

## Project Design Phase-II

### Technology Stack (Architecture & Stack)

Date	11 February 2026
Team ID	LTVIP2026TMIDS90282
Project Name	Weather-Based Prediction of Wind Turbine Energy Output: A Next-Generation Approach to Renewable Energy Management
Maximum Marks	

#### Technical Architecture:

The project is developed using Python as the core programming language due to its simplicity and strong support for machine learning libraries. Pandas and NumPy are used for data handling, cleaning, and preprocessing operations. These libraries help in managing structured datasets and performing mathematical computations efficiently.

For model development, Scikit-learn is used to implement regression algorithms such as Random Forest Regressor. The model is trained on historical wind turbine data to learn the relationship between wind speed, theoretical power, and actual energy output. Matplotlib and Seaborn are used for visualization and analysis of data during the preprocessing stage.

After training, the model is serialized and saved as a .sav file using Joblib. This saved model is later loaded into the Flask web application for deployment. Flask serves as the backend framework that handles user requests, processes inputs, and returns prediction results.

The frontend of the application is built using HTML and CSS to provide a simple and interactive user interface. Git and GitHub are used for version control and project management. Together, these technologies form an integrated system that supports data processing, model training, deployment, and real-time prediction of wind turbine energy output.



