DST-AMRITA
**TECHNOLOGY
ENABLING
CENTRE**

**DST AMRITA
TECHNOLOGY ENABLING
CENTRE.**

विज्ञान एवं
प्रौद्योगिकी मंत्रालय
MINISTRY OF
**SCIENCE AND
TECHNOLOGY**
सत्यमेव जयते

HALF YEARLY -REPORT

JULY- DECEMBER 2023

**DR.KRISHANSHREE ACHUTHAN,
AMRITA VISHWA VIDYAPEETHAM,
AMRITAPURI, KOLLAM,
KERALA 690546**
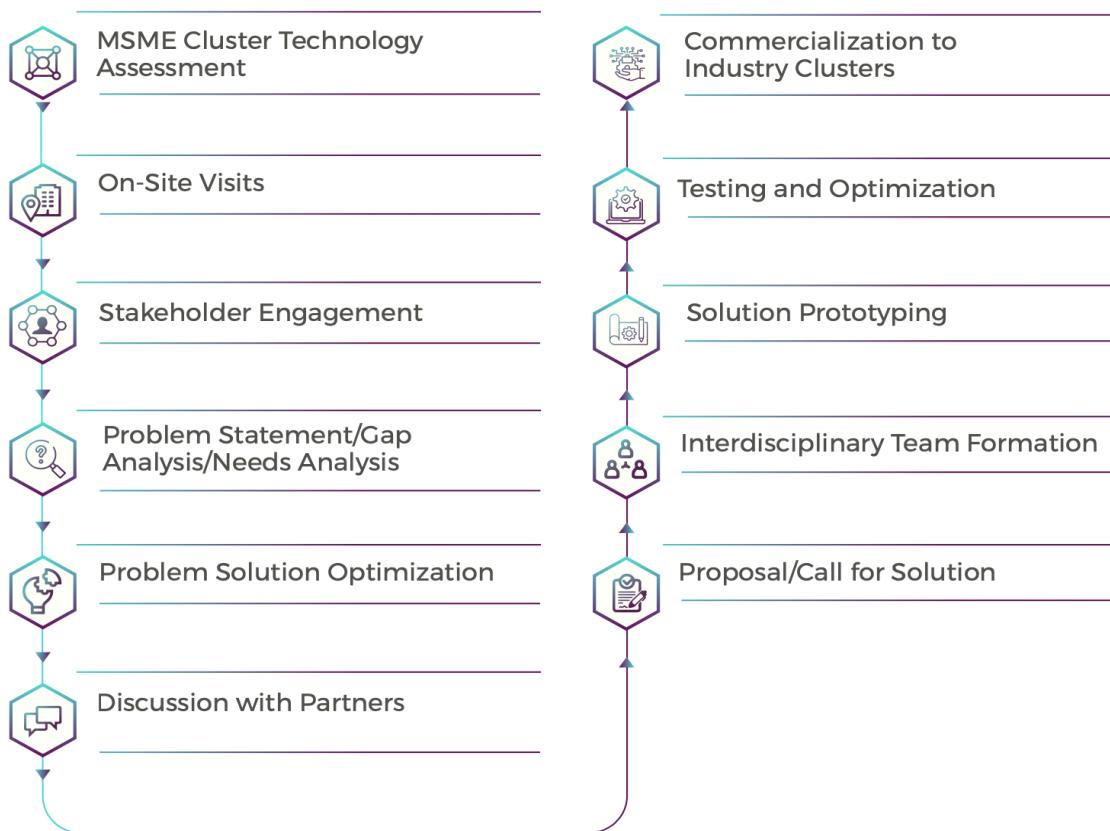
DST Amrita Technology Enabling Center – MSME Focus

DST-Amrita TEC has been closely working with Micro, Small, and Medium Enterprises (MSMEs) looking to boost their technological capabilities. We have offered tailored services, including guidance, training, and resources, to help MSMEs adopt advanced technologies, and promote innovation and productivity. This has helped provide exposure to a certain extent on latest technologies, upgrading of infrastructure. We have also helped them identify and solve problems, fostering global competitiveness through new technologies and guided them with streamlining their processes. We have a structured process that has helped us to excel to solve the MSME problems.

MSME Cluster Technology Assessment

On-Site Visits

Stakeholder Engagement

Problem Statement/Gap Analysis/Needs Analysis

Problem Solution Optimization

Discussion with Partners

Commercialization to Industry Clusters

Testing and Optimization

Solution Prototyping

Interdisciplinary Team Formation

Proposal/Call for Solution

The process adopted by Amrita TEC for solving MSME Problem

Technologies Mined, Developed, Commercialized, and Transferred

Technologies Mined

One prominent area of focus for DST-Amrita TEC involves the strategic exploration and extraction of technologies—a process commonly referred to as technology mining. Our efforts in this domain encompass a diverse range of sources, including technologies sourced from Amrita Vishwa Vidyapeetham's intellectual property portfolio, projects recommended by the Department of Science and Technology (DST), and innovative technologies originating from other academic institutions. Notably, Amrita-TEC serves as a hub and nodal center, actively engaged in the development of technologies and fostering an innovative mindset within the academic community.
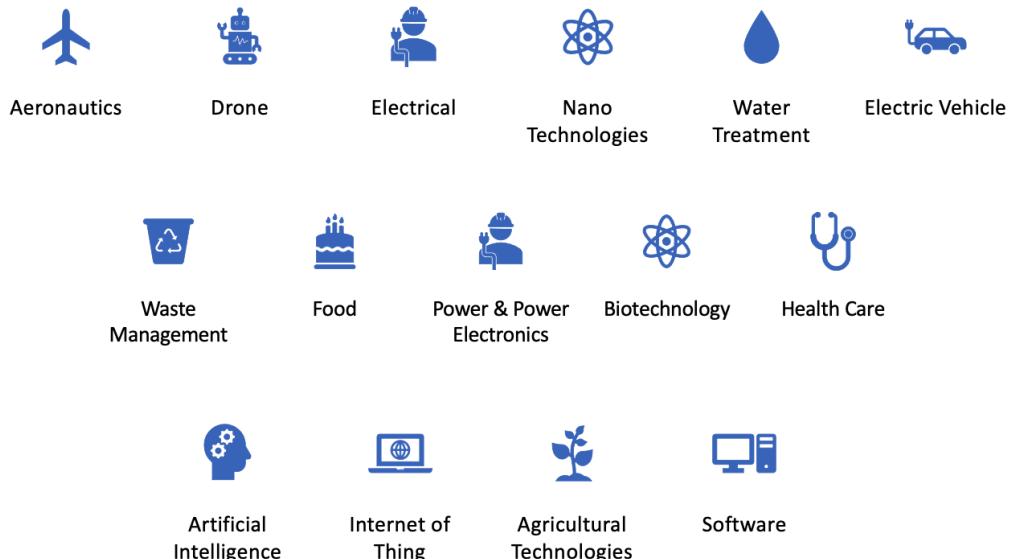
List of Technology Mined.

Sl.No	Field	Title of the Technology
1.	Agricultural Technology	An Application H2O: Sustainable Water Management System
2.	Agricultural Technology	Biosand Filter for Water Purification
3.	Agricultural Technology	Commercializing Eco-Friendly Water Holding Bags Made from Plant-Based Biomass as a Replacement For Synthetic Bags
4.	Agricultural Technology	Integrated Surveillance in Agriculture
5.	Agricultural Technology	Fabrication of Hybrid Electrochemical Device Using Cathodic Ni-Based Ldhmos2/Mxene Nanocomposites And Anodic Mos2/Mxene
6.	Agricultural Technology	Commercializing Eco-Friendly Water Holding Bags Made from Plant-Based Biomass as a Replacement for Synthetic Bags
7.	Agricultural Technology	Drone Based Pest Control Using Mobility Kit
8.	Agricultural Technology	Automated Cashew Kernel Sorting Machine

9.	Agricultural Technology	Empowerment of Rural Women Engaged in Poultry Farming Using Android Smartphone Technology
10.	Healthcare Technology	Health Care for Elders Through Smart Watch and Calling Bell
11.	Healthcare Technology	Gaurdian Crip
12.	Healthcare Technology	Development And Commercialization Of A Low-Cost Palatable Pellet To Prevent The Progress Of Early Diabetic Retinopathy
13.	Healthcare Technology	In-Vitro Inhibitory Effect of Yaimadhu Krapka on Epithelial Mesenchymal Transition In Barretts Esophagus Cell Lines
14.	Healthcare Technology	Digital Observing of Children for Migrant Population
15.	Healthcare Technology	Medassist(Your Personalized Health Companion, Powered by Ai)
16.	Healthcare Technology	Care Me A Caring Hand for Women.
17.	Healthcare Technology	3D Printed Prosthetic Arm
18.	Healthcare Technology	Smart Healthwatch-Empowering Wellness Through Technology
19.	Healthcare Technology	Development of Nanofiber Skin Patches for Herbal Drug Delivery
20.	Healthcare Technology	Care Me a Caring Hand for Women
21.	Healthcare Technology	Fish Disease Detection
22.	Healthcare Technology	Novel Biocompatible Herbal Extract Loaded Hydrogel for Diabetic Wound Healing
23.	Healthcare Technology	Valorization of Hostel Food Wastes for The Production of Biopolymer
24.	Healthcare Technology	A Comprehensive Child Protection Project
25.	Healthcare Technology	Designing of Plant Based Herbal Mouth Freshener
26.	Healthcare Technology	Ved-Dent ,An Ayurvedic Tooth Brush
27.	Healthcare Technology	Cozywave- Pain Relief Solution
28.	Healthcare Technology	Assistive Device For Glaucoma
29.	Miscellaneous Technology - Automotive	Scooty Throttle Accidental Rise Cutoff System

30.	Miscellaneous Technology - Environment	Citrate-Based Non-Polluting Dishwashing Solutions from Domestic Waste By Aspergillus Niger Fermentation
31.	Miscellaneous Technology - Housing	Innovative Technique for Disposal of Settled Sediments In Water Tanks
32.	Miscellaneous Technology - Environment	Biodegradable Honeycomb Coir Fiber Packing Material Alternative to Bubble Wrap
33.	Miscellaneous Technology - Environment	Cost Effective Biodegradable and UV Protective Biomaterials-Based Packaging Materials
34.	Miscellaneous Technology - Water & Sanitation	Phage-Shield Harnessing Immobilized Phages in Urinal Screen Mat for Odour Reduction
35.	Miscellaneous Technology - Automation And Transportation	Delivery of Essential Medicines by Drones In Hilly Areas
36.	Miscellaneous Technology – Automotive	Scooty Throttle Accidental Rise Cutoff System
37.	Miscellaneous Technology - Telecommunication	Numbershield Protect Your Mobile Number and Stay Alerted
38.	Miscellaneous Technology - Foods	High-Quality Poultry Products and Services
39.	Miscellaneous Technology - Water & Sanitation	Wastewater Filter Using Biochar Derived from Water Hyacinth
40.	Miscellaneous Technology	Ethics, Quality, And Sustainability in High Regard
41.	Miscellaneous Technology - Consumer Goods	Fashion Enthusiast And Design
42.	Power And Energy Technology	Adaptable Speed Charging Dock for Electric Vehicles
43.	Power And Energy Technology	Adaptable Speed Charging Dock for Electric Vehicles
44.	Power And Energy Technology	Highway Hybrid Power Generator
45.	Power And Energy Technology	Paper Bag Manufacturing

46.	Power And Energy Technology	Carbon Aware Smart Work Space Towards Carbon Neutrality
47.	Power And Energy Technology	Advanced Footstep Power Generation System
48.	Power And Energy Technology	Building A Renewable Energy Based Advanced Irrigation System With IOT
49.	Power And Energy Technology	An Integrated System For Monitoring and Control of Solar Panel Using IOT and Machine Learning
50.	Agricultural Technologies	Production of Eco-Friendly Cement and Tile from Water Hyacinth
51.	Services & Hospitality Technology	Automated Contactless Attendance System with Motion Sensor and RFID Reader.
52.	Services & Hospitality Technology	Unlocking Potential Through Inclusive Edu-Tech
53.	Services & Hospitality Technology	An Android Application for Sustainable Textile Retail Production
54.	Services & Hospitality Technology	Shesafe Guardian Web - Empowering Womens Safety Through Web Technology
55.	Services & Hospitality Technology	Hello Ai - Smart Console
56.	Services & Hospitality Technology	SIWSD-Sway In Women Smuggling Device
57.	Services & Hospitality Technology	Smartserve Rations-Empowering Distribution
58.	Services & Hospitality Technology	Multimodal Assessment Analyzer for Online Exams (Edge Intelligence 4 Education)
59.	Services & Hospitality Technology	Automatic Contactless Attendance System With Proximity Checker And Heat Sensor
60.	Services & Hospitality Technology	Interactive Buddy Robot For Mindfulness Digital Wellness
61.	Services & Hospitality Technology	Hello AI
62.	Services & Hospitality Technology	Empowering Women's Security Through Smart Safety Systems
63.	Services & Hospitality Technology	Android Application for Empowerment and Entrepreneurship for Women in Rural Areas

Aeronautics　Drone　Electrical　Nano Technologies　Water Treatment　Electric Vehicle

Waste Management　Food　Power & Power Electronics　Biotechnology　Health Care

Artificial Intelligence　Internet of Thing　Agricultural Technologies　Software

Broader Classification of the Area of Technology Mined

Technologies Developed

Netravaad
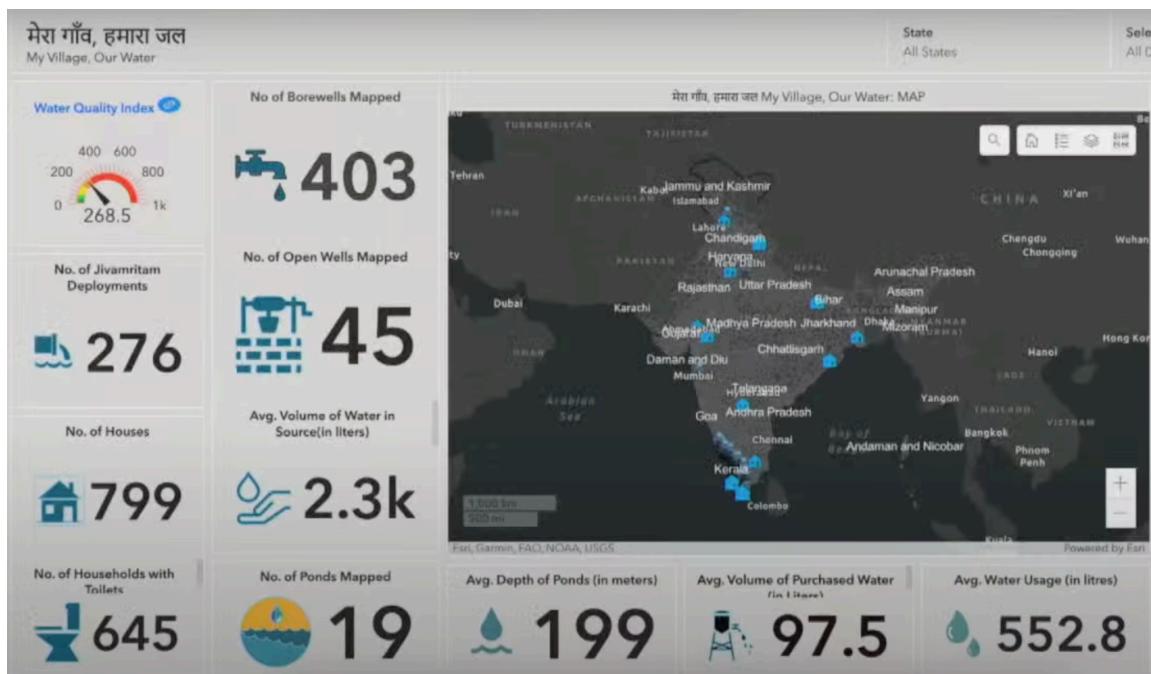
Netravaad, an innovative device designed to facilitate communication for individuals with speech impairments. The device incorporates a camera, display, speaker, controller, and rechargeable battery, providing six hours of usage on a single charge. Using the AI algorithm Sharani, the camera detects the user's eye signs and translates them into alphabets, words, or sentences, which are then displayed on the

screen. The device verbalizes the detected words through the speaker, allowing others to comprehend the user's communication. Future developments will focus on expanding Netravaad's language support to include regional languages like Malayalam and Hindi, enhancing inclusivity for a broader user base.

SREE - Sustainability and Resilience by Community Engagement & Empowerment

We have developed a technology-based crowd-sourced platform capable of carrying assessments through a bottom-up approach and bringing multiple stakeholders on a common knowledge acquisition level to make informed community decisions, which can solve community-level sustainability and resilience assessment challenges. The SREE crowd-sourced platform was built to derive geo-enabled varying sustainability and resilience indices for various themes such as Agriculture, Skills & livelihood, Education, Health, and Water at the household level, community level, district, state, and national level, ensuring inclusivity amongst all stakeholders
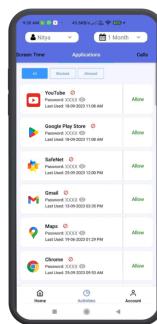
AI-Powered Ocular Diagnostics

Amrita has developed the first Extended Reality ecosystem (XR ecosystem) in South Asia, integrating augmented reality (AR), virtual reality (VR), and mixed reality (MR) technologies. This innovative system has already benefited 150 patients and offers a range of applications, including visualizing organs as holograms for precise, patient-specific medicine. The XR system supports medical training with immersive tools for students, facilitates telemedicine operations, and enhances remote connectivity. Notably, the Pediatric Cardiac Unit utilizes 3D printing and extended reality for in-depth study and preparation before surgeries

SafeNet - Providing Family Safe Internet & Digital Access

Quality Family Time
Improves familial intimacy

Sharper Minds
Enhances concentration and memory.

Reading Habits
Encourages the love for books.

Social Skills
Boosts your child's social life.

Problem Solving
Enhances the problem-solving capabilities.

Creative Minds
Fosters creativity and mindfulness.

Emotional Intelligence
Improves emotional regulation.

Active Lifestyle
Encourages physical activities and games.
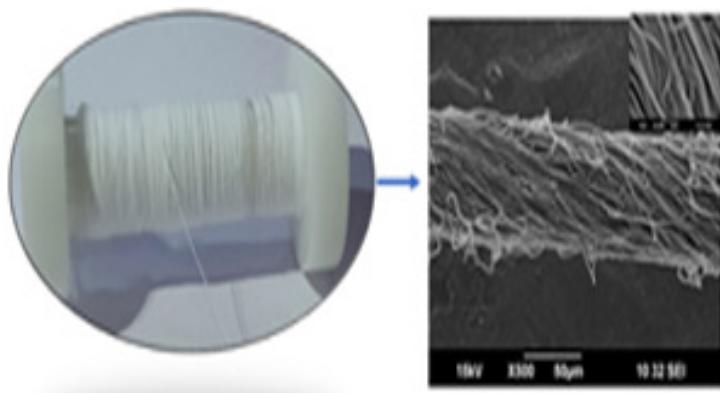
SafeNet is a Technology Framework for safe and healthy usage of the Internet. To enable parents, guardians, educators, and school administrators to provide child-safe Internet and digital platform access, our researchers at Amrita have developed this platform, Safe-Net.

Nanotextile Vascular Graft

Small diameter vascular grafts (3-5 mm) made up of PLLA nano yarns. Mechanical properties tested as per ISO standards and optimised. Biocompatibility of the nanotextile graft was assessed in vitro as well as after implantation in rabbit aortic artery. Large animal studies to evaluate the safety and efficacy of the small-diameter graft are underway in ovine model.
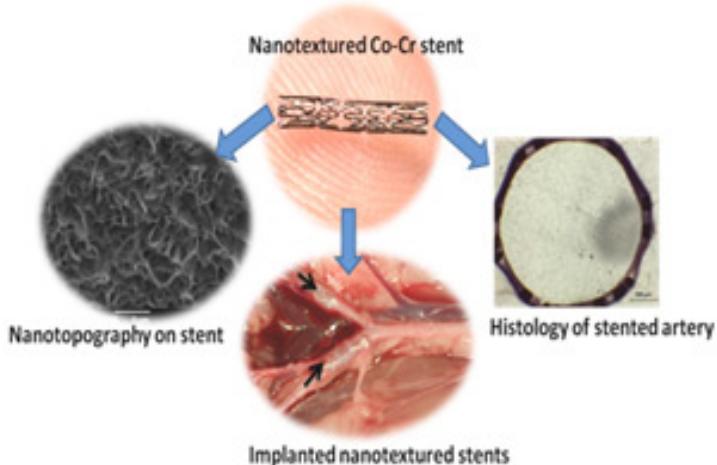
Polymeric Nanoyarns

Nanofibrous poly L-lactic acid (PLLA) yarns are used as a raw material to enhance the mechanical properties of nanocomposite bone implants. PLLA yarns with
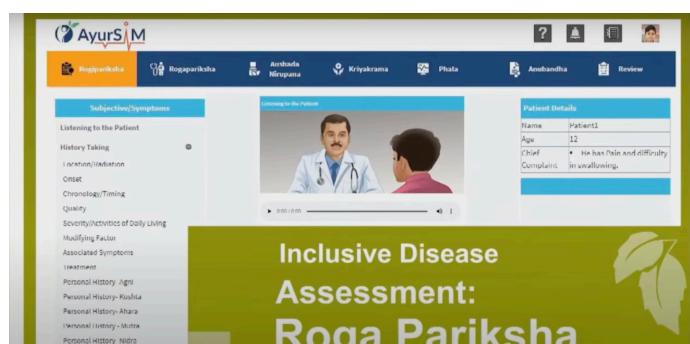
mechanical strength in the range of 10-20 MPa and yarn diameters of 150-350 μm, consisting of fibers with dimensions of 800-1500 nm, have been developed.

Nanotextured Coronary Stents

Metallic coronary stents made of Cobalt Chromium and Stainless Steel have been surface textured to generate a uniform surface titania nanotopography, which did not alter the mechanical or handling characteristics of the stent but provided an enhanced in vivo response in terms of reduced intimal hyperplasia after implantation in rabbit iliac artery.

Ayurvedic Virtual Clinical Simulations (AyurSIM)

Ayurvedic Virtual Clinical Simulations (AyurSIM) is a research initiative that is being developed jointly by the Institute of Teaching and Research in Ayurveda (ITRA, Jamnagar) and Amrita Vishwa Vidyapeetham (Amritapuri). This project promotes Ayurveda eLearning.

Technologies Transferred

Salt Bath Hardening Furnace

The kitchen knife manufacturing industry in Kerala requires a small Salt Bath Hardening Furnace to enable the quality of their products. The furnace should have a connected load of less than 20kW enabling it to operate without a dedicated transformer. Since the products are relatively small in size, the primary objective is to find an economical and efficient solution for their hardening process. MSME DFO Thrissur facilitated the DST-supported Technology Enabling Centre (TEC) managed by Amrita Viswa vidyapeetham University, Amritapuri, Kollam, Kerala to take it up for a solution. AMRITA - TEC, Amrita University successfully developed a solution and A Salt bath hardening furnace developed by AMRITA - TEC was handed over to M/S Safe Power.

Material Composite
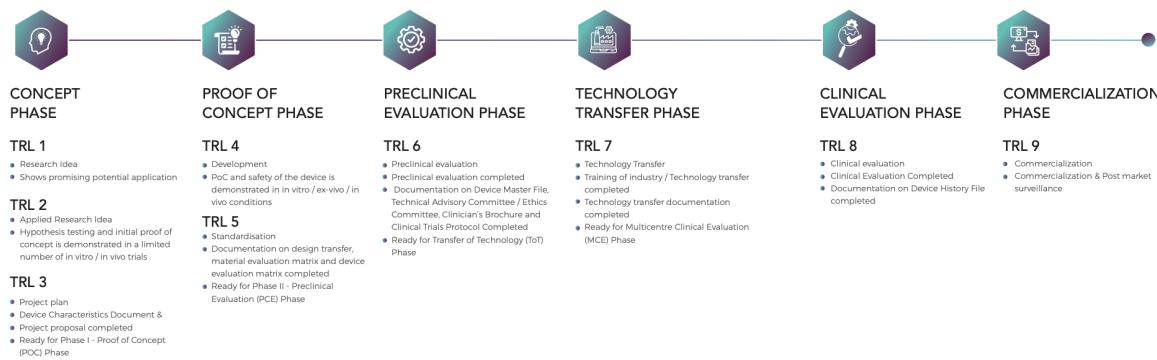
Technology Enabling Center has collaborated and demonstrated its novel material composite developed by Amrita Vishwa Vidyapeetham to the Govt of India. A technology transfer is being explored.

TRL Assessment

Amrita Technology Enabling Centre (TEC) has played a crucial role in advancing technological innovation through the systematic assessment of Technology Readiness Levels (TRLs). TRL assessment is a method that evaluates a technology's maturity and readiness for practical implementation. This process, guided by the TRL scale, enables researchers, engineers, and decision-makers to gauge a technology's development stage, from conceptualisation to full-scale deployment and commercialisation.

Amrita TEC strives to connect innovators with the right resources and industry partners, facilitating the enhancement of TRL levels and accelerating the transition of ground-breaking ideas from the laboratory to the market. In doing so, it serves as a catalyst for technological progress and innovation, propelling emerging technologies toward impactful real-world applications.

CONCEPT PHASE

TRL 1
- Research Idea
- Shows promising potential application

TRL 2
- Applied Research Idea
- Hypothesis testing and initial proof of concept is demonstrated in a limited number of in vitro / in vivo trials

TRL 3
- Project plan
- Device Characteristics Document &
- Project proposal completed
- Ready for Phase I - Proof of Concept (POC) Phase

PROOF OF CONCEPT PHASE

TRL 4
- Development
- PoC and safety of the device is demonstrated in in vitro / ex-vivo / in vivo conditions

TRL 5
- Standardisation
- Documentation on design transfer, material evaluation matrix and device evaluation matrix completed
- Ready for Phase II - Preclinical Evaluation (PCE) Phase

PRECLINICAL EVALUATION PHASE

TRL 6
- Preclinical evaluation
- Preclinical evaluation completed
- Documentation on Device Master File, Technical Advisory Committee / Ethics Committee, Clinician's Brochure and Clinical Trials Protocol Completed
- Ready for Transfer of Technology (ToT) Phase

TECHNOLOGY TRANSFER PHASE

TRL 7
- Technology Transfer
- Training of industry / Technology transfer completed
- Technology transfer documentation completed
- Ready for Multicentre Clinical Evaluation (MCE) Phase

CLINICAL EVALUATION PHASE

TRL 8
- Clinical evaluation
- Clinical Evaluation Completed
- Documentation on Device History File completed

COMMERCIALIZATION PHASE

TRL 9
- Commercialization
- Commercialization & Post market surveillance

No	Title	TRL level
1	Investigation On Paver Block With Replacement Of Foundry Sand, Coconut Shell Ash And Plastic Waste	4
2	Experimental Investigation On Clc Block With Partial Replacement Of Flyash With Foundry Sand	3
3	Epoxy Coated Solar Water Heater For House Hold Applications	4
4	Development Of Impringing Jet Solar Air Heater For Dryers Of Powder Coating Applications In Small And Medium Scale Industries	5
5	Semicircular Jet Impingement Solar Thermal Energy Extractor For Drying Of Agriculture Products	4
6	Shredding Of Areca Powder From Disposal Areca Leaf For Manure And Food For Cattle	3
7	Iot Employed Flood Alerting System For Ground Bridges	2
8	Climbing Mobile Robot	2
9	Development Of Energy Efficient Jet Impingement Evacuated Tube Solar Air Heater Assisted Dryers For Dehydration Of Onions	4
10	Energy Harvesting Using Contactless Twin Disc Implanted Magnets And Belted Pulley	3
11	Crimevision : Advanced Deep Learning	2
12	Predicting Vulnerabilities In Terms And Conditions	2
13	Hearing The Unheard	1
14	Predictive Maintenance For Machine Tools - Turning , Milling , Drilling	3
15	Humanoid Robo For Dyslexia Students Of Primary School	2
16	A Smart And Secure Oxygen Enabled Headgear For Miners And Industrial Workers	2
17	Soldiers Health Care Monitoring	2

18	Agro Tomato Plantation	1
19	Iot Based Low Cost Smart Ambu Bag Machine For Low Cost Ventilators	1
20	Fiche - Photography Service Providing Company	2
21	A Guesture Based Tool For Sterile Browsing Of Radiology Images	2
22	Predicting The University Eligibility Using Data Science	1
23	A Smart Alert System For Maintaining Social Distance For The Disabled With Health Monitoring	2
24	Self-Activating Hygiene Sanitation In Public Settings For Physically Disabled Persons	2
25	Smart Waste Management System	2

Images of Technologies that were assessed for TRL

Industry & Government Bodies Tie-Ups for Technology Enbalement through TEC

TEC Interaction with SAP Labs India

SAP Labs India (SLI) is the fastest-growing subsidiary of SAP, a multinational company that provides customers with world-class business solutions. Founded in November 1998, SAP Labs India drives SAP's product strategy, is responsible for SAP core solutions, and provides product localization and India-specific solutions. SAP flagship products like the Business Technology Platform, SAP S/4 HANA, Financial Management, Supply Chain Management, and CRM have tailor-made offerings for MSMEs. A delegation from SPI led by Ms. Sindhu Gangadharan, Managing Director, SAP Labs India visited Amrita Vishwa Vidyapeetham Coimbatore campus and had interactions with Dr. Sasangan Ramanathan, Dean-Engineering, and Dr. Prashant R. Nair, DST-Amrita TEC fellow. Potential collaboration opportunities identified for Amrita TEC were:

- Training programs for the MSMEs for whom DST-Amrita TEC has supported in technology commercialization
- Training programs for industry association partners of DST-Amrita TEC
- Hackathon for students with problem statements of MSMEs
- Research projects with faculty & students with relevance to MSME needs

Industry Interaction with Plywood Consortium

Mr Mahesh Mohan Sr.Manager Amrita Technology Enabling Center, Mr. K.N. Surendran, Sr.Scientist with Dr Shiju Satyadev (an entrepreneur) interacted with Perumbavoor Plywood Consortium. The discussion was on optimising the functionality of the Smart Ply and reaching out to all the industries of the consortium.

Industry Interaction with Tata Technologies

An industry interaction was conducted with Mr.Rabindra sha, Chief Engineer, Tata Technologies with Dr.Krishnashree Achuthan, Director Amrita Technology Enabling Center, Mr. Sumeet Bahl, and Dr Ganesh Udupa, Professor. Discussions on Augmented Reality/ Virtual Reality and its potential for applications in industries were held. There is a great need for development of AR/VR technologies in India and tie-ups to support this was discussed.

Industry Engagements with global organisation

Left: Amrita Technology Enabling Center facilitate MoU between International Skills Development Corporation and Amrita Ahead for collaborations and programs to professionals for upskilling.

Right: TEC team meets with WIPRO Corporation VP, Sanjeev Jain on collaborative opportunities with WIPRO. Discuss at depth skilling, industry orientation and support.

Industry Engagements with regional industry partners

Amrita Technology Enabling Center has facilitated various industry partners with technology development and commercialisation. A glimpse of visit at the partners displaying their products at the exhibition. (Left) Mr. Sooraj Surendran, Survat Industries and Mr. Kiran Vijay KVEES Food, displaying products with his start-up.

Industry Interaction MSME Vendor Development Program at Trissur

The Vendor Development Programme (VDP) was held in Thrissur MSME DFO Campus. The event was organized by MSME DEO, Thrissur, and SIDBI, Kochi, with support from SBI, Canara Bank, UBI, and NSIC. Amrita TEC (Technology Enabling Center) had a prominent stall at the venue. The various technological innovation and development services provided by Amrita TEC were explained to the entrepreneurs during the event. These discussions led to the generation of potential leads for future collaborative activities between Amrita TEC and MSMEs.

Memorandum of Understanding with Cochin Shipyard Limited

Amrita Technology Enabling Center, through its various engagements with Cochin Ship Yard Limited, has further entered into an MoU with respective sustainable and environment-friendly technology development. Amrita TEC team, headed by Dr Krishnashree Achuthan exchanged the MoU with the authorities of Cochin Ship Yard.

Sustainable technologies with respect to alternatives to plastics will be developed, trained and transferred to entrepreneurs, self-help groups and ecopreneurs.

Further to discover the scope for various technology interventions that can be offered to the rural community, the Cochin Shipyard team and the Amrita TEC team visited Wayanad, the aspirational district to conduct a field study/

Events and Engagements with various Stakeholders

MSME 3.0 Hackathon evaluation at Jansons Institute of Technology, Coimbatore

The MSME 3.0 Hackathon at Jansons Institute of Technology was a great effort of the Ministry of Micro, Small and Medium Enterprises (MSME), and the host institution.
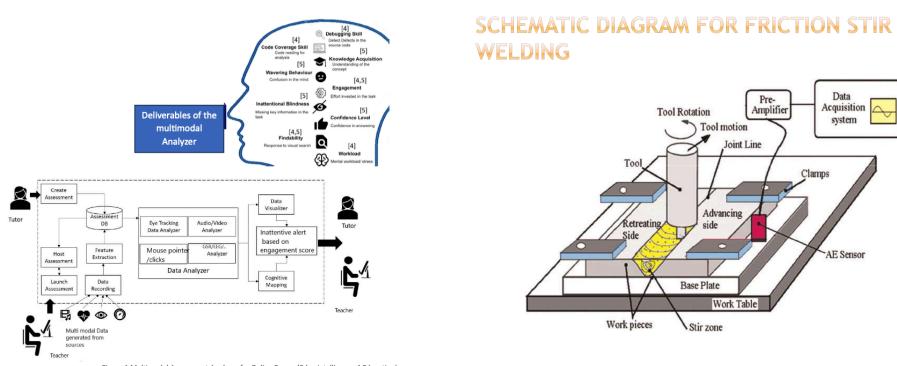
The hackathon brought together a diverse group of participants, each competing to address real-world challenges faced by MSMEs. Mr. C. Rathina Balaji, Commercial Associate, Amrita TEC served as the judge for the event. His role was crucial in evaluating the 25 innovations presented by the participating teams. The judging criteria included creativity, technical feasibility, market potential, and overall impact on MSMEs. The evaluation process was meticulously organised, with each team allotted a specific time slot for presenting their innovations. The judging panel, comprising experts from both academia and industry, worked collaboratively to ensure a fair and comprehensive evaluation.

Event Women-Led Hackathon for MSME Challenges
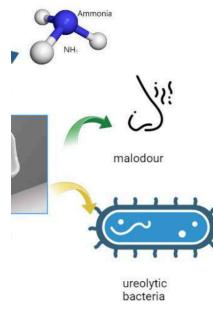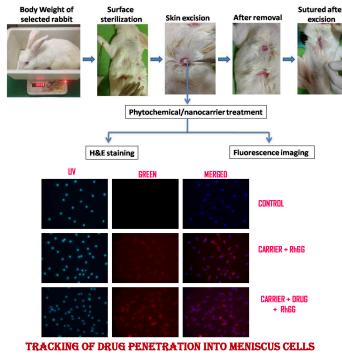
A women-led hackathon was organized by the Amrita Technology Enabling Center, featuring a hands-on training session at Amrita Vishwa Vidyapeetham, Ettimadai, Coimbatore—the training aimed to assist women in brainstorming their ideas and preparing proposals. The session saw active participation from over 60 individuals, resulting in the submission of 68 ideas.
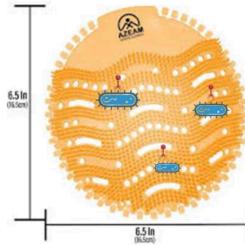
Hands-on training session organised at Amrita Vishwa Vidyapeetham, Coimbatore

Figure 1 Multimodal Assessment Analyzer for Online Exams (Edge Intelligence 4 Education)

SCHEMATIC DIAGRAM FOR FRICTION STIR WELDING

Few Ideas Submitted by Women on Various Technologies

Further to it after the submissions, a review was conducted with an expert committee comprised of the following members was engaged in evaluating the submitted ideas:

Mr. Kiran Vijay, Director, Kvees Food Products Pvt Ltd

Mr.Visakh.KS, Managing Director, Tzvao Fintech Pvt Ltd.

Mr. Sumeet Bahl, VPGlobal Marketing & Strategy, Amrita Technologies.
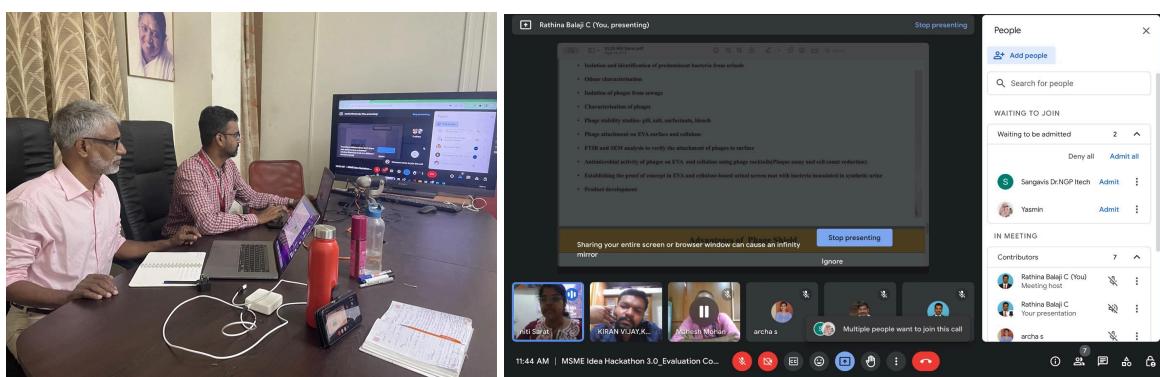
Mr. K.N. Surendran, Sr. Scientist, Amrita Technology Enabling Centre.

Mr. Mahesh Mohan, Sr. Manager, Technology Enabling Center.

Dr. Ravikumar Pandi V, Amrita Vishwa Vidyapeetham.

Dr. Prashant R. Nair, Amrita Vishwa Vidyapeetham.
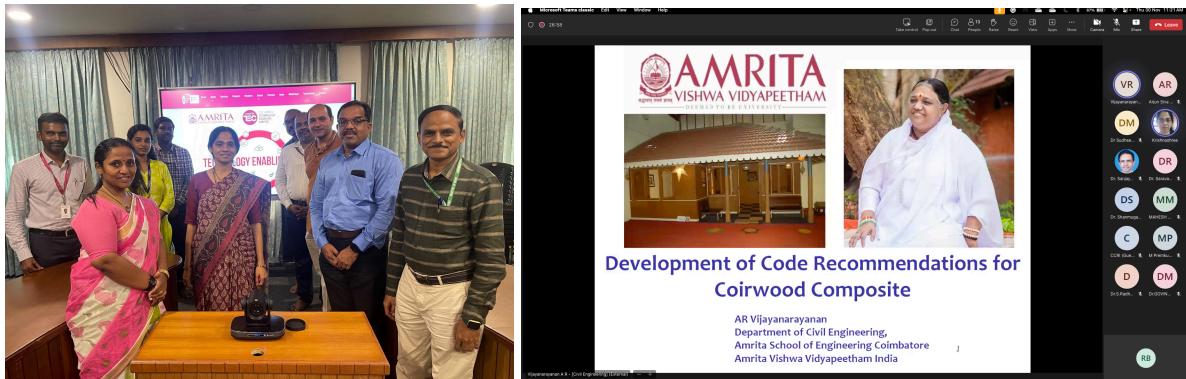
Dr. Rahul Krishnan, Wireless Networks and Applications.

Evaluation of the Idea Submitted by the Expert Committee

This esteemed committee meticulously evaluated the submitted ideas, focusing on the technological aspects, and provided constructive feedback to the participants. The commitment of the committee members ensured a thorough and fair evaluation process for the prospective ideas presented in the hackathon.

Engagement with Central Coir Research Institute

Amrita Technology Enabling Center has conducted an exhaustive research on the coir industry through its field visit, exhibition visit, and interactions with entrepreneurs through the Central Coir Research Institute and Coir Board of India. Various problem statements were identified, and research gaps were identified. The solutions were proposed to the authorities of Coir Research Institute. Amrita TEC has facilitated various interactions for the groundbreaking technologies to promote the coir in the use of agriculture, construction - building and roadways and other usages in sustainable products. TEC has supported research in the areas of Coir Geotextile as an Interface Layer for roadway construction, Life Cycle Assessment of Coir Products, Coirwood Composite standards for construction, Coir Pith Production and Selection of Plant Species and technology development for continuous Coirir Fiber with Uniformity.

Manufacturing Conclave jointly organised by Amrita TEC and BCIC, Bangalore.

Amrita Technology Enabling Center, in association with the Banglore Chamber of Industries and Commerce, organised a one-day Manufacturing Conclave to gain insights on the latest trends in manufacturing, understand how these can help in growing your business, and contribute to nation-building. Let us come together and upskill, engage, collaborate and contribute for an Atma Nirbhar Bharat. The key focus area of the conclave includes

- Affordable automation and digitization
- Sustainability in manufacturing
- Manufacturing Technology, and
- Technology Demonstration

The prominent speakers of the conclave included the following personalities.

Smt. Gunjan Krishna, IAS - Commissioner for Industrial, Dept. Director Industries & Commerce, Govt. of Karnataka

Dr. S Devarajan (PED/Hos Devarajan - President, Bangalore Chamber of Industry and Commerce

Mr. Prakash Gadhar - Chairman, Manufacturing Expert Committee,
 Bangalore Chamber of Industry and Commerce

Mr Ramesh T K - Managing Director,
ACE Designers Ltd

Mr. Himanshu Jadhav - Chief Executive Officer,
Jendamark India Pvt Ltd

Mr Sivaganesh Vellingiri - GM - FA Business Support,
FANUC India

Mr Rakesh S B- Vice President,
Aerospace and Defence, Sansera Engineering Ltd

Maj. Neil Christopher Castelino, Senior Director Corp & Govt. Affairs- South,
Flipkart

Dr Manish Rajan Walvekar, Assistant Professor, Amrita Dharsanam International Center for Spiritual Studies, Amrita Viswa Vidyapeetham

Mr Keyur Bhalavat - Founder & Chief Executive Officer,
Plutomen

Mr Lokesh Venkataswamy - CEO & Managing Director,
Innomanta Consulting Private Limited

Mr Rajesh Kumar Jha - Country Environment & Sustainability Manager,
ABB India Limited

Mr V C MOHAN- EHS Regional Co-ordination for India,
Australia and Support ASEAN, Bosch Limited -

Mr. Chandrashekar Bharathi - Managing Director,
AceMicromatic MIT

Mr. Shridhar Rajappanavar - Founder and CEO,
Key Sustainability Solutions
Ms. Divya Seethapathy - Director Global Procurement Resilience Program -
Global Supply Chain, Schneider Electric.

During the conclave topics related to technology-driven manufacturing for growth
and prosperity with a focus on affordable digitisation and automation, homegrown
technology, sustainability, innovation and emerging manufacturing technologies, and
scope and opportunities were addressed by the experts.
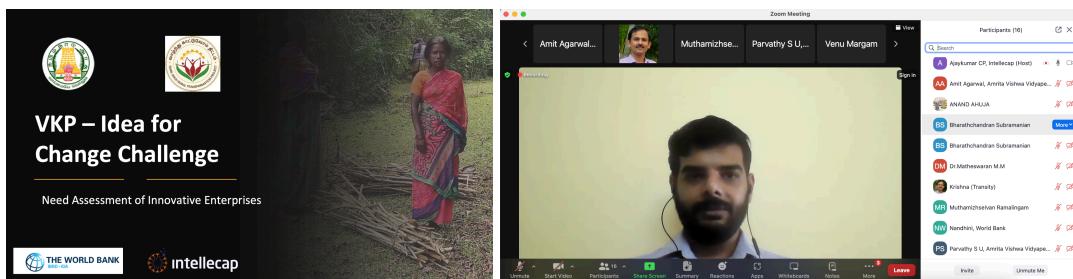
Field Visits to Rural Communities to Provide Technology Solutions

Mr.K.N.Surendran, Sr.Scientist, conducted a field visit to address social challenges
in rural areas through Technology Enabling Centers (TECs). The identified problem
involves environmental pollution and wastage from burning paddy straw in fields
after harvest. Proposed solutions include paddy straw composting for organic
manure, bioenergy production, paddy straw board manufacturing, and livestock feed.

Emphasizing research and innovation, along with public awareness and incentives, can lead to sustainable practices, reducing environmental impact and creating economic opportunities for rural communities. Amrita TEC is scouting for innovative ideas and technology solutions to address the problems of rural communities

Interventions with Vaazhnthu Kattovom Project (VKP), Tamilnadu Government.
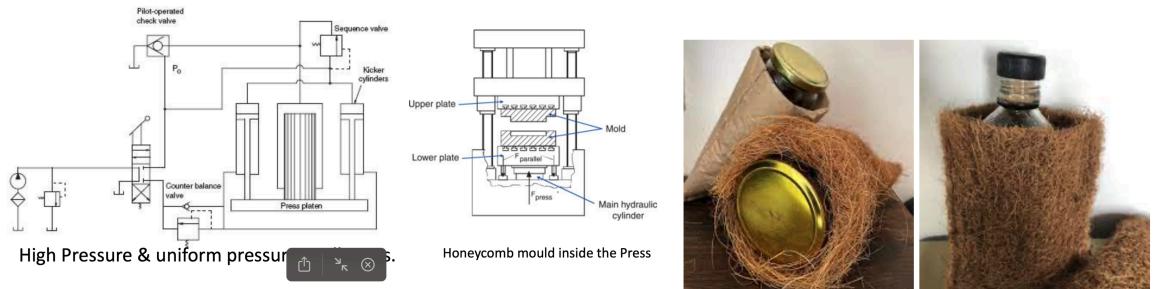
Amrita Technology Enabling Center actively participated in the "Idea for Change" event, an initiative organized by the Vaazhnthu Kattovom Project (VKP) under the auspices of the Government of Tamil Nadu—the event aimed to address challenges faced by rural enterprises through collaborative problem-solving. The VKP provided a set of problem statements pertaining to these enterprises, which were tackled by the Amrita Technology Enabling Center and its partner institution. The Vaazhnthu Kattovom Project (VKP) plays a pivotal role in fostering sustainable development in rural areas of Tamil Nadu. By identifying challenges faced by local enterprises, VKP seeks innovative solutions to catalyze positive change. Amrita TEC has proposed various solutions tailored to address the unique needs of each rural enterprise, taking into consideration the socio-economic and environmental factors.

Facilitating Funding for Various Projects

The Amrita Technology Enabling Center facilitated various ideas to secure partners funding for various technology development in sectors including processing and sustainable packing. Amrita TEC is closely working on solving MSME problems. The design of a novel cashew sorting machine to help the cashew industry to solve its manpower shortage was supported by Amrita TEC to secure partners. To solve the

sustainable needs for packing material in the growing e-commerce market, Amrita TEC has supported securing funding for a novel coir-based sustainable packing item.

High Pressure & uniform pressure across.

Honeycomb mould inside the Press

Participation in Synergia Conclave

Mr. Sumeet Bahl, represented Synergia conclave Bangalore 2023, Lt Gen Hiroe Jiro Commanding General TERCOM Japan. The conclave was a multi-disciplinary think tank engagement that brought together various experts globally for drafting policy making and regulation.

Academica Partnership with Various Institutions

A team from Cochin University of Science & Technology (CUSAT) visited Amrita Vishwa Vidyapeetham Coimbatore campus and had interactions with Dr. Prashant R. Nair, DST-Amrita TEC fellow. Potential collaboration opportunities identified were an academic partnership with DST-Amrita Technology Enabling Center (TEC) for technology commercialization and transfer of patented technologies at various academic departments and research centres of the premier university, CUSAT. The CUSAT team included Prof. Santhosh Kumar M.B from the Department of Information Technology, Emeritus Professor Dr. Kannan Balakrishnan from the Computer Applications department, Former Dean Dr. KPS Nair, and Prof. Pramod Kumar. Prof. Santhosh Kumar provided insights into the smart agriculture applications using blockchain and Banana Propping techniques developed by CUSAT.

Training Programs & Workshops Organised
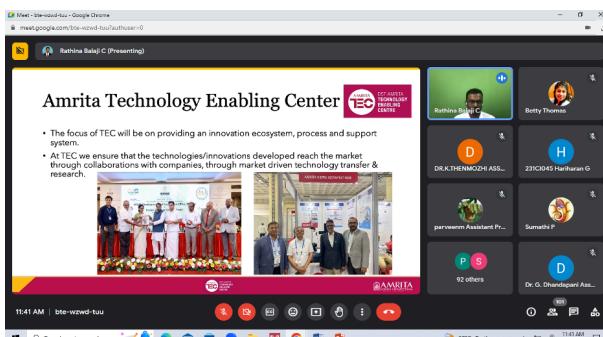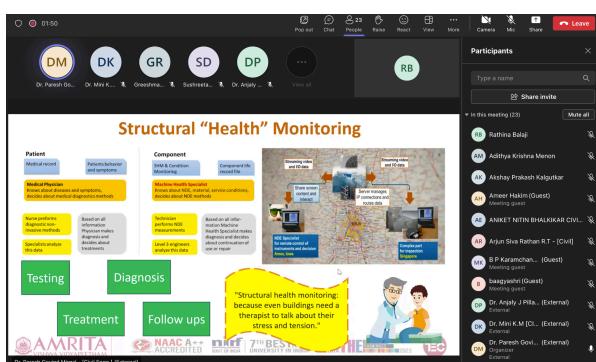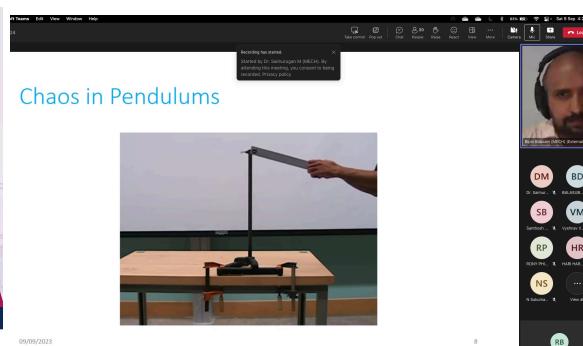
TACTICS - Capacity Building Program on Cyber Safety

Technology Advancement and Capacity-building Training Initiatives or TACTICS is a comprehensive session for Industry, Organizations and entrepreneurs It is designed to equip the participants with the knowledge and skills needed to protect themselves against cyber threats. The program aims to increase awareness and understanding of common cyber threats and provides best practices for securing personal and professional data. We provide best practices for securing personal and professional data, including password management, network security, and privacy protection. Additionally, we educate the participants on the safe and responsible use of social media and email and provide strategies for identifying and responding to phishing attacks and other cyber threats. Our ultimate goal is to enhance the cybersecurity posture of the industries and mitigate the risks associated with cyber threats. By participating in the program, participants can take proactive steps to safeguard their personal and professional data, prevent cyber attacks, and respond to security incidents. Over 1000 members will benefit from this programme organised at various locations during the year 2023.

Various Training Programs Organised by Amrita TEC

Amrita Technology Enabling Center has organised various training programs for the benefit of the industries, entrepreneurs , academia, student community, researchers and innovators. Expert talks on various fields that would benefit the ecosystem were organised to train the participants. The latest technology trends in manufacturing, construction and cloud computing were organised.

Workshop on Spacetech - Innovation and Entrepreneurship

TEC facilitated in organizing a workshop titled "Space Tech - Innovation and Entrepreneurship' in collaboration with Laghu Udyog Bharati and Amrita Vishwa Vidyapeetham. The workshop will be inaugurated by the Chairman of ISRO Sri. S Somanath followed by his keynote address. The second session was by Sri. Pradeep K S, DGM, Canara Bank, and the final one by Sri. Biju Kurien, General Manager, DIC Kollam.

Techstars Startup Weekend 2023 Event Mentor

Dr. Prashant R. Nair, DST-Amrita Technology Enabling Centre (TEC) fellow and Head, IQAC, Amrita Vishwa Vidyapeetham Coimbatore campus, conducting a mentoring session for Edtech startups for the Techstars Startup Weekend 2023 organized by and held at Atal Incubation Centre (AIC) Raise, Coimbatore. Techstars Startup Weekend is a global grassroots movement of active, empowered entrepreneurs who are learning the basics of founding startups and launching

successful ventures. This is another initiative of DST-Amrita TEC towards building ecosystem collaboration and partnerships.

Problem-solving and ideation workshop for Amrita TEC academic partner, Kalaignar Karunanidhi Institute of Technology

A workshop was organised for the students of Kalaignar Karunanidhi Institute of Technology (KIT). Dr M. Ramesh, the Principal delivered the welcome note. Dr Prashant R. Nair, DST-Amrita TEC fellow & Vice-Chairman - IQAC, Amrita Vishwa Vidyapeetham, Coimbatore campus and C.Rathina Balaji, Commercial Associate, Amrita Technology Enabling Center successfully trained over 60 students on how to address a problem statement and come out with a solution in a structured and scientific approach. Dr. S. Shanthi, Head CFRD proposed the vote of thanks for the program.

Talk for National IPR Workshop of Cell for IPR Promotion and Management (CIPAM) of the Ministry of Commerce & Industry


Dr. Prashant R. Nair, DST-Amrita TEC fellow & Vice-Chairman - IQAC, Amrita Vishwa Vidyapeetham, Coimbatore campus delivered a keynote address on 'Importance of IPR for Academia' for a national workshop on IPR organized by Cell for IPR Promotion and Management (CIPAM) of the Ministry of Commerce & Industry of Government of India and hosted at RVS College of Arts & Science (RVSCAS), Coimbatore on 4 September 2023. RVSCAS is an academic partner institution of DST-Amrita TEC. 100+ participants from industry and academia attended the workshop, which was inaugurated by Dr. K.K. Shine, Chairperson of the National Council for Teacher Education (NCTE) of the Government of India. Dr. M.P. Ayyappa Das, Vice-Principal of RVSCAS, presided over the keynote session. CIPAM in partnership with industry associations, is conducting IPR awareness programs in various states and this workshop is part of this national professional body's outreach program in the state of Tamil Nadu.

Talk for DST Sponsored Faculty Development Program (FDP) on Entrepreneurship

As part of the DST-Amrita Technology Enabling Center (TEC)'s academic partnership program, Dr. Prashant R. Nair, DST-Amrita TEC fellow, and Vice-Chairman - IQAC, Amrita Vishwa Vidyapeetham, Coimbatore campus, spoke on 'Unleashing Entrepreneurship through Innovation' and 'Technology Readiness
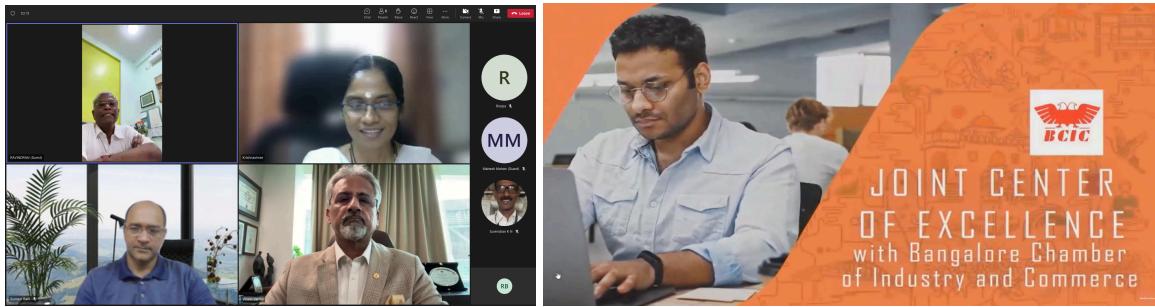
Levels (TRL)' for an Online Faculty Development Program (FDP) on Entrepreneurship sponsored by the Department of Science & Technology (DST) of the Government of India and organized by Amrita Centre for Entrepreneurship (ACE) of the Directorate of Corporate & Industry Relations (CIR), Amrita Vishwa Vidyapeetham. 25 faculty from various universities and colleges attended this online FDP, coordinated by Mr. R. Krishnan, Head-ACE, CIR @ AMRITA. The objective of this 2-week online FDP is to equip the participants with competence in the area of entrepreneurship development so that they can mentor science & technology students to become entrepreneurs in the future.

Awards & Achievements

Industry Joint Centre of Excellence Launched For Technology Empowerment

Amrita Technology Enabling Center and Banglore Chamber of Industry and Commerce had various collaborative sessions conducted over the past three years. Further to the continual engagement, a new concept note for the Centre of Excellence by Amrita and BCIC, focusing on Startups, MSMEs, and Technology Development for Societal Good, was proposed and launched with common objectives.

Discussion on Joint Centre of Excellence

The Center aims to identify areas of strength and leverage resources from its network of partners, including manpower and funding. It intends to prioritize activities and execute them within agreed timelines. The Models of Engagement include Corporate CSR, Government (Central and State), Academia-Industry Innovation Days, MSME Outreach, and support systems for Startups. The objectives span areas like Start-Up, MSME, Corporate, and State, addressing problem statements with both domestic and global relevance. It envisions collaboration with industry partners, offering support systems to startups, conducting IAM/Yoga sessions for corporate entities, and engaging in research and whitepapers.

Launch of Joint Center of Excellence with BCIC

Finalist Award in Medicall Point of Care Devices

Medicall, is India's largest B2B Medical Equipment Exhibition. Medicall serves as a marketing platform wherein the equipment companies showcase their products and services to Hospital owners and decision-makers. The event also recognises the

innovators through an evaluative process with an expert committee. Amrita 5 in 1 Health care device won the finalist award in the Point of Care Devices category.
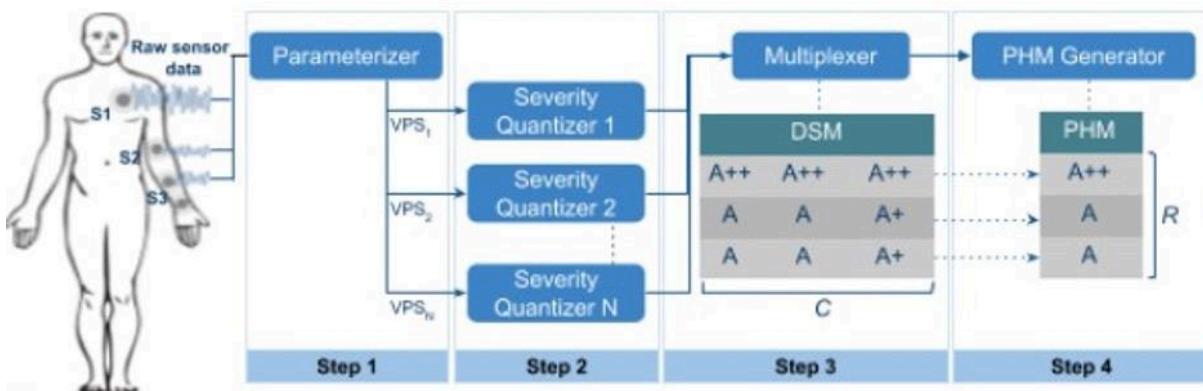

Patents Granted through TEC

## Indian Patent 459006 Systems and Methods for Remote Health Monitoring and Management
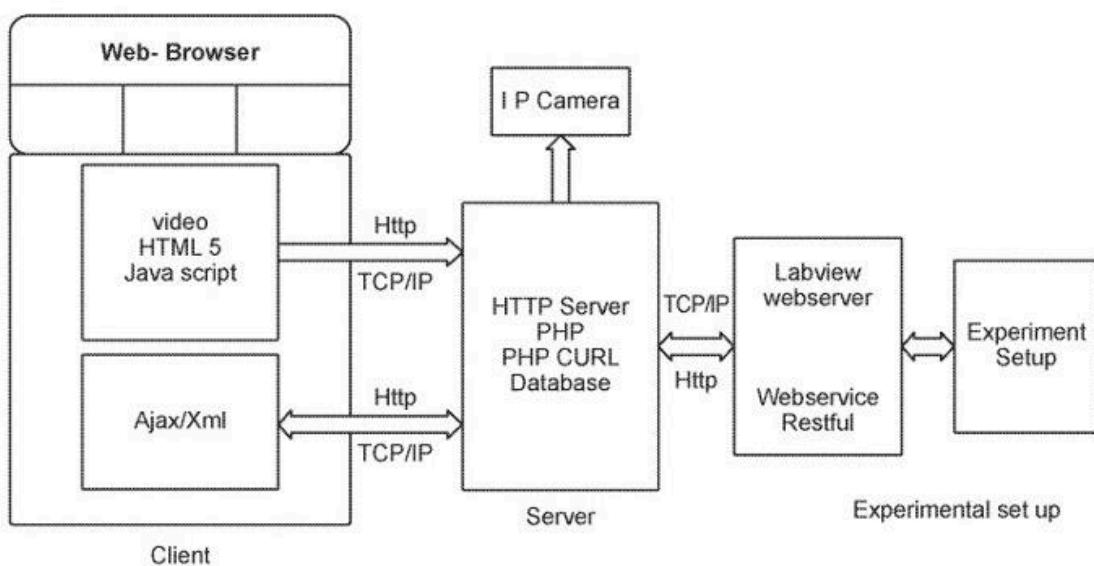
With connected medical devices fast becoming ubiquitous in healthcare monitoring there is a deluge of data coming from multiple body-attached sensors. Transforming this flood of data into effective and efficient diagnosis is a major challenge. To address this challenge we designed, developed, and tested a predictive healthcare data analytics and communication framework called RASPRO (Rapid Active Summarization for effective PROgnosis) in a collaborative work with doctors.

In RASPRO we built a novel three-step technique to derive high performance alerts from voluminous sensor data

Indian Patent 457984 Solar Monitoring System for Measuring Solar Radiation Intensity
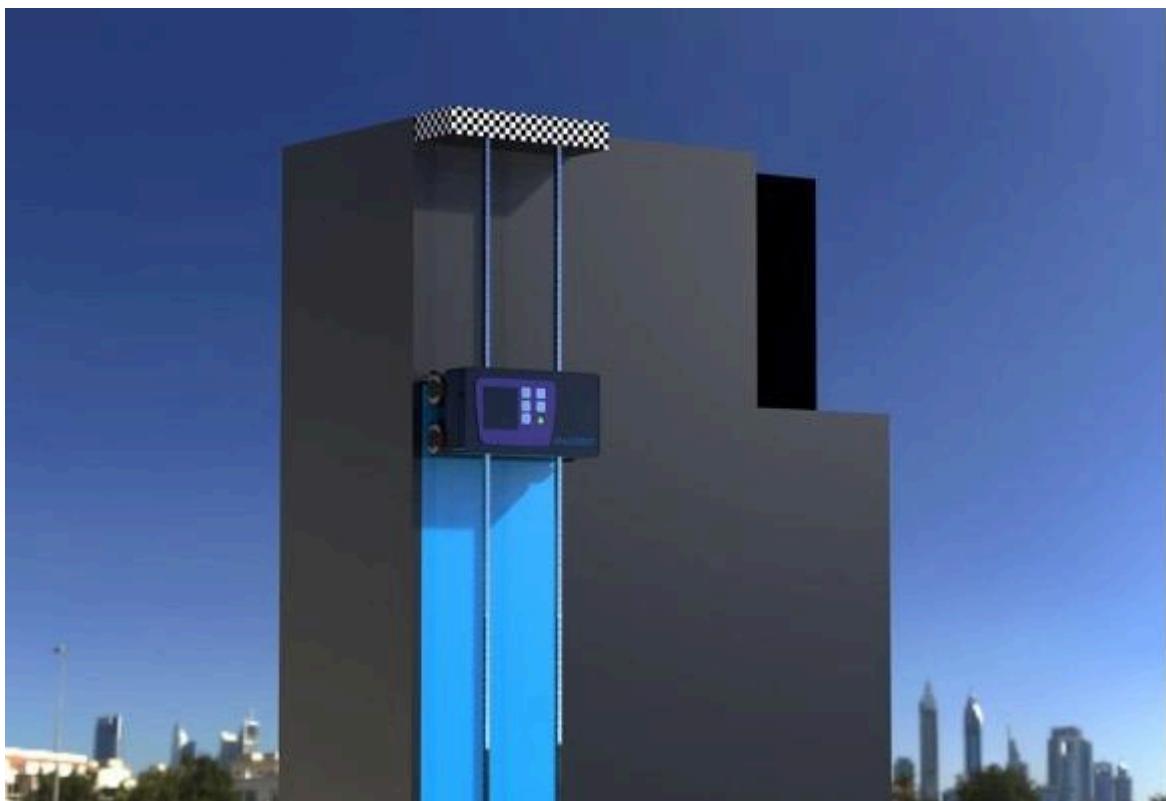
A solar monitoring system for measuring solar radiation intensity comprising a tracking unit having two-axis movement comprising, an image capturing head mounted with first and second irradiation measuring units, and a controller. The first irradiation measuring unit comprises a direct normal irradiance (DNI) sensor and the second irradiation measuring unit includes a diffuse horizontal irradiance (DHI) sensor and a global horizontal irradiance (GHI) sensor. The controller receives inputs from the sensors or a software program configured to control orientation of the image capturing head so that the DNI sensor is always exposed to the sun, and the shading disc is always directly between the DHI sensor and the sun.

## Indian Patent 455612 An Automated System for Wall Painting
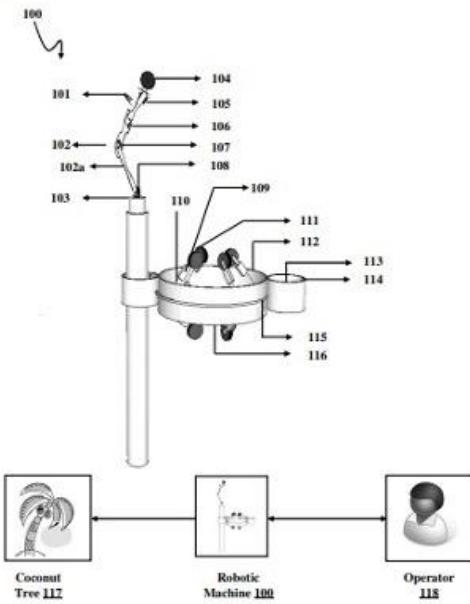
Amrita developed a robot which ascends tall walls upon which it gets mounted, independently, and simultaneously paints the surface without compromising the finish. This robot combines machine learning and computer vision with standard robotics methods to achieve its goals. The student team had participated in James Dyson award international design competition. They were also a semi-finalist in the Accenture innovation challenge. The "WallpBot" has also been filed as a patent.The

idea was to create the simplest possible solution to paint tall walls and save human counterparts from health hazards and painting accidents.

Indian Patent 452646 Robotic Machine for Climbing Coconut Trees and Harvesting Coconuts

The present invention provides a robotic machine for climbing coconut trees and cutting coconuts, the robotic machine includes a machine unit and a ground station, wherein the machine unit comprises robotic arm, robotic body and base rod connecting the robotic arm and robotic body. The robotic arm includes an arm unit, a controller unit, a processing unit, a plurality of servomotors, a wireless camera, and DC motors. The robotic body includes circular body, plurality of wheels, plurality of torsion springs, battery and channel for the circular motion of the arm. The wheels enable the machine unit to hold and climb on the trunk of a coconut tree. The camera captures video in the vicinity of the cutter, and transmits the video to the ground station for displaying to the operator, and based on the video, the operator can command the machine unit and position the cutter to cut the coconut precisely.

Indian Patent 435985 A Method for Producing Geocells and Geogrids Using Areca Leaf Sheath

The present invention relates to a method for producing geocells and Geogrids using Areca Leaf Sheath. The method comprising the steps of, soaking the Areca leaf sheath in water for a predetermined time, pressing the soaked Areca leaf sheath under a hot press with a predetermined pressure to obtain a flat Areca leaf sheath, drying the flat Areca leaf sheath in the air for a predetermined duration, obtaining a plurality of strips by cutting the soaked Areca leaf sheath of predetermined width, weaving the strips together to form an Areca grid of predetermined size, and tying the Areca grids using threads to form Areca cells as shapes similar to geocells. The Areca cells can be formed in a honey comb structure to increase the tensile strength of the geocells. The Areca grids can be utilized in civil engineering applications in multiple layers to increase the bearing capacity of the geogrid.