Final Year Project Showcase Batch-2021
For the Year 2025

Department of Mechanical Engineering Name of Programme: Mechanical Engineering		
1	**Project Idea**	**Development of Drone for PV Cleaning Application** This project aims to develop an autonomous drone integrated with a machine vision system for identifying and cleaning dusty photovoltaic (PV) panels. It provides a sustainable, efficient, and cost-effective solution to maintain solar panel efficiency, especially in dusty environments.
2	**Process**	• Design and assembly of a hexacopter drone. • Development and training of CNN and YOLOv11 machine vision models for classifying dusty vs. clean panels. • Real-time image classification using ESP32 CAM module. • Integration of a relay-controlled water spray cleaning mechanism. • Field testing and optimization.
3	**Outcome**	• A fully functional drone capable of autonomous flight and assist in cleaning of solar panels. • Machine vision models capable of detecting soiled panels with high accuracy. • Reduction in manual labor and cleaning resource consumption. • Field-tested operation with a 20-meter flight range and reliable performance in diverse conditions.
4	**Evidence (Theoretical Basis)**	• Literature review on drone technologies, PV panel cleaning methods, and machine learning models. • Detailed analysis and simulation of dust accumulation effects on panel performance. • Comparative evaluation of CNN vs YOLOv11n detection models.
5	**Competitive Advantage or Unique Selling Proposition**	
a	**Process Improvement which leads to superior product or cost reduction, efficiency improvement of the whole process**	Conventional PV cleaning is manual, time-consuming, and inefficient for large setups. Our drone automates detection and cleaning, reducing labor, water use, and downtim
b	**Attainment of any SDG**	The project supports SDG 9 by using UAVs and AI for smart solar maintenance. It promotes innovation, reduces resource use, and ensures sustainable infrastructure.
c	**Capture new market**	Targets unserved sectors like remote solar farms and large rooftop PV systems. Offers a scalable, portable solution for areas lacking automated cleaning options.
d	**Any Environmental Aspect**	Minimizes water use with targeted cleaning and reduces carbon emissions. Supports sustainable energy by improving solar efficiency with fewer resources.
6	**Target Market**	• Industries: Solar farm operators, Renewable energy companies. • Groups: Maintenance companies, Drone technology firms.

		• Regions: Arid and semi-arid areas with high dust accumulation. • Benefit: Scalable, autonomous maintenance for solar PV systems where manual cleaning is difficult or inefficient.
7	**Team Members (Names & Roll No.)**	• Syed Muzammil Ahmed – ME-21009 • Syed Shayan Ahmed – ME-21008 • Muhammad Ammar Siddiqui – ME-21012 • Muhammad Ahsan Iqbal – ME-21013
8	**Supervisor Name**	Dr. Haider Ali Dr. Syed Ahmad Raza
9	**Supervisor Email Address**	haider.ali@neduet.edu.pk drahmad@neduet.edu.pk
10	**Pictures (If any)**