FINAL PROJECT ASSIGNMENT

Full EV Simulation

Objective

Design and simulate a comprehensive electric vehicle (EV) model using MATLAB/SIMULINK, integrating the key topics covered throughout the course.

Scope

Your project should address the following systems and components:

1. **Vehicle Dynamics:**
   • Simulate speed, torque, acceleration, and power consumption.

2. **Energy Management:**
   • Incorporate state monitoring and energy flow optimization.

3. **Electric Motors:**
   • Model motor characteristics and evaluate efficiency under varying conditions.

4. **Power Electronics:**
   • Include components like inverters and DC-DC converters for power control.

5. **Control Systems:**
   • Implement a drive cycle simulation to analyze performance.
   • Integrate regenerative braking for energy recovery.

Deliverables

• A **functional MATLAB/SIMULINK model** of an EV system.

• A **detailed report** covering:

  – System architecture and design considerations.
  – Simulation results (graphs, tables, and analysis).
  – Challenges faced and solutions applied.

• **Presentation slides** summarizing your project for Week 14.

Key Milestones

- **Week 13:** Complete simulation, including all components. (Present it in class)

- **Week 14:** Present your final project in class.

Grading Criteria

1. Model Functionality and Accuracy **(40%)**
   - Correct implementation of vehicle range, energy consumption, acceleration, and power requirement calculations.
   - Accurate use of formulas and adherence to real-world constraints.
   - Validation of MATLAB/SIMULINK model outputs with expected theoretical results.

2. Exercise Completion and Detail **(30%)**
   - Completion of all required simulations in MATLAB/SIMULINK, including vehicle range and energy consumption.
   - Inclusion of at least one real-world scenario simulation, such as WLTP (Worldwide Harmonized Light Vehicles Test Procedure) or other standard drive cycles, to analyze energy consumption and range under varying driving conditions.
   - Clear annotations in the MATLAB code and SIMULINK blocks to explain system design.

3. Report Quality **(20%)**
   - Detailed explanation of the simulation setup, methodology, and results.
   - Use of graphs, tables, and other visual aids to present findings.
   - Discussion of factors affecting EV performance (e.g., battery size, terrain, efficiency losses).

4. Classroom Engagement **(10%)**
   - Active participation during discussions and Q&A sessions.
   - Ability to explain and justify design choices clearly and concisely.

Expectations

- Apply concepts from **assignments and exercises** throughout the course.

- Showcase creativity and problem-solving in system integration.

- Demonstrate a deep understanding of EV technologies.

For any further clarification or support, feel free to ask. Good luck with your project!