Final Project Proposal

- **Project Description:**
  This project analyzes machine downtime data from a steel factory to convert unplanned downtime losses into operational gains. Using production, maintenance and downtime event logs, the project identifies root causes of downtime, quantifies associated costs, and proposes targeted maintenance improvements.

- **Group Members & Roles :**
  Nadine Mohamed — Project Lead / Modeling (Data Integration & Root Cause Analysis)
  Leads the project and ensures effective coordination among all members.
  Responsible for the modeling phase, which includes using Python and Power Query to integrate and relate multiple datasets, build the data schema, and analyze the root causes of downtime to extract meaningful performance insights.
  Faiza Allam — Data Collection & Visualization
  Collects and organizes all relevant datasets from available sources.
  Responsible for creating interactive dashboards in Tableau to visualize downtime metrics, performance trends, and key insights derived from the analysis.
  Rawan Baza — Business Questions & Presentation
  Defines the main business questions that guide the project analysis.

Prepares part of the final presentation slides and helps communicate the business impact of the findings clearly and effectively.

Wafaa — Insights Generation & Presentation

Collaborates with Rawan to analyze the data results and identify actionable insights.

Contributes to preparing and delivering the final project presentation and report.

Youssef Nabil — Data Cleaning & Preprocessing

Responsible for cleaning and preparing the data by handling missing values, duplicates, and inconsistent records.

Ensures the dataset is clean, standardized, and properly formatted for modeling and analysis.

Anas Hany — Modeling & Predictive Analysis

Works with Nadine on the modeling part, focusing on building data-driven relationships and exploring predictive patterns in machine downtime to support maintenance decision-making.

- **Team Leader: Nadine Mohamed**

- **Objective :**

1. Reduce unplanned downtime by identifying top failure causes.
2. Quantify downtime costs and identify highest-cost departments.
3. Analyze relation between maintenance activities and downtime.
4. Produce interactive dashboards and actionable recommendations.

5. Propose predictive maintenance rules for future implementation.

- **Tools & Technologies:**
  1. Data storage & queries: SQL (MySQL / PostgreSQL)
  2. Data extraction & analysis: Python (pandas, numpy, matplotlib)
  3. Visualization: Tableau (interactive dashboards)
  4. Ad-hoc review: Excel
  5. Documentation: Word & PowerPoint

- **Milestones & Deadlines**

Data Collection & Business Questions Definition → (Oct 15)

1. Gather and organize all required datasets.
2. Define business questions and key objectives based on factory operations.
3. Tools: Kaggle, Excel.
4. Deliverables: Collected datasets and documented business questions.

Data Cleaning & Preprocessing → (Oct 20)

1. Handle missing and duplicate data, ensure data consistency and readiness.
2. Prepare cleaned datasets for modeling and analysis.
3. Tools: Excel,SQL, Python (pandas,Numpy).

4. Deliverables: Cleaned and validated dataset.

Modeling & Data Integration → (Nov 1)

1. Build data model and define relationships between tables.
2. Integrate datasets and prepare data schema for analysis.
3. Tools: SQL ,Python (pandas,Numpy), Power Query.
4. Deliverables: Finalized data model and schema diagram.

Calculations & Analysis → (Nov 5)

1. Perform calculations of KPIs (e.g., downtime hours, costs, production efficiency).
2. Analyze correlations between downtime, maintenance, and production.
3. Tools: DAX,Python (pandas,Numpy).
4. Deliverables: KPI metrics and analytical insights.

Visualization Dashboard → (Week 4: Nov 15)

1. Develop interactive Tableau dashboard showing downtime trends, costs, and productivity.
2. Ensure dashboard usability and performance (target: load <3s).
3. Tools: Tableau.
4. Deliverables: Interactive Tableau dashboard.

Final Report & Presentation → (Week 5: Nov 20)

1. Compile project report summarizing all phases and insights.
2. Prepare final presentation slides and present key findings and recommendations.
3. Tools: PowerPoint, Word, Tableau.

4. Deliverables: Final report and presentation slides.

- **KPIs (customized):**

1. Data Cleaning & Processing — % missing/duplicate handled (Target: 100%)
2. Analysis & Insights — % of business questions answered (Target: ≥ 90%)
3. Visualization & Reporting — Dashboard load time < 3s; Usability ≥ 80% users navigate without help
4. Final Documentation — Final report completeness 100%; Actionable recommendations ≥ 3