Maharaja Agrasen Institute of Technology, Delhi

Department of Mechanical Engineering
Department of Mechanical & Automation Engineering

A REPORT ON EV PRODUCTION TRAINING PROGRAM

Department: Mechanical Engineering
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1. Introduction

The **EV Production Training Program** was a specialized 3-day technical workshop curated by **Team Jatayu** for diploma students. The program provided a high-intensity transition from traditional mechanical concepts to the multidisciplinary world of Electric Vehicle (EV) manufacturing, covering design, vehicle dynamics, and advanced power electronics.

2. Participant Profile

- **Total Attendees:** 10 Students.
- **Background:** Mechanical Engineering diploma students.
- **Baseline:** While participants were grounded in mechanical principles, the workshop focused on upskilling them in digital design and electrical architecture, leveraging the expertise of SAE-MAIT Collegiate Club's Team Jatayu's senior members.

3. Daily Workshop Curriculum

Day 1: Modern EV Design & Manufacturing

The opening day focused on the "Digital Twin" philosophy and modern industrial processes.

- **Material Science:** Introduction to material selection using **ANSYS Granta**, focusing on strength to weight ratios and carbon footprints.
- **Manufacturing Processes:** Overview of advanced machining, including **CNC/VMC** for precision components and **Water Jet Cutting** for heat-sensitive profiles.
- **Roll cage Construction:** Detailed session on structural safety, **Finite Element Method (FEM)** analysis, and the use of **Jigs & Fixtures** to maintain alignment during welding.

- **Ergonomics:** Students learned about driver safety and posture using **RULA (Rapid Upper Limb Assessment)** and **REBA** analysis to minimize driver fatigue.

Day 2: Mechanical Subsystems (Powertrain & Suspension)

Day 2 moved from conceptual design to the mechanical heart of the ATV.

- **Onshape CAD Assignment:** To build software proficiency, students modelled a **doorknob** (basic features) and a **fidget spinner** (complex assemblies and motion).
- **Powertrain Architecture:** * Introduction to gear types: Spur, Helical, Bevel, and Worm gears.
  - Understanding **Simple, Compound, and Planetary (Epicyclic) gear trains**.
  - **ATV Specific Workflow:** Motor Shaft → Sprocket System → Custom Gearbox → Axle → Tires.
- **Suspension Geometry:** * Comparison of Independent vs. Dependent systems.
  - Deep dive into **Double Wishbone** configurations (The "Gold Standard").
  - Key terminology: **Camber, Toe, Caster,** and **Roll Centre optimization**.

Day 3: Electrical Systems & Electronics Integration

The final day addressed the "brain" of the vehicle, covering the complete electrical stack required for a functional EV.

- **Curriculum Points:**

1. **Why Electronics Matter:** Transition from mechanical to software-defined vehicles.
2. **Basics of Electricity & Components:** Resistors, capacitors, and basic circuits.
3. **Power Electronics & Motors:** Introduction to DC and AC motors, focusing on high-efficiency output.
4. **The Battery Stack:** Chemistry basics, Lithium-ion configurations, and **Battery Management Systems (BMS)**.
5. **Control Systems:** Role of the **Motor Controller** in managing torque and speed.
6. **Sensors & Actuators:** Feedback loops for vehicle control.
7. **Regenerative Braking:** Using the motor as a dynamo to recover energy.
8. **Architecture:** Wiring harness design, high-current connectors, and safety mechanisms.
9. **Communication:** Introduction to **CAN bus** and vehicle data systems.

- **Baja Vehicle Overview:** A basic walkthrough of how these systems integrate into a competitive Baja-style vehicle.

4. Lab Exposure & Live Integration

The highlight of the program was access to the **Team Jatayu Research Lab**.

- **Vehicle Inspection:** Students inspected a **live EV vehicle**, specifically analyzing the **Roll cage** construction and mounting points for the suspension.
- **Component Tactility:** Students handled physical motors, controllers, and gearboxes to understand the scale and weight distribution discussed in theory.

5. Outcomes and Feedback

- **Certification:** Participants were awarded **E-certificates** by the Mechanical Engineering Department.
- **Feedback:** Students noted that the lab visit and physical component demonstration were the most impactful parts of the workshop.
- **Conclusion:** The workshop successfully "kick-started" the participants' journey into EV technology, bridging the gap between diploma theory and industrial application.