B.I.T. Sindri, Dhanbad, Jharkhand — Estd. 1949

Department of Civil Engineering

AVLOKAN

ACE — Association of Civil Engineers

Annual Technical Fest — 2026

HACKATHON — DAY I

Official Problem Statement Booklet

Duration	Total Challenges	Participation	Date
12 Hours	**44**	**Inter-College**	**Day — I**
(9:00 AM – 9:00 PM)	*Across 5 Tracks*	*Teams of 3 – 4 Members*	*AVLOKAN 2026*

Issued by the Department of Civil Engineering, B.I.T. Sindri

ABOUT AVLOKAN 2026

AVLOKAN is the annual technical festival of the Association of Civil Engineers (ACE), Department of Civil Engineering, Bharat Institute of Technology (B.I.T.) Sindri. Conducted over three days, AVLOKAN brings together engineering students, faculty, and industry professionals from across the country to collaborate, compete, and innovate. The festival serves as a platform for students to apply classroom theory to real-world problems — with a particular emphasis on civil infrastructure, sustainable development, and digital engineering.

Day	Event	Description
I	**HACKATHON** *(12-Hour Sprint)*	Teams from different colleges choose a problem statement and develop a working prototype — hardware or software — within 12 continuous hours. Emphasis is on practical, deployable, and civil-engineering-relevant solutions. Expert panel evaluates demonstrations at the end of the day.
II	**TECHNICAL EVENTS** *(Paper Presentation, CAD, Quiz)*	Day 2 features individual and team-based technical competitions including Technical Paper Presentation, AutoCAD Drafting Contest, and Civil Engineering Quiz. Participants demonstrate their domain knowledge, research acumen, and presentation skills before a panel of faculty and industry judges.
III	**CULTURAL & VALEDICTORY** *(Fest, Awards & Closing)*	The concluding day celebrates achievements with cultural performances, guest lectures from industry leaders, prize distribution for all events, and the formal valedictory ceremony. Outstanding projects from the Hackathon are showcased in a public exhibition.

HACKATHON — RULES & REGULATIONS

1. Eligibility & Registration

1.1 The Hackathon is open to all undergraduate and postgraduate engineering and technology students currently enrolled in a recognised university or institute.

1.2 Participants must register as a team. Each team shall comprise **a minimum of 3 and a maximum of 4 members.** All team members must be from the same institution.

1.3 Each institution may field a maximum of **5 teams** in a single track. A team may register for only one track.

1.4 One member of each team must be designated as the **Team Leader** who shall serve as the primary point of contact with the organisers.

1.5 Valid college ID cards are mandatory for all participants and must be presented at the registration desk on Day I. No exceptions shall be made.

2. Problem Statement Selection

2.1 Teams must choose **exactly one problem statement** from this booklet during online pre-registration, at least **72 hours before the event.**

2.2 Problem statement selection is on a first-come, first-served basis. A single problem may be attempted by a **maximum of 3 teams** across the entire event.

2.3 Teams are strongly encouraged to conduct preliminary research on their chosen problem before the event. Pre-event preparation of concept sketches, algorithm outlines, or system architecture is permitted and encouraged.

2.4 Change of problem statement after registration is **not permitted** under any circumstance.

3. Event Schedule — Day I (Hackathon)

08:00 – 09:00	Participant Registration, ID Verification & Kit Distribution
09:00 – 09:30	Inauguration Ceremony, Welcome Address & Track Briefing by Coordinators
09:30 – 09:45	Problem Statement Confirmation & Workstation Allocation
09:45 – 10:00	Final Rules Briefing by the Jury Panel
10:00	HACKATHON BEGINS — 12-Hour Development Sprint
13:00 – 14:00	Lunch Break (Teams must leave a representative at workstation)
16:00 – 16:30	Mid-Point Evaluation — Brief Progress Check by Mentors (no marks; advisory only)
19:00 – 19:30	Dinner Break (Teams may not leave premises unattended)
22:00 – 22:15	**FINAL SUBMISSION — Hard Deadline; No extensions granted**
22:15 – 22:45	Repository / Hardware lock-in; Jury Preparation
22:45 – 23:45	Final Demonstrations & Jury Evaluation (Q&A per team)
23:45 – 00:00	Score Compilation; Day I Results Announcement

4. Deliverables & Submission Requirements

4.1 Teams must submit a **working prototype** — hardware, software, or a combination of both — that directly addresses their chosen problem statement.

4.2 A **Project Report (maximum 8 pages, A4, PDF format)** must be submitted digitally by 22:00 hrs. It must include: Problem Definition, Proposed Solution, System Architecture / Design Schematic, Tools & Technologies Used, and Future Scope.

4.3 A 5-minute verbal presentation followed by a 5-minute Q&A with the jury is mandatory for every team. Presenters must demonstrate the prototype live during evaluation.

4.4 For software-based solutions: all source code must be committed to a **private GitHub repository** and the link shared with organisers by the submission deadline.

4.5 For hardware-based solutions: a working prototype or a detailed, labelled mock-up with clear functionality demonstration is required. CAD drawings or circuit schematics must be included in the report.

5. Judging Criteria & Scoring Rubric

S.No.	Criterion	Marks	Evaluation Focus
1.	Problem Understanding & Solution Relevance	20	*Does the solution directly and correctly address the problem statement?*
2.	Innovation & Technical Depth	20	*Novelty of approach; engineering complexity; use of advanced methods.*
3.	Functionality & Working Prototype Quality	25	*Does the prototype/software work as intended? Is it stable and functional?*
4.	Civil Engineering Applicability & Real-World Impact	15	*Practical relevance to civil/infrastructure domain; scalability potential.*
5.	Presentation, Report Quality & Team Coordination	10	*Clarity of explanation, quality of report, Q&A handling.*
6.	Sustainable & Responsible Design	10	*Consideration of sustainability, safety, cost-effectiveness, and ethics.*

6. Resources, Tools & Infrastructure

6.1 Each team will be allocated a dedicated workstation comprising a table, chairs, and a power outlet. Participants must bring their own laptops, chargers, and any personal tools.

6.2 Stable Wi-Fi connectivity will be provided. Teams requiring hardware components (Arduino, sensors, resistors, basic electronics) may request from the resource desk, subject to availability — on a best-effort basis. Teams are encouraged to carry their own components.

6.3 Use of open-source software, libraries, APIs, and publicly available datasets is permitted. Pre-written code frameworks are allowed; however, at least **60% of the solution must be developed during the event.**

6.4 Faculty mentors from the Department of Civil Engineering will be available for technical guidance at scheduled intervals. Mentors are advisory only and will not assist in building solutions.

6.5 Use of Generative AI tools (ChatGPT, Copilot, etc.) is **permitted as an assistive tool only.** Solutions must demonstrate original ideation by the team. AI-generated content must be clearly identified in the report.

7. Code of Conduct & Disciplinary Policy

7.1 All participants are expected to maintain professional conduct. Any form of plagiarism, copying of another team's work, or submission of pre-built projects will result in **immediate disqualification.**

7.2 Participants must not tamper with or interfere with another team's workstation, equipment, or code.

7.3 The premises must be kept clean and tidy. Damage to institute property will result in disqualification and may attract additional penalty at the discretion of the organising committee.

7.4 Consumption of alcohol, tobacco, or any prohibited substance on campus is strictly forbidden and will result in immediate expulsion from the event.

7.5 The decision of the Jury Panel and the Organising Committee shall be **final and binding.**

7.6 Participants leave and re-enter the venue for emergencies only, with prior written permission from the Event Coordinator. Exit without permission will be treated as withdrawal.

8. Awards & Recognition

Position	Award Title	Prize	Perks
Winner (1st)	AVLOKAN Grand Innovator Award	₹ 15,000 + Trophy	*Certificate, Fast-track Industry Referral*

First Runner-Up	Excellence in Engineering Award	**₹ 10,000 + Trophy**	*Certificate, Mentorship Session*
Second Runner-Up	Distinguished Innovation Award	**₹ 5,000 + Trophy**	*Certificate of Merit*
Best Civil Application	Civil Engineering Impact Award	**₹ 3,000 + Plaque**	*Special Jury Commendation*
Best Sustainability	Green Engineering Award	**₹ 3,000 + Plaque**	*Special Jury Commendation*
All Participants	—	**Participation Certificate**	*Issued by Dept. of Civil Engg.*

Note: Prize money is subject to sponsorship confirmation. The organising committee reserves the right to revise the prize structure with prior notice.

PROBLEM STATEMENTS — ALL TRACKS

The following 44 problem statements are classified into five thematic tracks. Teams must select one problem from within their registered track. Each problem is designed to challenge teams to apply engineering principles to practical, real-world scenarios with measurable outcomes.

Code	Track Title	No.	Solution Type
TRK-A	Smart Infrastructure & Transportation Engineering	**8**	*Hardware / Software / Simulation*
TRK-B	Sustainable Energy & Environmental Engineering	**8**	*Hardware / Software / Prototype*
TRK-C	Digital Construction & Structural Health Monitoring	**8**	*Hardware / Software / Simulation*
TRK-D	Smart Cities & Urban Systems	**10**	*Software / App / Platform*
TRK-E	Open Innovation	**10**	*Hardware / Software / Any*

TRK-A Smart Infrastructure & Transportation Engineering

"Designing intelligent mobility and infrastructure solutions for tomorrow's cities"

Focus Area: Urban transportation systems, road & bridge technology, vehicular engineering, traffic management, and mobility optimization using AI and IoT.

Expected Solution Type: *Hardware / Software / Simulation*

P1 Innovative Cooling Solution for Parked Vehicles in Hot Climates

TYPE

Problem Statement:

Design a sustainable, green-energy-based solution that actively maintains the interior temperature of a parked vehicle at approximately 25°C, regardless of external heat conditions. The solution must not rely on sun shades, blinds, tinted windows, or basic solar fans.

Constraints & Considerations:

1. Must operate effectively in direct sunlight and high ambient temperatures.
2. Should be compliant with regulatory norms (e.g., no tinted windows or external blinds).
3. Should utilise renewable energy sources (e.g., solar, thermoelectric, passive cooling).
4. Should be compact, vehicle-compatible, and ideally retrofit-friendly.

P2 Passenger Comfort Modeling in an Automotive Suspension System

TYPE

Problem Statement:

Establish and validate a mathematical model that accurately represents passenger comfort parameters within a defined suspension system under real-time driving conditions. The model should be supported by physical testing to ensure correlation between theoretical predictions and actual ride experiences.

P5 Standardised Effortless Battery Swapping Station for All Types of Electric Vehicles

TYPE

Problem Statement:

Design a standardised, user-friendly battery swapping station that supports all types of EVs with a universal battery concept. The solution should integrate with existing fuel station infrastructure, include robust battery management systems, comply with government regulations, and offer quick swapping with digital payment systems. The goal is to provide EV users the same convenience as traditional fuel vehicle users.

P7 Framework for On-Road Dynamic Automobile Pantograph Mechanism

TYPE

Problem Statement:

Develop a framework for powering electric vehicles directly from external overhead power lines by designing a vertical pole mounted on the vehicle with a roller that draws electricity — similar to train pantographs but adapted for road vehicles. The solution should include mechanical design, theoretical physics validation, and simulation analysis. A working prototype should demonstrate proof of concept.

P8 Open Road Frequency – The Future of Car-to-Car Communication

TYPE

Problem Statement:
Design and prototype a system that enables real-time, localised communication between vehicles, inspired by aviation-style shared frequencies. The solution should define a communication protocol (voice, text, symbolic alerts), ensure a distraction-free interface, prioritise messages based on urgency, and address security, privacy, scalability, and interoperability with existing V2V and V2X systems.

P9 CAE Analysis of Automotive Systems Integrated with ECU and Virtual Operating Conditions

TYPE

Problem Statement:
Develop a solution that integrates system CAD models with ECU software to perform dynamic CAE/CFD analysis under virtual operating conditions. The focus should be on simulating system behaviour in motion, starting with thermal analysis using CFD techniques to address challenges in electric and hybrid vehicle designs.

P31 High-Fidelity Prediction of Stiffness in Stamped Panels Using AI/ML

TYPE

Problem Statement:
Develop a scalable AI/ML solution that accurately predicts the stiffness and deformation behaviour of stamped components based on their geometric shape and applied load. The goal is to replace time-intensive CAE simulations with a fast, high-fidelity predictive model that provides immediate feasibility feedback to design teams during shape change proposals.

P39 AI-Driven Urban Mobility Optimisation for Sustainable Smart Cities

TYPE

Problem Statement:
Develop an intelligent, real-time urban mobility management solution that leverages AI, machine learning, and IoT to analyse traffic flow data, identify congestion hotspots, and dynamically optimise signal timings and routing. The system should integrate data from GPS, traffic cameras, sensors, and public transport networks into a unified traffic intelligence dashboard. It must be scalable, adaptable to different urban environments, and include real-time commuter alerts, multi-modal transport integration, and predictive congestion modelling.

TRK-B Sustainable Energy & Environmental Engineering

"Engineering green solutions for a carbon-neutral future"

Focus Area: Renewable energy systems, EV technology, energy storage, wind & solar infrastructure, sustainability assessment frameworks, and environmental impact analysis.

Expected Solution Type: *Hardware / Software / Prototype*

P4 Enhancing Energy Density of EV Batteries to Overcome Range Anxiety

TYPE
Hardware / Research Prototype

Problem Statement:
Explore and develop innovative approaches to increase the energy density of EV batteries, thereby extending driving range without compromising safety, cost-effectiveness, or manufacturability. The solution should consider advancements in battery chemistry, cell architecture, thermal management, and materials science while maintaining safety standards and economic viability.

P6 Fire Suppression Device for Electric Vehicle Battery Safety

TYPE
Hardware Prototype

Problem Statement:
Design a compact, installable device for EVs that can detect abnormal temperature rise in battery packs and automatically release stored CO_2 to suppress fire at the onset. The system must include temperature sensors for early detection, a CO_2 storage and release mechanism, and operate autonomously. The solution must be reliable, cost-effective, and compatible with various EV models.

P12 Sustainability Rating and Grading Framework for Construction Products

TYPE
Software / Framework

Problem Statement:
Develop a structured process for deriving sustainability ratings or grades for construction products at both part and system levels using life cycle assessment methodologies. The approach should consider material composition, design attributes, manufacturing processes, and intended use — building a system that consistently evaluates and assigns sustainability scores to enable informed, environmentally responsible decisions.

P14 AI-Based Alarm Tracking System to Reduce Lost Production in Wind Turbines

TYPE
Software / AI Tool

Problem Statement:
Develop an AI-based tool that automates the tracking and resolution process for wind turbine alarms. The system should collect alarm data, apply root cause analysis using the DMAIC methodology, identify responsible stakeholders and departments, trigger notifications, provide historical analytics for recurring alarms, and recommend actionable solutions with a clear process flow for alarm handling.

P15 GenAI-Based Fault Detection and Resolution in Solar Farms

TYPE
Software / AI Tool

Problem Statement:

Build a GenAI-powered solution that accurately detects faults in solar panels using real-time monitoring, automated data collection, and advanced image analysis. The system should support predictive maintenance and integrate seamlessly with existing solar farm management tools, while being scalable, cost-effective, and compliant with industry standards.

P38 Adopting a Super-Capacitor or Hybrid Energy Storage System for Lighting Applications

TYPE
Hardware / Prototype

Problem Statement:
A supercapacitor-based or hybrid energy storage system — combining rapid charge/discharge capabilities of supercapacitors with high energy density of batteries — can significantly enhance efficiency, reliability, and sustainability of lighting applications. This approach addresses key limitations of traditional battery-only systems such as slow charging, limited cycle life, and poor performance in extreme conditions. Lighting systems benefit from instant power delivery, extended operational life, lower maintenance, and improved energy retention in intermittent-use scenarios.

P40 Model-Based Design Concept for a System with Two Isolated Vibrating Systems

TYPE
Simulation / Software

Problem Statement:
Develop a model-based, multibody dynamic simulation framework capable of predicting and evaluating the vibration behaviour of two or more isolated systems within a shared enclosure. The solution should include mathematical modelling using line body techniques to simplify computational requirements and reduce simulation time, enabling early-stage design decisions that minimise structural risks and improve system reliability.

P44 AI-Based Cost-Effective Agile Mobile Blade Balancing Equipment for Large Wind Turbines

TYPE
Hardware / AI

Problem Statement:
Wind turbine blades for 10 MW machines and above are extremely large, heavy, and complex in shape. Due to manual layup processes during manufacturing, the centre of gravity (CG) often deviates from its intended design location — leading to turbine instability, premature bearing damage, altered natural frequencies, and reduced turbine lifespan. Blade balancing is essential before installation, but current methods are labour-intensive, time-consuming, and lack mobility. An AI-based, cost-effective, agile, and mobile blade balancing solution is needed.

TRK-C Digital Construction & Structural Health Monitoring

"Bringing AI-driven precision to construction sites and structural assessment"

Focus Area: Non-destructive testing, construction equipment automation, structural monitoring, robotics in construction, AI-based inspection, and digital quality assurance.

Expected Solution Type: *Hardware / Software / Simulation*

P3 AI-Driven Non-Destructive Inspection of Automotive Composite Materials

TYPE *Hardware / Software*

Problem Statement:

Develop an AI-enabled non-destructive evaluation system using ultrasound, X-ray, and thermography to detect micro-damages in composite materials without disassembly. The system should include real-time sensors, data interpretation algorithms, and predictive modelling. It must incorporate FMEA for failure mechanism identification, lifecycle assessment, and residual life estimation while adhering to ISO/ASTM standards.

P10 Autonomous Drones: Edge AI-Enabled Surveillance Platform for Construction Sites

TYPE *Hardware / Software*

Problem Statement:

Design and build an autonomous drone platform equipped with Edge AI capabilities for real-time surveillance and threat detection — applicable to large construction sites and infrastructure projects. The system should demonstrate onboard video processing, object detection, and decision-making without relying on cloud stations. It should also address power optimisation using energy-efficient edge processing strategies.

P11 Enhancing Safety, Efficiency, and Predictive Maintenance in Construction Equipment Operations

TYPE *Software / App*

Problem Statement:

Design and develop an AI-powered web and mobile application that transforms construction equipment operations by integrating operator health monitoring and predictive maintenance. The system should use wearable data to assess stress and fatigue levels, provide actionable alerts to supervisors, and apply machine learning to predict equipment failures based on usage patterns and environmental conditions.

P21 Search Bot for CAD Drawing and Model Retrieval in Engineering Projects

TYPE *Software / AI Tool*

Problem Statement:

Develop a search bot capable of intelligently retrieving CAD drawings and model contents from a large engineering database. The bot should interpret queries involving keywords, numerical specifications, shapes, and model components, returning the most relevant and up-to-date files. A query like 'tank of xx capacity' should yield matching drawings and models instantly.

P24 AI and Computer Vision-Based Non-Destructive Testing for Industrial Materials

TYPE *Software / AI Model*

Problem Statement:
Develop an AI model using computer vision to automatically detect and annotate defects in NDT images. The model should be trained to identify crack locations, depths, and types across various testing methods and materials — preferably industrial-grade stainless steel or aluminium (MS950/1200, AL6061). The system should be trained and tested using an 80/20 dataset split.

P32 Automated Validation of Flow Instrument Installation in 3D Piping Models

TYPE *Software / Simulation*

Problem Statement:
Develop an intelligent automated solution that analyses 3D piping models to validate flow instrument installations. The system should detect flow instruments and measure upstream and downstream straight pipe lengths, ensuring compliance with design standards and manufacturer specifications. It should identify fluid flow direction, verify that rotameters are correctly oriented, and use AI or rule-based logic to perform these checks efficiently.

P36 Flexible Robotic Arm for Safe and Adaptive Industrial Operations

TYPE *Hardware / Robotics*

Problem Statement:
Design a flexible robotic arm system that can be easily integrated into manufacturing setups. The system should support adaptive gripping for objects of various sizes, include reserve power capabilities to safely release objects during power failures, and enable automatic homing. The solution should simplify installation and maintenance by minimising cabling and improving modularity.

P37 Self-Driving Pathological Lab: Robotic Automation for Medical Testing

TYPE *Hardware / Robotics*

Problem Statement:
Design and deploy a mobile robotic automation system for pathology labs that autonomously handles sample processing tasks. The system should feature a collaborative robot (Cobot) mounted on an Autonomous Mobile Robot (AMR) with a precision vision system, modular grippers, and seamless integration with Laboratory Information Management Systems (LIMS). It must meet high standards of accuracy, safety, and compliance for medical environments.

TRK-D Smart Cities & Urban Systems

"Building connected, data-driven urban ecosystems"

Focus Area: Urban digital infrastructure, smart utilities, healthcare integration, workforce management, communication networks, and data-centric urban services.
Expected Solution Type: *Software / App / Platform*

P19 Chambered Full-Body Walkthrough Diagnostic Tool for Non-Invasive Health Screening

TYPE *Hardware / Software*

Problem Statement:
Design and develop a multidimensional, non-invasive diagnostic system in the form of a walkthrough chamber that enables a complete health check-up. The system should monitor key physiological systems — CNS, cardiovascular, renal, gastrointestinal, skeletal, skin, eyes, nasal passages, and reproductive organs — passively, without active participation beyond walking through. Results should be shared via a mobile application or connected healthcare provider.

P20 Smart Toilet for Automated Urine and Health Analysis

TYPE *Hardware / Software*

Problem Statement:
Develop a smart toilet system equipped with integrated sensors capable of automatically collecting and analysing urine and other biological samples. The system should include hygienic sample collection and disposal mechanisms, securely store diagnostic data in the cloud, and integrate sensors seamlessly into the toilet seat without disrupting user comfort.

P25 Autonomous Networks for 5G Network Digital Twins

TYPE *Software / Simulation*

Problem Statement:
Develop a digital twin-based solution for autonomous 5G network management aligned with xNF deployment standards. The system should support interoperability, enable efficient performance monitoring, and facilitate predictive maintenance. As 5G transitions toward 6G, the solution should be adaptable to emerging use cases and support smarter, more resilient network operations.

P26 Scalable AI-Driven Workforce Digital Twin for Manufacturing Sites

TYPE *Software / Platform*

Problem Statement:
Propose a conceptual design or working prototype of a Workforce Digital Twin platform that models and simulates the workforce layer of a manufacturing plant. The system should capture real-time signals from IoT devices, wearables, and HR systems to predict optimal workforce deployment based on skills, fatigue, production needs, and task priorities. It should recommend dynamic worker reallocation and support multi-site orchestration with compliance-aware scheduling.

P27 Automation in Drawing and Datasheet Conversions Using AI and Gen-AI

TYPE *Software / AI Tool*

Problem Statement:
Develop an AI or GenAI-based cloud solution capable of reading and converting engineering drawings and datasheets from any input format — including scanned images and handwritten documents — into native formats compatible with 1D and 2D data-centric engineering applications. The system should deliver converted outputs in under 120 seconds to enhance operational efficiency.

P28 AI-Driven BOM Converter

TYPE
Software / AI Tool

Problem Statement:
Design and develop an AI-powered BOM Converter that automates the transformation of eBOM into mBOM. The solution should intelligently restructure the BOM, incorporate necessary manufacturing details, and optimise it for production workflows.

P34 Invisible Watchdogs: Wi-Fi Sensing for Home Monitoring and Surveillance

TYPE
Hardware / Software

Problem Statement:
Design a Wi-Fi Sensing-based solution for home and indoor surveillance that leverages signal disruptions caused by movement to detect presence and activity. The system should use standard Wi-Fi gateways to interpret signal variations (phase, amplitude, frequency) and enable use cases such as intrusion detection, smart lighting, elder care monitoring, and foot traffic analysis — without compromising privacy.

P35 LiveSpeak: AI-Based Live Event Captioning via Speech Recognition

TYPE
Software / Embedded

Problem Statement:
Develop a real-time speech-to-text solution for live events that ensures high accuracy and low latency. The system should evaluate cloud-based services for speech recognition and explore Edge AI approaches for on-device processing using AI-enabled SoCs. The goal is a scalable and responsive captioning system deployable across various live event scenarios.

P29 AI-Powered Video Localisation Across Multiple Languages

TYPE
Software / AI Tool

Problem Statement:
Design an AI-driven solution capable of processing high-quality, large-sized video files and localising them into multiple languages. The system should automate transcription, translation, and audio dubbing while maintaining contextual accuracy and synchronisation.

P43 Bringing Healthcare to Everyone: Real-Time Monitoring and AI Solutions

TYPE
Hardware / Software

Problem Statement:
Design an AI-powered healthcare solution that enables real-time patient monitoring and prioritisation. The system should include a wearable device to track vital signs, detect early indicators of health issues, provide a remote dashboard for clinicians, and an AI model that helps prioritise care based on urgency. The solution must be cost-effective, scalable, and suitable for deployment in rural and resource-constrained settings.

TRK-E Open Innovation

"No boundaries — innovate across disciplines"

Focus Area: Cross-domain technology challenges spanning AI/ML, cybersecurity, automation, embedded systems, and general-purpose engineering software tools.
Expected Solution Type: *Hardware / Software / Any*

P13 Intelligent Rubrics-Based Evaluator for Flowcharts, Algorithms, and Pseudocode

TYPE *Software / AI Tool*

Problem Statement:
Develop an intelligent evaluation system capable of assessing flowcharts, algorithms, and pseudocode against predefined rubrics. The system should parse .docx, .pptx, .pdf, .png, and .jpg files, analyse submissions based on rubric criteria, generate detailed feedback, and support integration with learning management systems.

P16 Automated Electrical Wiring Diagram Generation Using GenAI

TYPE *Software / AI Tool*

Problem Statement:
Develop a GenAI-powered solution that automatically generates electrical wiring diagrams from electrical panel drawings. The system should leverage image recognition and schematic generation techniques to streamline documentation, reduce errors, and improve efficiency in electrical design workflows.

P17 Automating Material Selection for Design Projects Using GenAI

TYPE *Software / AI Tool*

Problem Statement:
Develop a GenAI-powered assistant that automates the material selection process by analysing application requirements and matching them with suitable materials from global standards and literature. The solution should simulate material behaviour, prioritise sustainable and recyclable options, and provide real-time recommendations during the design phase.

P18 Automating the Sizing and Selection of Commercial Off-The-Shelf (COTS) Parts Using GenAI

TYPE *Software / AI Tool*

Problem Statement:
Develop a GenAI-powered solution that automates the sizing and selection of COTS parts based on design parameters and application requirements. The system should analyse large datasets, simulate part performance, and recommend optimal components while considering load capacity, space constraints, material quality, cost, availability, and sustainability.

P22 AI-Driven Testing Framework for OTT and Digital TV Ecosystems

TYPE *Software / AI Tool*

Problem Statement:
Develop an AI-powered automated testing framework tailored for OTT and Digital TV platforms. Capabilities should include AI-generated test cases, self-healing test scripts that adapt to UI changes, visual testing using deep

learning, and predictive test optimisation using historical data. CI/CD integration should enable smart test execution and AI-driven failure analysis.

P23 Middleware Component to Recommend Enhancements from Non-Agentic to Agentic AI Frameworks

TYPE
Software / AI Tool

Problem Statement:
Build a reasoning-driven middleware engine that analyses existing solution documentation — problem definitions and solution descriptions — and recommends enhancements to convert them into agentic AI systems. The middleware should extract relevant content, assess agentic integration feasibility, and suggest functional and technical improvements, acting as an intelligent bridge between conventional and modern agentic architectures.

P30 Agentless Endpoint Protection: Efficient, Reliable, and Cost-Effective

TYPE
Software / Cybersecurity

Problem Statement:
Design a strategic, agentless endpoint protection solution that enhances visibility and threat response capabilities across physical devices. The system should simplify operations, close security gaps, and complement existing agent-based tools by providing coverage for endpoints that are difficult to manage or monitor.

P33 AI (Agentic) Enabled Agile Automated Threat Modelling

TYPE
Software / Cybersecurity

Problem Statement:
Design an AI-powered, agentic, and modular threat modelling framework tailored for engineering sector cybersecurity. The solution should be interactive, agile, and capable of adapting to new threat vectors in real time. It must support use cases such as AI-enabled medical devices and other complex systems, providing automated analysis, risk identification, and mitigation strategies.

P41 Enhancing Cybersecurity Resilience in the IT Industry Using AI

TYPE
Software / Cybersecurity

Problem Statement:
Develop an AI/ML-powered cybersecurity framework that can detect and neutralise emerging threats in real time, reduce detection time by at least 50%, and enable faster recovery from incidents. The solution should include automated incident response capabilities, integrate seamlessly with existing IT infrastructure, and incorporate a behavioural analytics-driven training platform to reduce human-related vulnerabilities.

P42 SmartOps AI – Autonomous Incident Resolution Engine

TYPE
Software / AI Tool

Problem Statement:
Traditional incident management in DevOps environments is often reactive, fragmented, and heavily dependent on manual intervention — leading to longer MTTR, increased costs, and reduced reliability. As organisations adopt hybrid and multi-cloud infrastructures (AWS, Azure, GCP), managing incidents grows complex. The challenge is to build an intelligent, automated solution that can detect, analyse, and resolve issues with minimal human involvement.

AVLOKAN 2026

Association of Civil Engineers — B.I.T. Sindri

Department of Civil Engineering, Bharat Institute of Technology, Sindri

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This document has been prepared by the Organising Committee of AVLOKAN 2026.