# Final Year Project Showcase Batch 2021
# Year 2025

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| **Department: Industrial & Manufacturing Engineering**<br>Programme: BE | |
| **1** | **Project Title**<br><br>Digital Twin on CNC Lathe Machine |
| **2** | **Project Idea:** This project aims to optimize power consumption for CNC lathe machines using Digital Twin technology. It incorporates machine learning models for intelligent power source selection (Solar or K-Electric) and provides a web application for remote monitoring and control. |
| **3** | **Process:** The project involves data collection, the creation of a Digital Twin for CNC lathe machines, the application of machine learning models to predict power consumption, and the development of a web interface to enable real-time monitoring and power source switching. |
| **4** | **Outcome:** The system optimizes energy consumption by dynamically selecting the most efficient power source (solar or grid). It also improves operational efficiency by integrating Industry 4.0 technologies like IoT, Digital Twin, and machine learning to predict power requirements and reduce energy waste. |
| **5** | **Evidence (Theoretical Basis):** The project is grounded in the principles of Industry 4.0, focusing on smart manufacturing, real-time data analysis, and digital representation. Machine learning techniques are employed to forecast energy consumption and optimize power source selection. Data from CNC lathe operations, including feed rate, depth of cut, and spindle speed, are used to train the models. |
| **6** | **Impact on Sustainability of Urban Regions or SDG-11 "Sustainable Cities and Communities":** This project contributes to SDG-11 by improving the sustainability of industrial operations. By optimizing power consumption and integrating renewable energy sources, it reduces environmental impacts and promotes the development of more sustainable and efficient urban manufacturing systems |
| **7** | **Competitive Advantage or Unique Selling Proposition** |
| **a** | **Attainment of any SDG** This project supports SDG 7 (Affordable and Clean Energy) by using solar power to reduce reliance on non-renewable energy sources. |
| **b** | **Environmental Aspect** The use of renewable energy (solar power) reduces the environmental footprint of CNC machining operations. |
| **c** | **Cost Reduction of Existing Product:** The system helps reduce energy costs by efficiently switching between power sources based on consumption patterns. |
| **d** | **Process Improvement which Leads to Superior Product or Cost Reduction, Efficiency Improvement of the Whole Process:** Optimize energy consumption using a Digital Twin system with machine learning for dynamic power source selection, reducing costs and improving efficiency. |
| **e** | **Expanding of Market share:** Target industries seeking sustainable solutions by offering energy-efficient CNC lathe systems with renewable energy integration. |

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| **f** | **Capture New Market:** Focus on sustainable manufacturing and renewable energy sectors looking for smart, energy-efficient manufacturing solutions. | |
| **g** | **Any Other Aspect:** Integration of Industry 4.0 technologies (IoT, AI, Digital Twin) to future-proof manufacturing processes, increasing adaptability and sustainability. | |
| **8** | **Target Market:** Manufacturing industries (automotive, aerospace, metalworking), energy-intensive sectors, and operations teams looking for energy-efficient, sustainable solutions. | |
| **9** | **Team Members** (Names along with email address | M.Anas Nadeem (IM-21033) – anasnadem7869@gmail.com<br>Zain Ul Abidin (IM-21034) – zainsahto383@gmail.com<br>Syed Rabi Shah (IM-21038) – rabishah399@gmail.com<br>Zabbiyan Siraj (IM-21098) – zabiyansiraj@gmail.com |
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**Pictures (If any)**