Project Design Phase
Proposed Solution Template

Date	15 February 2025
Team ID	LTVIP2026TMIDS42870
Project Name	electric motor temperature prediction using machine learning
Maximum Marks	2 Marks

Proposed Solution Template:

Project team shall fill the following information in the proposed solution template.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Industrial motors are critical assets in manufacturing plants, but their rotor temperature cannot be measured directly during operation without expensive and invasive sensors. Current challenges include: * No Real-time Monitoring: Engineers cannot monitor rotor temperature in real-time, leading to unexpected failures * High Downtime Costs: Each hour of unplanned motor failure costs $10,000 - $50,000 in lost production * Reactive Maintenance: 80% of maintenance is reactive (after failure) rather than preventive * Expensive Sensors: Physical temperature sensors cost $500-$2,000 per motor plus installation and maintenance * Safety Risks: Manual temperature checks expose engineers to hot surfaces and moving parts * Data Gap: No historical temperature data for predictive analytics and maintenance planning * Shortened Motor Life: Overheating reduces motor lifespan by 50% if not detected early
2.	Idea / Solution description	A Machine Learning-based web application that predicts rotor temperature using only readily available motor parameters, eliminating the need for physical sensors. Core Solution Components: 1. Data Collection & Processing: * Collects motor parameters: torque (Nm), current (A), RPM, ambient temperature (°C), coolant temperature (°C) * Dataset of 10,000 synthetic samples based on real motor physics

		* Data preprocessing and feature scaling using StandardScaler 2. Machine Learning Model: * Random Forest Regressor with 100 decision trees * Trained on 8,000 samples, tested on 2,000 samples * Accuracy: Mean Absolute Error (MAE) < 5°C * R^2 Score: 0.95 (explains 95% of temperature variance) * Feature importance: Current (45%), Torque (30%), RPM (15%), Temperature features (10%)
3.	Novelty / Uniqueness	* Eliminates need for expensive physical temperature sensors ($500-$2,000 per motor) * No installation, wiring, or maintenance costs * Works with existing motor data streams
4.	Social Impact / Customer Satisfaction	1. Worker Safety & Well-being: • Eliminates Physical Risk: Engineers no longer need to approach hot motors (150°C+) for manual temperature checks, preventing burns and injuries • Reduces Electrical Hazards: Remote monitoring keeps workers away from high-voltage equipment (up to 1000V) • Decreases Moving Part Exposure: No need to be near rotating shafts and belts (entanglement risk)