HACKATHON

Problem Statements

Date: April 16, 2026 | Venue: BME / PSNACET

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Event Instructions

- Team size: 2–3 members per team. Single-member teams are not allowed.
- Presentation duration: Maximum 8 minutes per team.
- Total slides: Maximum 8 slides only.
- Teams must have a working prototype (hardware or software).
- Participants are advised to bring the working model / prototype.
- No materials/equipment will be provided at the venue.
- Teams must strictly follow the slide and time limits.
- Exceeding the limits may result in penalties or disqualification.

Hardware Track

Build embedded/circuit-based biomedical devices using standard sensor modules and microcontrollers.

H1 — Portable SpO2 & Heart Rate Monitor

Design a wearable device using a pulse oximeter sensor (MAX30100/MAX30102) that continuously monitors SpO2 and heart rate, displays real-time values on an OLED screen, and triggers an alert when readings fall below safe thresholds.

H2 — EMG-Based Gesture Controller

Build a surface EMG acquisition system using electrodes and a signal conditioning circuit that detects at least 2 distinct muscle gestures and maps them to control actions (e.g., cursor movement, LED trigger, or wheelchair direction).

H3 — Smart IV Drip Rate Monitor

Develop a device that uses an IR drop sensor to count IV drip flow rate in real time, calculate volume infused, and send an alert (buzzer/LED) when the drip runs out or deviates from the target rate.

H4 — Low-Cost ECG Display Unit

Create a 2-lead ECG acquisition circuit using instrumentation amplifiers and an Arduino/ESP32 that captures and displays a real-time ECG waveform on a serial plotter or small LCD screen.

H5 — Fall Detection Wearable for Elderly

Build a wristband/waist-worn device using an MPU6050 accelerometer that detects sudden falls, distinguishes them from normal activities, and sends an SMS/buzzer alert to a caregiver.

Software Track

Build ML/AI-powered biomedical applications using publicly available datasets and pre-trained models.

S1 — AI-Powered Skin Lesion Classifier

Develop a mobile/web app that takes a photo of a skin lesion and classifies it as normal, benign, or potentially malignant using a pre-trained CNN (MobileNet/ResNet). Must show confidence score and a brief recommendation.

S2 — EEG Signal-Based Mental State Detector

Using a publicly available EEG dataset (e.g., PhysioNet), build an ML pipeline that classifies mental states (focus vs. fatigue vs. relaxed) from band-power features and visualizes results in a dashboard.

S3 — Hospital Bed Allocation Optimizer

Build a system that takes real-time bed occupancy input and uses a scheduling/optimization algorithm to suggest optimal bed allocation across departments, with a visual dashboard showing availability and patient priority.

S4 — Medication Reminder & Adherence Tracker

Create a mobile app where patients log their prescriptions; the app sends smart reminders, tracks adherence streaks, and generates a weekly compliance report that can be shared with a doctor.

S5 — Diabetic Retinopathy Screening Tool

Build a web app that accepts a fundus image upload and uses a pre-trained deep learning model to flag signs of diabetic retinopathy (No DR / Mild / Moderate), helping in early screening at low cost.

S6 — TB Treatment Adherence App

Build a low-tech adherence app with SMS reminders (via Twilio/Fast2SMS), local health worker check-in logging, and incentive tracking to help TB patients complete their full course of treatment. A working prototype should demonstrate reminder scheduling, check-in dashboard, and dropout risk flagging. Target: improve cure rates from 82% to 95%+ at under ₹20 per patient.

S7 — Real-Time Blood Bank Inventory Network

Build a blood availability portal where blood banks can update stock (blood group + units available) and users can search by city or pincode. Bonus: integrate WhatsApp API to send alerts when a requested blood group becomes available nearby. Prototype must support at least 5 simulated blood banks with live inventory updates and a working search interface.

Coordinator Tips & Judging Guide

Concern	Solution	Notes
Short duration	Use existing modules/datasets	No custom hardware fabrication needed
Hardware teams	ESP32/Arduino + sensor modules	Available locally or on Amazon
Software teams	Allow pre-trained models	Focus on integration + UI in judging
Judging criteria	Working demo 60%	Innovation 20%, Presentation 20%

All the best to all participants!