
SENSOR
NETWORKS
(WSNs)
ENABLES
CONTINUOUS
DATA
COLLECTION
AND
TRANSMISSION**
”

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Aerodynamic Innovations in Velomobile Design: Bio-Inspired Monocoque Structures Based on Dolphin Morphology

Abstract

This innovative study reveals velomobiles inspired by dolphins, employing a cutting-edge carbon fiber monocoque design to enhance aerodynamics and energy efficiency. Insights from the Shell Eco-Marathon demonstrate significant drag reduction and improved energy metrics, positioning this approach as a transformative solution for sustainable transportation.

This groundbreaking study delves into the design of velomobiles inspired by the sleek elegance of dolphins, utilizing an innovative carbon fiber monocoque framework to amplify aerodynamics and energy efficiency. Insights gleaned from the Shell Eco-Marathon unveil significant reductions in drag and impressive energy metrics, positioning this pioneering approach as a transformative solution for sustainable transportation.





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LEVERAGING CUTTING-EDGE CARBON FIBER INNOVATION TO ACHIEVE UNPARALLELED AERODYNAMICS AND ENERGY EFFICIENCY. LEVERAGING CUTTING-EDGE CARBON FIBER INNOVATION TO ACHIEVE UNPARALLELED AERODYNAMICS AND ENERGY EFFICIENCY.

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To achieve this, a comprehensive methodology was employed, starting with the conceptualization of a teardrop-shaped monocoque structure,

meticulously crafted using CAD software. Carbon fiber, known for its lightweight yet robust properties, was selected alongside a resin matrix to enhance structural integrity. The construction process involved layering carbon fiber sheets over a custom mold, replicating the dolphin's hydrodynamic curvature, thereby minimizing seams and drag points.

Performance testing revealed a drag coefficient of just 0.15 for the dolphin-inspired velomobile, markedly lower than the conventional 0.20 observed in traditional models. Energy trials demonstrated a 20% improvement in efficiency, with the velomobile consuming only 0.75 kWh/100 km at 30 km/h, compared to 0.94 kWh/100 km for standard designs. These findings validate the hypothesis that biomimicry can significantly enhance vehicular performance, aligning with the goals of sustainable engineering.

In conclusion, this research not only highlights the remarkable potential of nature-inspired design but also lays the groundwork for future advancements in eco-friendly transportation. By refining manufacturing techniques and exploring scalability, this innovative approach can pave the way for widespread adoption of high-performance, sustainable velomobiles in the evolving landscape of green mobility.

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Innovative Design And Development Of Cantilever Wheel Hubs For Trikes: A Focus On The Shell Eco-Marathon

Abstract

This study investigates cutting-edge cantilever wheel hubs for trikes, emphasizing their potential for lightweight innovation and superior aerodynamics in sustainable transport. We explore advanced materials and pioneering engineering solutions to elevate energy efficiency and revolutionize urban mobility.

“
CUTTING-EDGE INNOVATIONS IN MATERIALS AND DESIGN ANALYSIS ARE KEY TO ACHIEVING THIS GOAL
”

The design of the wheel hub is crucial for optimizing vehicle weight, striking a balance between mass reduction and structural integrity. Cutting-edge innovations in materials and design analysis are key to achieving this goal. The stub axle endures dynamic fatigue loads while supporting the vehicle's weight and minimizing stress on mountings. Notably, the analysis of the hub and axle can be performed independently of bearing design, paving the way for groundbreaking lightweight solutions and resilient engineering advancements.

One researcher emphasizes key factors influencing outcomes, highlighting positive results from various case studies, while another critiques this perspective, arguing for a more nuanced, context-dependent understanding. A third researcher introduces a groundbreaking methodology that has gained popularity in subsequent studies, collectively underscoring the complexity of the subject and the necessity for a multifaceted approach.

Lefty Hub has become an essential platform, skillfully aggregating and disseminating research findings. By providing a centralized repository, it streamlines access to relevant literature and fosters collaboration among scholars. Its advanced search capabilities and synthesis tools enable users to pinpoint key trends and research gaps, thus propelling academic discourse forward.

“
A STANDOUT STUDY FOCUSED ON THE LIGHTWEIGHT DESIGN OF A STEERING KNUCKLE USING ALUMINUM 6061-T5 ALLOY
”

In the quest for optimal wheel hub materials, numerous studies have examined options based on mechanical properties and weight considerations. A standout study focused on the lightweight design of a steering knuckle using Aluminum 6061-T5 alloy, renowned for its yield strength of 276 MPa. This alloy achieved an impressive 45.8% weight reduction while meeting stringent strength criteria.



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Modal analysis using unsprung mass revealed that a steel hub could serve as a cost-effective alternative to aluminum without compromising performance. Innovative designs featuring adapter plates maintain stress levels well below the yield strength. Additionally, the exploration of 7075-T6 aluminum through velocity machining presents a fresh perspective on traditional wheel hub designs.

As research evolves, composite materials like carbon fiber are being considered for their potential advantages. This dynamic exploration invites ongoing innovation and collaboration, with the promise of redefining wheel hub standards and advancing sustainable transportation solutions that resonate with the future of mobility.



A New Era In Turbine Design: The Extraordinary Potential Of Hybrid High Entropy Alloys

Abstract

High Entropy Alloys (HEAs) are transforming material science with their unique blend of multiple principal elements, offering exceptional hardness and corrosion resistance. Ideal for aerospace turbine blades facing extreme conditions, this article explores how integrating HEAs with nanomaterials can enhance turbine technology and efficiency.

The pursuit of application-specific materials is making significant strides, particularly with High Entropy Alloys (HEAs). These cutting-edge alloys, composed of five or more principal elements, each contributing 5–35% to the overall composition, provide exceptional properties without the limitations of strict equimolar ratios. Fabricated through powder metallurgy, HEAs possess distinctive microstructures that enhance both strength and ductility, largely due to pronounced core effects.

Their stability is closely associated with Gibbs free energy configurational entropy, facilitating the emergence of simpler crystal structures such as BCC and FCC. Notably, the “slow atom diffusion effect” further amplifies their high-temperature strength and structural integrity, positioning HEAs as prime candidates for aerospace applications.

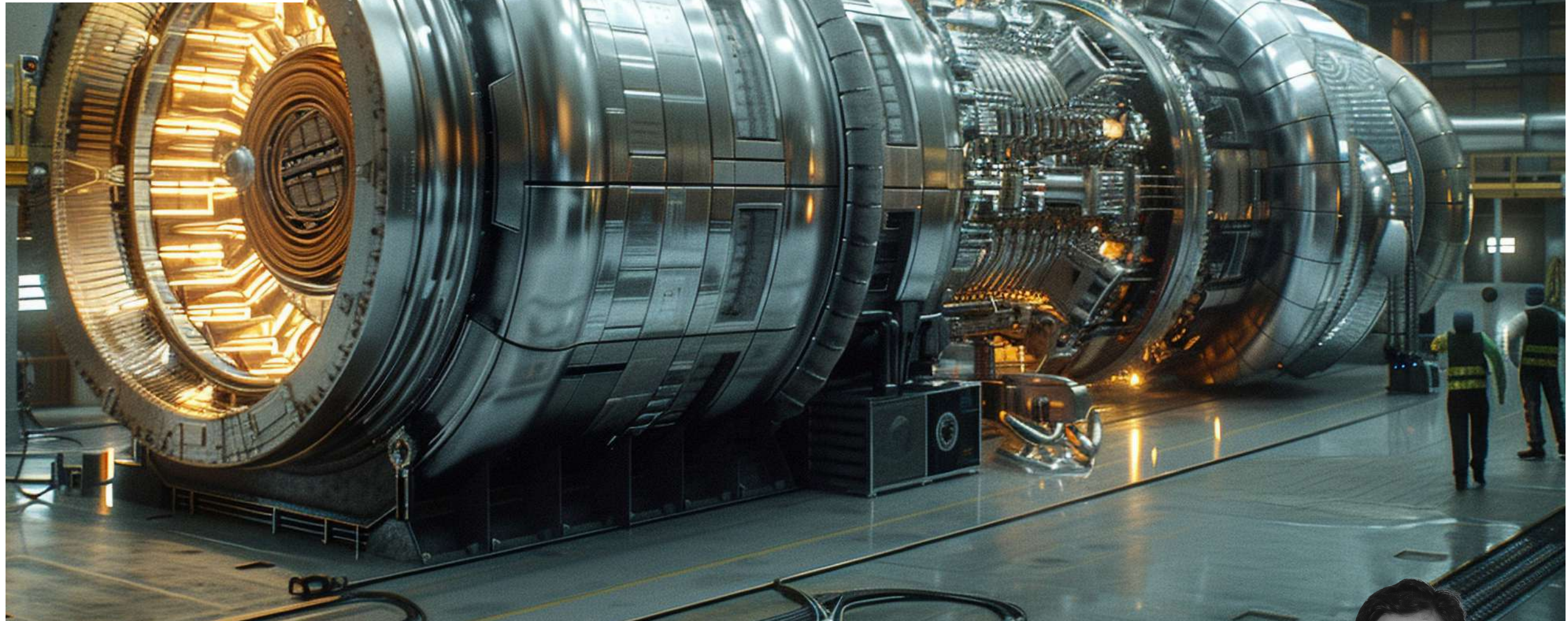
This investigation centers on the AlCoCrFeNiCu HEA, celebrated for its remarkable mechanical strength, corrosion resistance, and thermal stability. The integration of multi-walled carbon nanotubes (MWCNTs) serves to further elevate these properties, making the alloy particularly suitable for extreme operational conditions.

Sintering, a pivotal production method, involves heating the material just below its melting point, with critical parameters such as temperature and dwell time playing vital roles in determining the final characteristics. X-ray diffraction (XRD) analysis reveals that CNT-reinforced samples exhibit finely developed crystallographic structures and outstanding oxidation resistance.

In summary, the AlCoCrFeNiCu HEA, especially when enhanced with CNTs, holds considerable promise for turbine blade applications in the aerospace sector. Future research should aim to optimize manufacturing parameters to maximize material performance, ensuring that HEAs can meet the stringent demands of contemporary aerospace engineering.

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Revolutionizing Construction: The Benefits of Geopolymer Bricks Made from Industrial By-Products

Infrastructure development and housing are crucial for the progress and prosperity of any nation, serving as the backbone of economic growth, social development, and an improved quality of life for its citizens. In recent years, the concept of sustainability has gained significant traction, especially in the construction sector, where the environmental impact of building materials is under increasing scrutiny.

In light of these challenges, geopolymer-based red mud bricks have emerged as a sustainable alternative to traditional clay bricks. These innovative bricks are formulated using industrial waste by-products, significantly reducing the reliance on natural soil. This research focuses on Sustainable Red Mud Bricks (SRMB), which utilize red mud—a by-product from aluminum production—and geopolymer as key ingredients. Notably, the production of SRMB does not involve soil, cement, water curing, or sintering, resulting in a completely environmentally friendly building material.

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**WITHIN JUST
THREE DAYS OF
CURING, SRMB
CAN ACHIEVE
APPROXIMATELY
50% OF ITS
STRENGTH AT 28
DAYS**

”

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One of the standout features of SRMB is its potential for low or even zero emissions of carbon dioxide (CO₂) during production, addressing one of the most pressing concerns in the construction industry today. By harnessing industrial waste and innovative technology, SRMB not only contributes to reducing landfill waste but also promotes a circular economy. This research aims to highlight the benefits of geopolymer-based bricks as a viable solution to the environmental issues associated with conventional brick production, paving the way for more sustainable construction practices in the future.

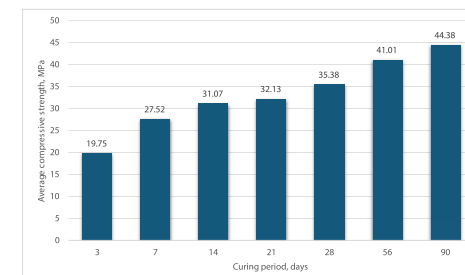
The primary ingredients for these bricks include red mud, fly ash, ground granulated blast furnace slag, alccofine, and quarry dust. These materials are meticulously mixed in dry form to ensure uniformity and optimal performance in the final product.

Lefty Hub has become an essential platform, skillfully aggregating and disseminating research findings. By providing a centralized repository, it streamlines access to relevant literature and fosters collaboration among scholars. Its advanced search capabilities and synthesis tools enable users to pinpoint key trends and research gaps, thus propelling academic discourse forward.

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**SRMB NOT ONLY
CONTRIBUTES
TO REDUCING
LANDFILL
WASTE BUT
ALSO PROMOTES
A CIRCULAR
ECONOMY**

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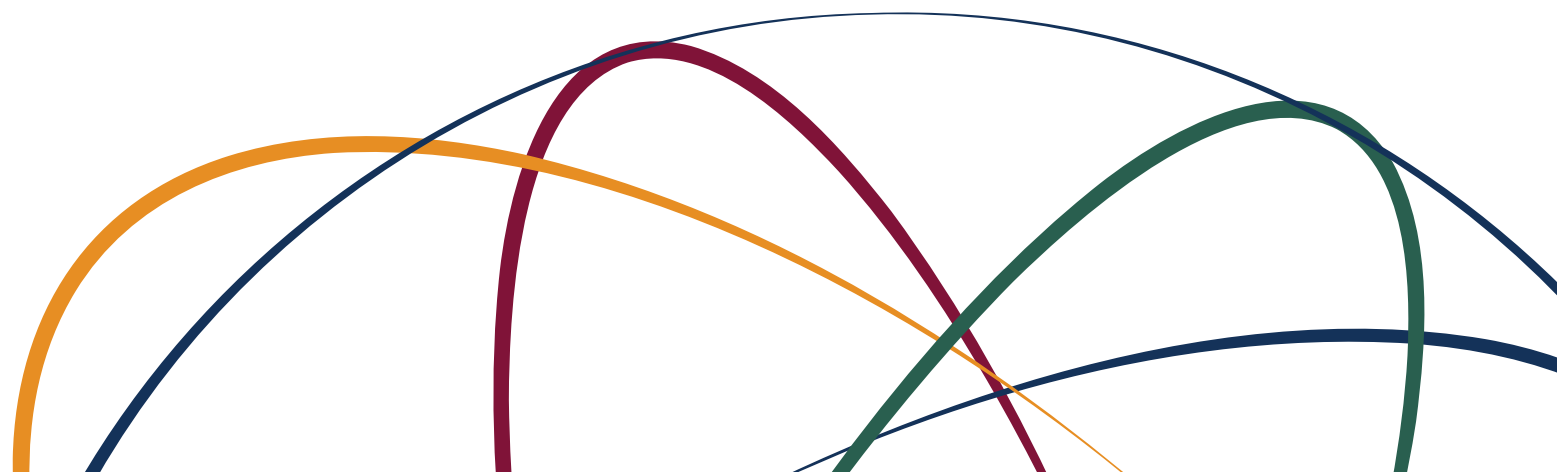
Once the dry mixture is prepared, alkali activator solutions—specifically sodium silicate and sodium hydroxide—are introduced. The formulation of this design mix proportion is achieved through the use of analytical software, which enables precise calculations to optimize the mixture's properties.

Once at the pressing station, the mixture is compacted into molds using a hydraulic press. Once cast, the bricks undergo a curing process at room temperature for approximately 24 hours.

After this initial phase, the bricks are left to cure for an additional period, typically until the third day, at which point they are fully cured and ready for construction applications.

In terms of compressive strength, SRMB demonstrates impressive performance. The compressive strength of these bricks ranges significantly, varying from 19 MPa to 44 MPa. This range indicates that SRMB can support substantial loads, making them suitable for various construction applications, from residential buildings to more demanding commercial structures. Within just three days of curing, SRMB can achieve approximately 50% of its strength at 28 days. This rapid initial strength gain is particularly advantageous for construction projects that require quicker turnarounds.





Indoor Industrial Electric Trike: Revolutionizing Mobility in Spinning Mills

The rapid pace of industrialization has brought about a plethora of innovations aimed at improving efficiency, reducing operational downtime, and maximizing output. One of the key challenges faced by industries, particularly those engaged in manufacturing, textiles, and logistics, is ensuring seamless worker mobility across vast production floors. Workers must often traverse long distances, addressing issues such as machine malfunctions, maintenance, and material handling.

In spinning mills, where the production of yarn is continuous, minimizing downtime caused by yarn breakage is crucial for maintaining optimal production efficiency. The workers responsible for repairing yarn breakages, known as siders, play a vital role in the spinning process. Traditionally, these workers patrol the mills on foot, identifying and fixing issues as they arise. However, this method of mobility can be time-consuming and inefficient, particularly in large-scale spinning mills where the distance between machines can be significant.

In response to this challenge, our team of mechanical engineering students from Kumaraguru College of Technology designed an electric three-wheeled vehicle (E-trike)—an innovative solution tailored for indoor industrial environments. Dubbed the “Trike 2π,” this eco-friendly and versatile vehicle is specifically engineered to enhance worker mobility in confined spaces, such as spinning mills, where efficient and rapid movement is essential for reducing downtime.

The E-trike was developed as a solution to this problem. By providing workers with a fast and reliable mode of transportation within the mill, the E-trike allows siders to quickly access problem areas, identify yarn breakages, and perform repairs without unnecessary delays. This innovation has the potential to drastically reduce downtime, improving overall production efficiency and worker productivity.

The Trike 2π is an electric three-wheeled vehicle designed specifically for use in indoor industrial environments. It is compact, agile, and powered by a 36V 250W brushless DC (BLDC) hub motor, making it an eco-friendly alternative to traditional gas-powered vehicles. Its compact design enables it to navigate through tight spaces, such as the narrow rows of machines in a spinning mill, while its electric powertrain ensures quiet and emission-free operation.

The chassis of the Trike 2π is one of its standout features. Constructed from 1-inch round steel pipe, the chassis is designed to minimize the number of welds, thereby enhancing the vehicle's structural integrity and durability. By bending a single pipe into shape, the design reduces the risk of weak points at weld joints, ensuring that the trike can withstand the demands of industrial use. The chassis is capable of supporting a payload of up to 150 kg, allowing it to transport not only the worker but also any necessary tools or equipment.

The motor and battery system are designed for efficiency and reliability. The 36V 250W hub motor is integrated into the 16-inch front wheel, providing smooth and responsive acceleration.

Power is supplied by a 36V 20Ah lithium ferro-phosphate battery, which offers long-lasting performance and a quick recharge time.

Stability is a key concern when navigating through narrow rows of machines. The trike's low ground clearance of 5 inches helps reduce body roll during cornering, ensuring that the vehicle remains stable even when making sharp turns. This feature is particularly important in confined spaces, where sudden movements or instability could lead to accidents.



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THE TRIKE 2π
REPRESENTS
A SIGNIFICANT
ADVANCEMENT
IN INDUSTRIAL
MOBILITY,
OFFERING A
PRACTICAL,
EFFICIENT, AND
ECO-FRIENDLY
SOLUTION FOR
INDUSTRIES
WITH CONFINED
OR LARGE
INDOOR SPACES
”



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**DUBBED THE
“TRIKE 2π,”
THIS ECO-FRIENDLY
AND VERSATILE
VEHICLE IS
SPECIFICALLY
ENGINEERED TO
ENHANCE WORKER
MOBILITY IN
CONFINED SPACES**

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To ensure worker safety, the Trike 2π has a maximum speed of 20 km/h. This speed limit strikes a balance between efficiency and safety, allowing workers to move quickly without the risk of accidents. The speed is sufficient for workers to patrol the mill and respond to issues promptly, while still maintaining control of the vehicle.

Although the Trike 2π was originally developed to tackle the mobility challenges faced by workers in spinning mills, its versatility extends to a wide range of industries requiring indoor mobility. The trike's compact design, electric powertrain, and superior maneuverability make it an ideal solution for industries beyond textiles.

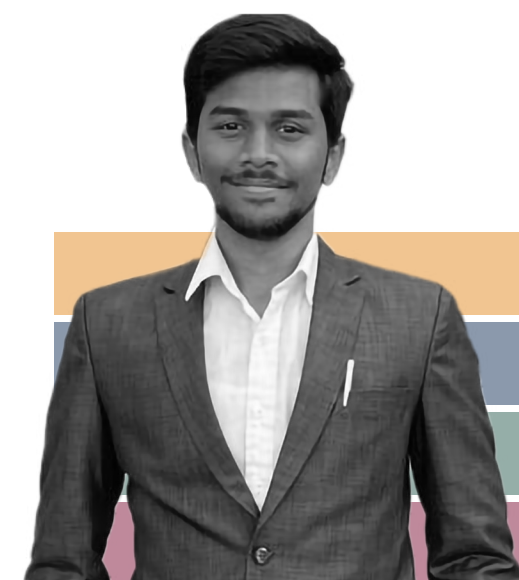
In warehouses and logistics, where workers often cover long distances to transport goods or check inventory, the E-trike offers a quick and efficient means of navigating large spaces, improving productivity. With a payload capacity of up to 150 kg, it is well-suited for carrying tools, equipment, or small packages. Similarly, in hospitals and healthcare facilities, the trike can facilitate the rapid movement of medical personnel or equipment between departments, where speed and quiet operation are critical. Its zero-emission, electric design makes it perfect for indoor use in sensitive environments, reducing both noise and pollution.

In manufacturing plants, where large production floors require quick mobility for maintenance personnel or supervisors, the E-trike ensures smooth operations by allowing workers to move between stations efficiently. Its potential extends to airports, large public venues, malls, or convention centers, where security personnel need to cover extensive areas. The trike provides an eco-friendly and time-saving solution for patrolling and indoor mobility.

The Trike 2π represents a significant advancement in industrial mobility, offering a practical, efficient, and eco-friendly solution for industries with confined or large indoor spaces. Its durable chassis, compact design, and powerful electric motor make it a reliable option even under demanding conditions. Beyond the textile sector, the E-trike's applications are extensive, meeting the universal need for efficient indoor transportation across various industries.

As industries evolve, the demand for innovative solutions like the Trike 2π will continue to grow. With its versatility and wide range of applications, this electric vehicle is set to revolutionize how workers move within industrial environments, making it a valuable asset for the future of industrial mobility.

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From the Leadership



At Kumaraguru, RIDE is not just a framework but a vision that empowers individuals to become catalysts of change. The interconnected forces of Research, Innovation, Design, and Entrepreneurship are the cornerstones of our commitment to building leaders who will shape a sustainable and inclusive future. Through RIDE, we have created a collaborative platform where students, faculty, industry, and community converge, inspiring transformative thinking and purposeful action. This approach adds to the academic rigor; to nurture a generation that believes in the power of ideas to drive progress and uplift society. Kumaraguru is committed to pioneering solutions that address global challenges, anchored by the spirit of RIDE and driven by our core values of innovation and excellence.

Mr. SHANKAR VANAARAYAR
President
Kumaraguru Institutions

At Kumaraguru College of Technology, our curriculum is evolving with new regulations to support a forward-looking, multidisciplinary approach that meets the demands of a rapidly changing world. By embedding Research, Innovation, Design, and Entrepreneurship within our academic structure, we empower students to engage deeply in real-world problem-solving and industry-relevant learning. Our Proejct Transcend 2024 for KCT's New Regulations exemplifies this commitment—serving as a platform where students bring their projects to life, showcase their innovations, and demonstrate their entrepreneurial spirit. Through these initiatives, we are not just educating but inspiring a generation of resilient, adaptable leaders.



Dr. RAMESH BABU N
Dean - Electrical Sciences & Curriculum Design & Development



Kumaraguru's RIDE ecosystem creates a seamless blend of research, innovation, design, and entrepreneurship that equips students with a powerful toolkit for success. At Forge, we leverage this collaborative space to guide budding entrepreneurs, transforming their ideas into viable, market-ready solutions. RIDE enables students to harness collaboration and innovation, driving real impact in their communities and beyond.

Mr. VISH
Co-Founder & CEO, Forge



RIDE at KCT is a robust platform for advancing interdisciplinary research that addresses some of the most pressing challenges of our time. This collaborative framework empowers students and faculty alike to contribute impactful knowledge and develop solutions that extend beyond academic boundaries. Here, research and innovation come together to foster a culture of continuous learning and societal advancement.

Dr. MANIVEL R
Associate Dean, Research, KCT

RIDE at KCT is more than a framework; it's a philosophy that underpins our commitment to cultivating change-makers. This dynamic space encourages students to explore and push boundaries across research, innovation, design, and entrepreneurship, developing skills that prepare them to meet the complex demands of tomorrow. By bringing together a community of passionate learners and thinkers, we are building a foundation for a brighter, more resilient future.



Dr. EZHILARASI M
Principal, KCT

Design plays a crucial role in the RIDE framework, serving as the bridge between creative ideas and tangible solutions. At KCT, RIDE fosters an environment where students can engage in purposeful design, leading to impactful innovations that address real societal needs. This dynamic hub nurtures not just thinkers but doers, individuals ready to apply design thinking to make a difference in the world.



Dr. VINO HAR STEPHEN RAPHEAL
HoD, DoA Innovation, KCT



Kumaraguru's RIDE framework provides students with a transformative experience, one that embraces the spirit of innovation and entrepreneurship as fundamental to growth. Through research-driven projects and entrepreneurial support, our collaborative space nurtures innovative thinking, enabling students to pursue ideas that have the potential to redefine industries and benefit society at large.

Dr. RAGHUV EER V R
Director, Kumaraguru School of Innovation



The RIDE journey at Kumaraguru thrives on dynamic exploration and collaboration. Within this innovative hub, students are inspired to delve into research and innovation that solve real-world problems. It's a place where ideas are not only welcomed but actively developed, guided by mentors and an infrastructure that supports experimentation and growth. RIDE empowers our students to think beyond limitations and make lasting impacts.

Mr. NIROSH KUMAR H
Head - RiG



RECENT & ONGOING PROJECTS



PROJECT
BioT- A Liquid Bioreactor

TEAM
Keerthana A, Jeevagan V, Madhushini V S, Priyakharini P, Sowmiyann P

STAGE
Prototype

BioT(microBIOlogical Tree) acts as indoor photobioreactor (system that utilizes light to cultivate and grow photosynthetic microorganisms which are very effective air purifiers) to nullify the carbon build up and multiply the oxygen availability.

Our power conversion and storage team has developed a lithium iron phosphate (LFP) energy storage system with a powerful 2-kWh capacity, designed to provide ample energy storage for renewable applications.

PROJECT
2Kw Ré Battery

TEAM
Veeramanikandan

STAGE
Product Stage

PROJECT
TEAM QBOTIX

TEAM
Abirami & Team

STAGE
Product

Team QBotix is a pioneering robotics team from Kumaraguru College of Technology, driving innovation and excellence by setting new standards in engineering to lead and inspire in the field of robotics.

The CNC Router is an etching tool built on CNC technology, with fully custom-developed firmware created by our team. A CNC router machine designed for wood carving, equipped with custom firmware for DIY usability. It enables fast, efficient carving tailored to individual needs.

PROJECT
CNC Router

TEAM
Sanjay &Team

STAGE
Product Stage

PROJECT
Variable Mach Number Nozzle System For Trisonic Wind Tunnel

TEAM
KCIRI

STAGE
Prototype

This project is to design and develop a variable Mach number nozzle system for a Trisonic wind tunnel with a cross-section of 1.6 m x 1.6 m, by employing actuators and control systems. The function of the actuators and control system designed for various configurations are validated by Multi-Body Dynamics (MBD) analysis.

Design & Development of lead lag damper to provide rotor blade damping in response to relative motion between the blade root and trailing edge to eliminate instability on ground and in flight.

PROJECT
Indigenous Development of Lead-Lag Damper for Helicopters

TEAM
KCIRI

STAGE
Product Stage

PROJECT
AI-Powered Fall Detection and Health Monitoring

TEAM
Kumaraguru School of Innovation

STAGE
PROTOTYPE

This Edge AI-powered wearable provides real-time fall detection and health monitoring, ensuring rapid response to emergencies without relying on constant internet connectivity. It enhances safety for elderly individuals and outdoor enthusiasts by reducing injury risk and promoting independence.

This project seeks to create an advanced navigation system for the visually impaired, integrating computer vision, AI, and sensor technologies for real-time obstacle detection and context-aware guidance.

PROJECT
Vision navigation for visually impaired

TEAM
NISANTH T SIBI S THARIKA N B SIVACHANDRU V

STAGE
ProTOTYPE

RECENT& ONGOING PROJECTS

PROJECT Yali 3.0 Cockpit

TEAM
Yugabharathi
Jaiharish

STAGE
Product Stage

The cockpit, crafted from a blend of pineapple fibre and carbon fiber , the seat made up of upcycled plastic, showcases Sea Sakthi’s commitment to eco-conscious design. By leveraging natural materials and advanced composite structures, the team has succeeded in reducing weight by 50%.The team is the first and only Indian Team to participate and win accolades in the Monaco Energy Boat

Team ReNew is India’s first to compete in Shell Eco-marathon’s Hydrogen Fuel Cell category.Uses Specktronik 375 fuel cell with 57% efficiency at 250W. Hydrogen fuel cells emit only water and reduce fossil fuel dependency.

PROJECT Team ReNew

TEAM
Pratish, Harini &
Asvitha

STAGE
Product Stage

PROJECT AI-Driven Pallet Alignment System

TEAM
Tharaneesh, Mariya,
Sanjith, Akshaya,
Ponnarasi

STAGE
Market Stage

A market-ready AI-powered pallet alignment system utilizing machine learning, computer vision, and robotics. It automates detection and alignment, enhancing warehouse efficiency, optimizing space, reducing errors, and improving safety while adapting to diverse layouts and pallet sizes.

A market-ready propeller solution utilizing generative design and additive manufacturing to minimize drone noise. Enhanced aerodynamics and lattice structures ensure discretion for sensitive environments and maintaining lightweight, high-performance capabilities.

PROJECT Propeller Design for Drone Noise Minimization

TEAM
Faizal, Janani,
Thilagesh, Balapranav

STAGE
Market Stage

PROJECT Leviathan Moto Racing

TEAM
Jaiharish

STAGE
Product Stage

Leviathan Moto Racing is a dedicated team focused on sustainable electric bike manufacturing, participated twice in SAE’s Electric Two Wheeler Design Competition (ETWDC), achieving Championships in their first attempt.

An innovation-driven platform showcasing RC cars, miniature vehicles controlled via wireless transmitters. This product empowers users to explore advanced control systems, enabling precise steering, acceleration, and braking, paving the way for creative applications in remote-controlled technology.

PROJECT Remote-Controlled Vehicle Innovation Platform

TEAM
Sandhiya

STAGE
Product Stage

PROJECT TamilNadu Daily Entrepreneurship Eco -System Development

TEAM
Saravanan

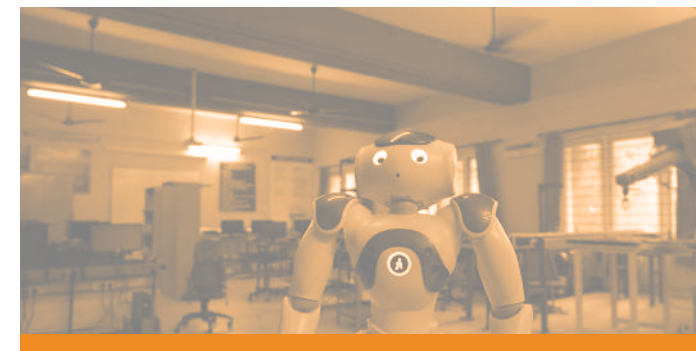
Dairy Entrepreneurship Incubation

Dairy Business Entrepreneurship Networking Platform

The project aims to develop a universal dairy curriculum focused on climate-smart dairy entrepreneurship, providing tailored training for farmers, entrepreneurs, and extension officials. It will train and mentor a cohort of 80 dairy entrepreneurs in two districts of Tamil Nadu over 12 months, offering them connections to technical, governmental, financial, and market institutions for comprehensive support and sustainable growth.

THE LEGACY

CELEBRATING 40 YEARS
THE STORY SO FAR



VISION, LEGACY, AND THE FOUNDER'S FORESIGHT

FOUNDER ARUTCHELVAR Dr.N.MAHALINGAM

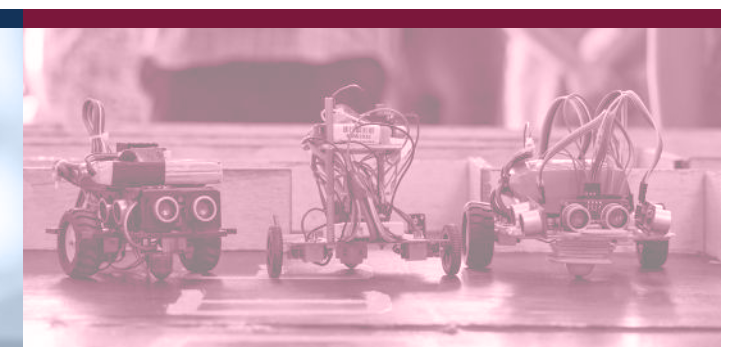
The thriving **RIDE** culture traces its roots back to **Arutchelvar Dr. N. Mahalingam**, the visionary founder of Kumaraguru Institutions. With a profound belief in education's power to transform lives and drive societal progress, he laid the foundation for a legacy of excellence in learning and innovation. He foresaw the pivotal role that research and innovation would play in nation-building, and thus, established Kumaraguru with a mission to create leaders, entrepreneurs, and change agents.

Today, the institution carries forward his legacy with pride, embedding RIDE at the core of its educational philosophy. Kumaraguru's emphasis on Research, Innovation, Design, and Entrepreneurship reflects the founder's enduring vision of a community that contributes not just to personal and professional growth, but to societal transformation on a global scale. Through its thriving RIDE ecosystem, Kumaraguru Institutions stand as a testament to a future driven by knowledge, character, and purposeful innovation, poised to make a lasting impact.



“THE ULTIMATE GOAL
AND THE ONLY GOAL, OF
ALL OUR ENDEAVOURS,
IS TO DO GOOD TO
THE SOCIETY.

- Dr. N. MAHALINGAM”





FOUR DECADES OF NATION BUILDING THROUGH EXCELLENCE IN EDUCATION

Kumaraguru Institutions, with a legacy of 4 decades of academic excellence, encompasses Educational Institutions and Centres of Excellence in the domains of engineering, technology, management, science, agriculture, innovation, entrepreneurship, liberal arts and humanities aspiring to offer distinct world class education. Established by Padma Bhushan Arutchelvar Dr. N. Mahalingam, Kumaraguru Institutions (KI) includes Kumaraguru College of Technology (KCT) instituted in 1984, KCT Business School in 2005 (KCT BS), Kumaraguru Institute of Agriculture in 2014 (KIA), Kumaraguru College of Liberal Arts and Science in 2018 (KCLAS) and Kumaraguru School of Business (KSB) in 2022 drawing strength from each other for cross dimensional education and integrated knowledge that expands intellectual horizons and builds empowered and conscientious students.

With sprawling 292 acres spread across three campuses, Kumaraguru Institutions offers 25 Undergraduate programmes, 17 Postgraduate programmes and 30 Research programmes. With more than 900+ teaching, research, administrative and support staff, and a dozen centres of excellence and industry sponsored labs, KI currently impacts more than 8000+ students every year. Kumaraguru Institutions have time and again been accoladed by national accrediting and ranking agencies such as NAAC, NBA, NIRF and ATAL Ranking. Recently Kumaraguru College of Technology has been accredited with the highest A++ Grade by NAAC, rated as QS I-Gauge Diamond institution and recognised as one of the top 5 Innovative Institutions by CII Industrial Innovation Awards for 3 consecutive years, positioning Kumaraguru Institutions for national prominence.

8000+
students

35,000+ Alumni
in 48 countries

900+
Faculty & Staff

976+ Annual
Research
Publications

52 International
Collaborations

15+
Patents

184 Industry
Partners

12+ Industry
partnered Labs

25+ Crore
Funded Projects

RECENT ACCOLADES



KCT.BS has been accredited by ACBSP for 10 years, highlighting its excellence in business education.



KCT has been recognized for its performance in Faculty Quality, Employability, and Governance & Structure by QS I - Gauge adapted from the International QS STARS University Rating System.



KCT has been awarded Gold Medals in two categories: "Innovation in Teaching Methodology" and "Exceptional Infrastructure".



Top 5 Innovative Institutions in India. The only Institution to receive the award for three consecutive years.



Platinum Rating with 81 points. Indian Green Building Council Green Campus Rating System



KCLAS & KCT have been commended as the Best Institute for providing Global Exposure & the Best Institute for promoting Industry-Academia Linkage respectively.



THE CAMPUS



6300 students
14 departments



500 students
4 programmes



KUMARAGURU
COLLEGE OF LIBERAL
ARTS AND SCIENCE

1400 students
12 programmes



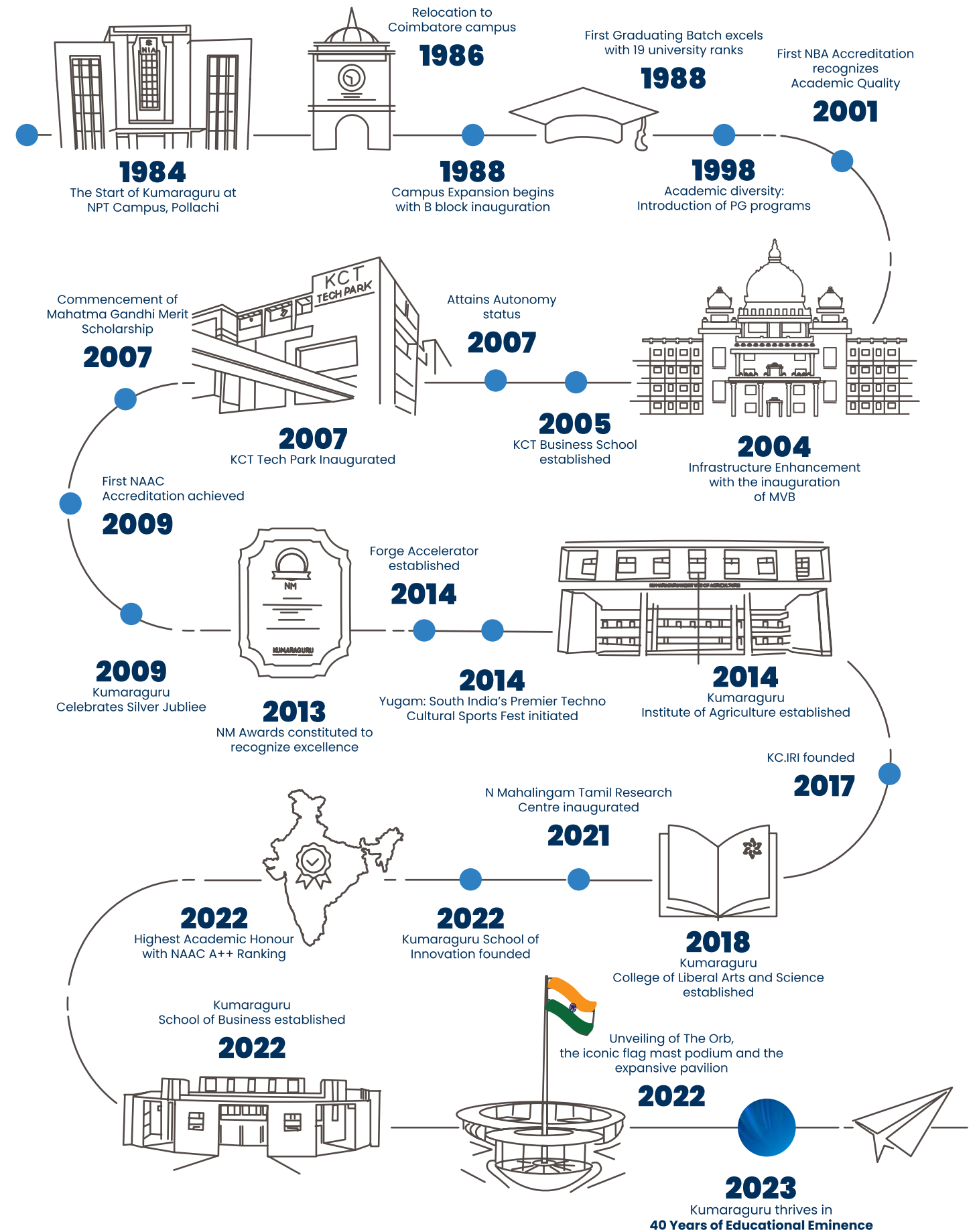
KUMARAGURU
INSTITUTE OF
AGRICULTURE

610 students
7 departments



KUMARAGURU
SCHOOL OF BUSINESS

West Campus
MBA Programme
120 students



APPAKUDAL

COIMBATORE

WEST CAMPUS



RiDE

Kumaraguru Institutions
Saravanampatti, Chinnavedampatti (POST),
Coimbatore- 641049, Tamilnadu.

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