MODELLING AND SIMULATION OF ELECTRIC AND HYBRID VEHICLES

GROUP -2

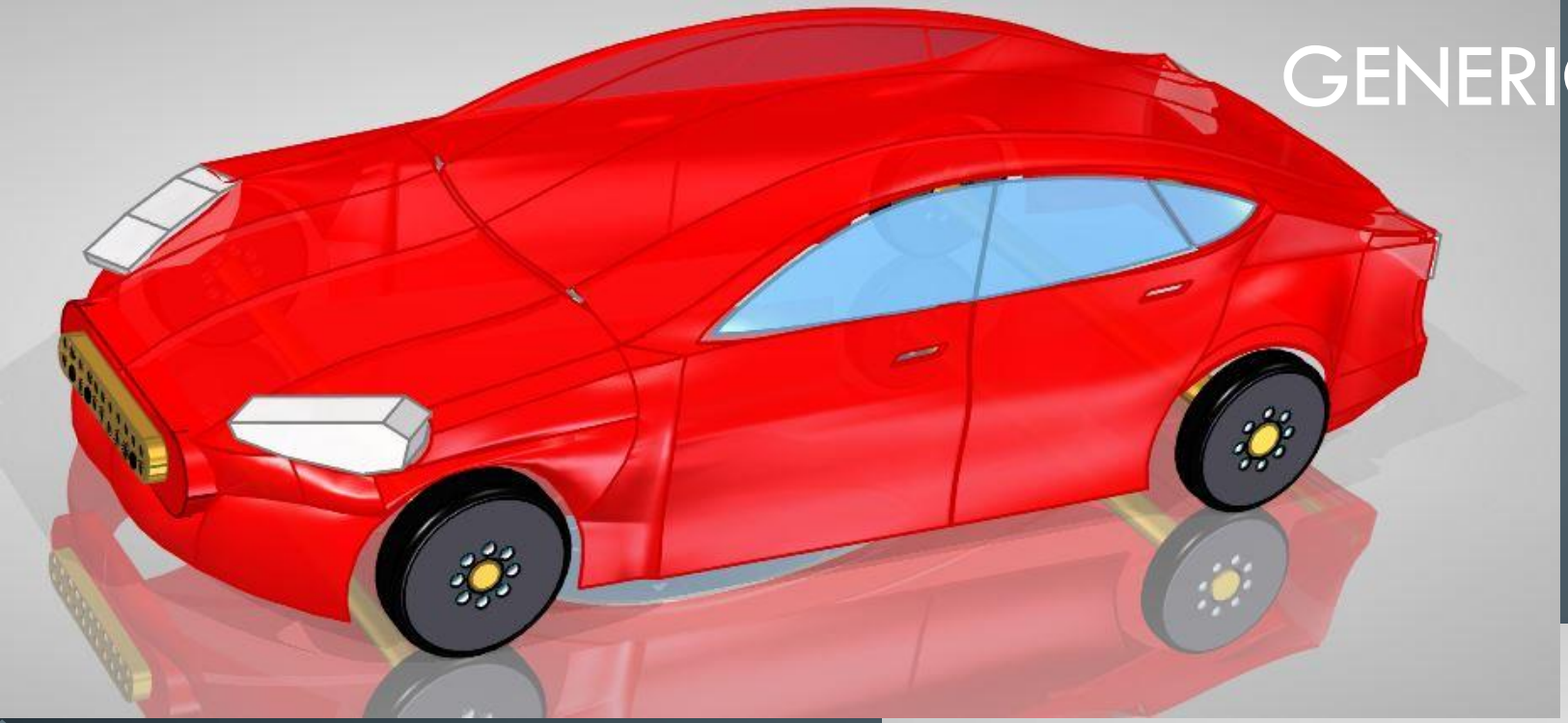
ME14BTECH11020: KALU RAM MEENA

ME14BTECH11034: SHUBHAM KUMAR

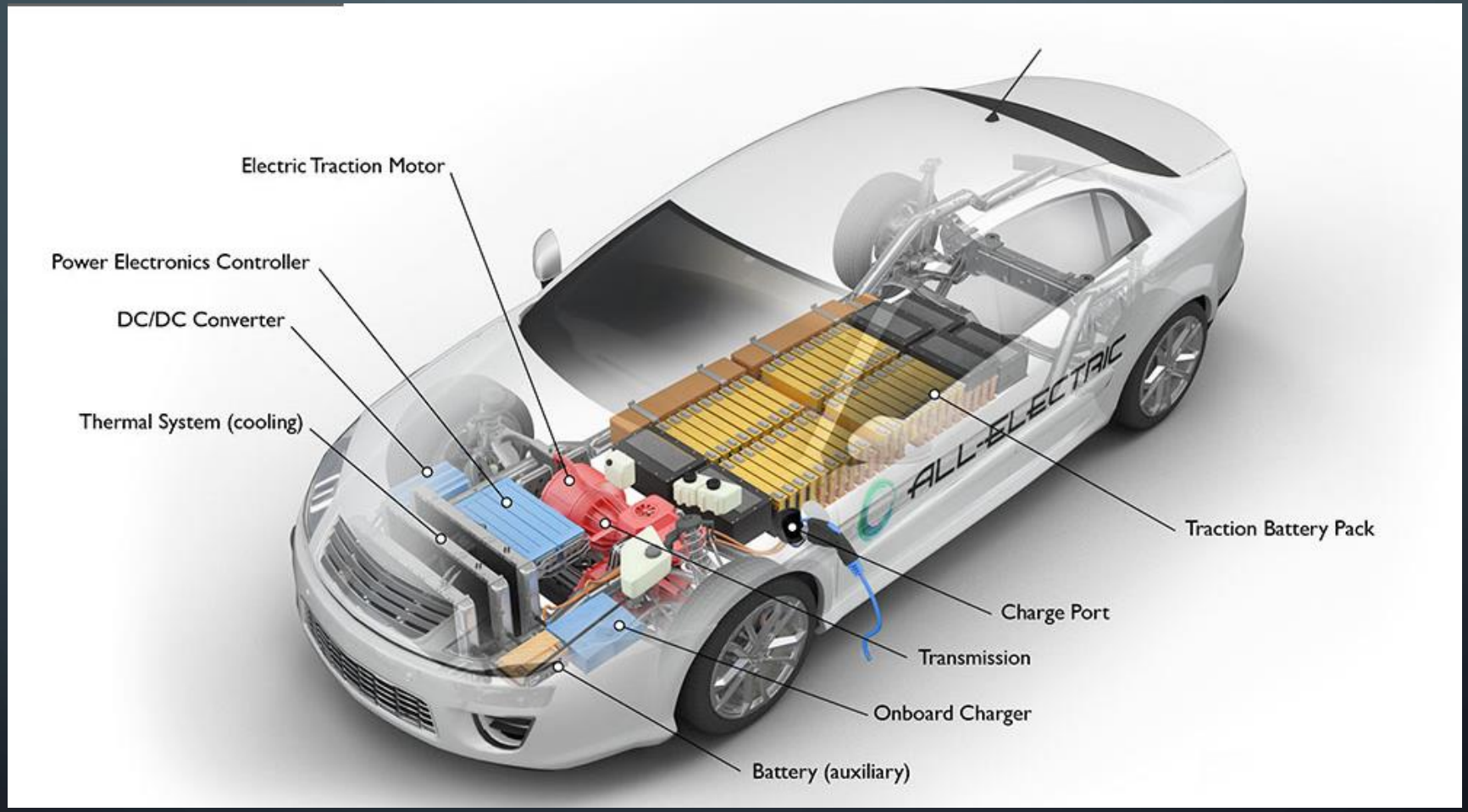
ME14BTECH11026: KURUVA SEKHAR

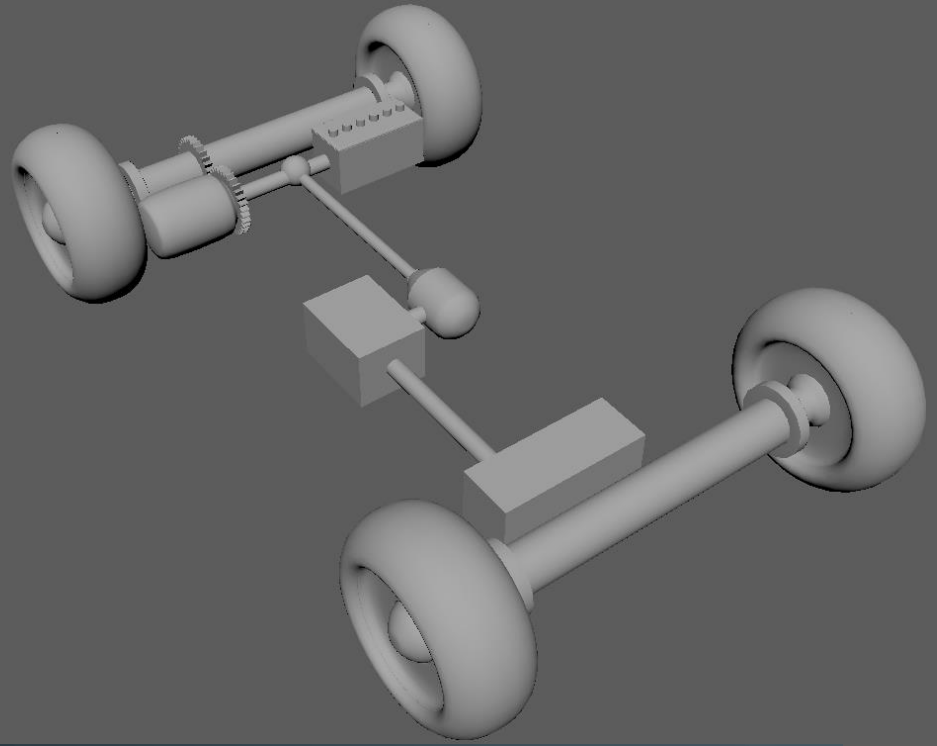
ME14BTECH11027: PATHAK MOHIT AJIT

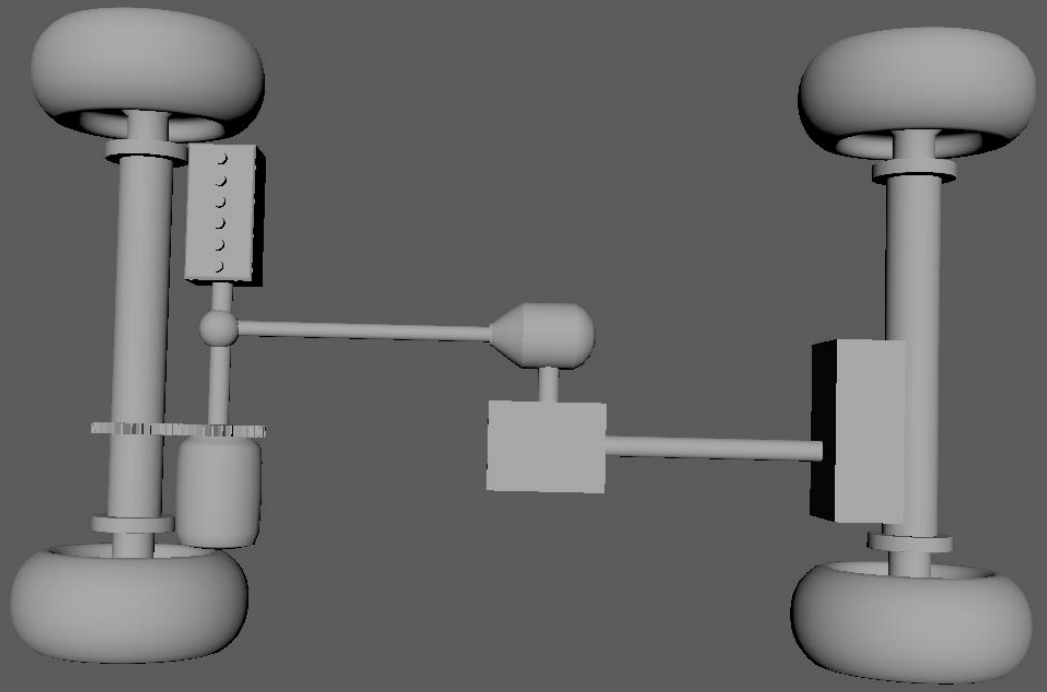
GENERIC CAR MODEL



ELECTRIC VEHICLE LAYOUT

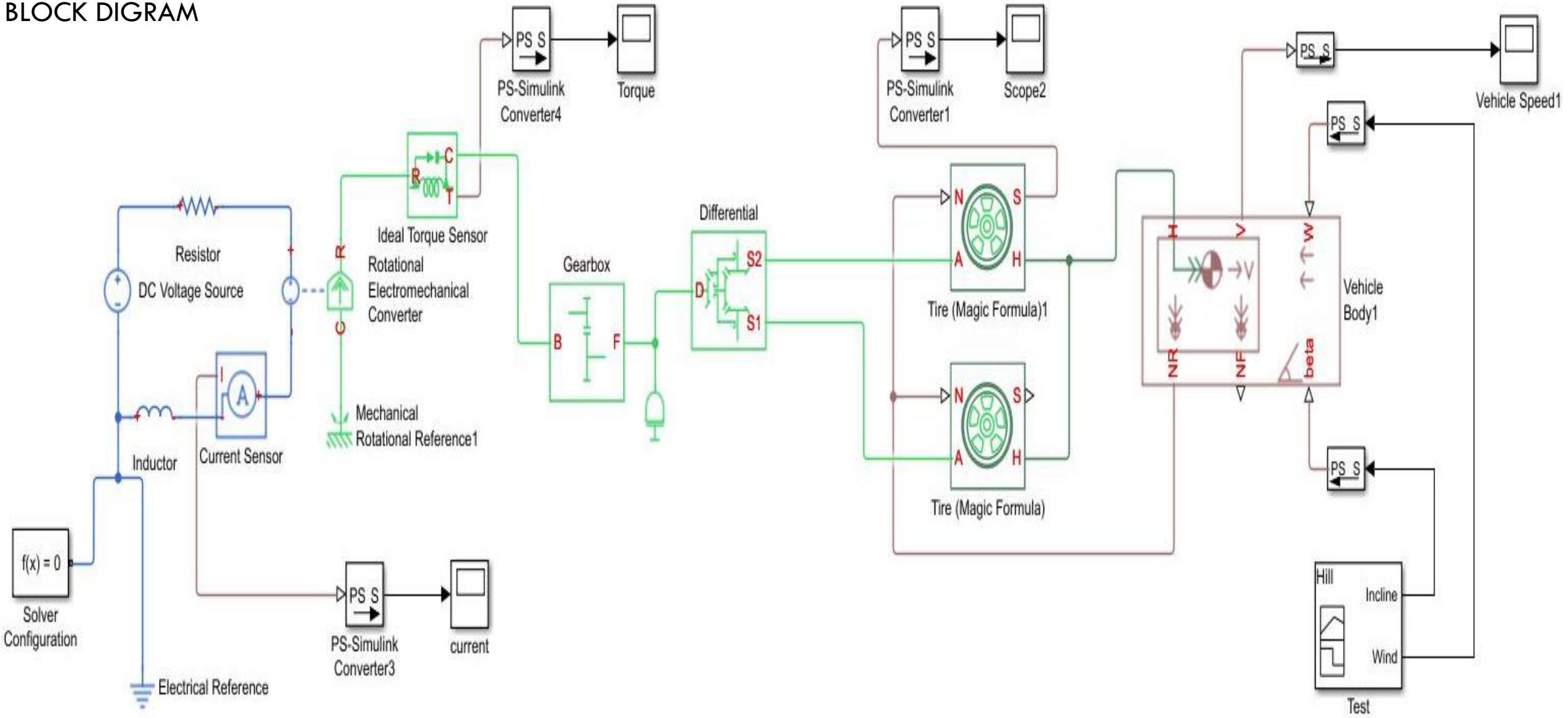






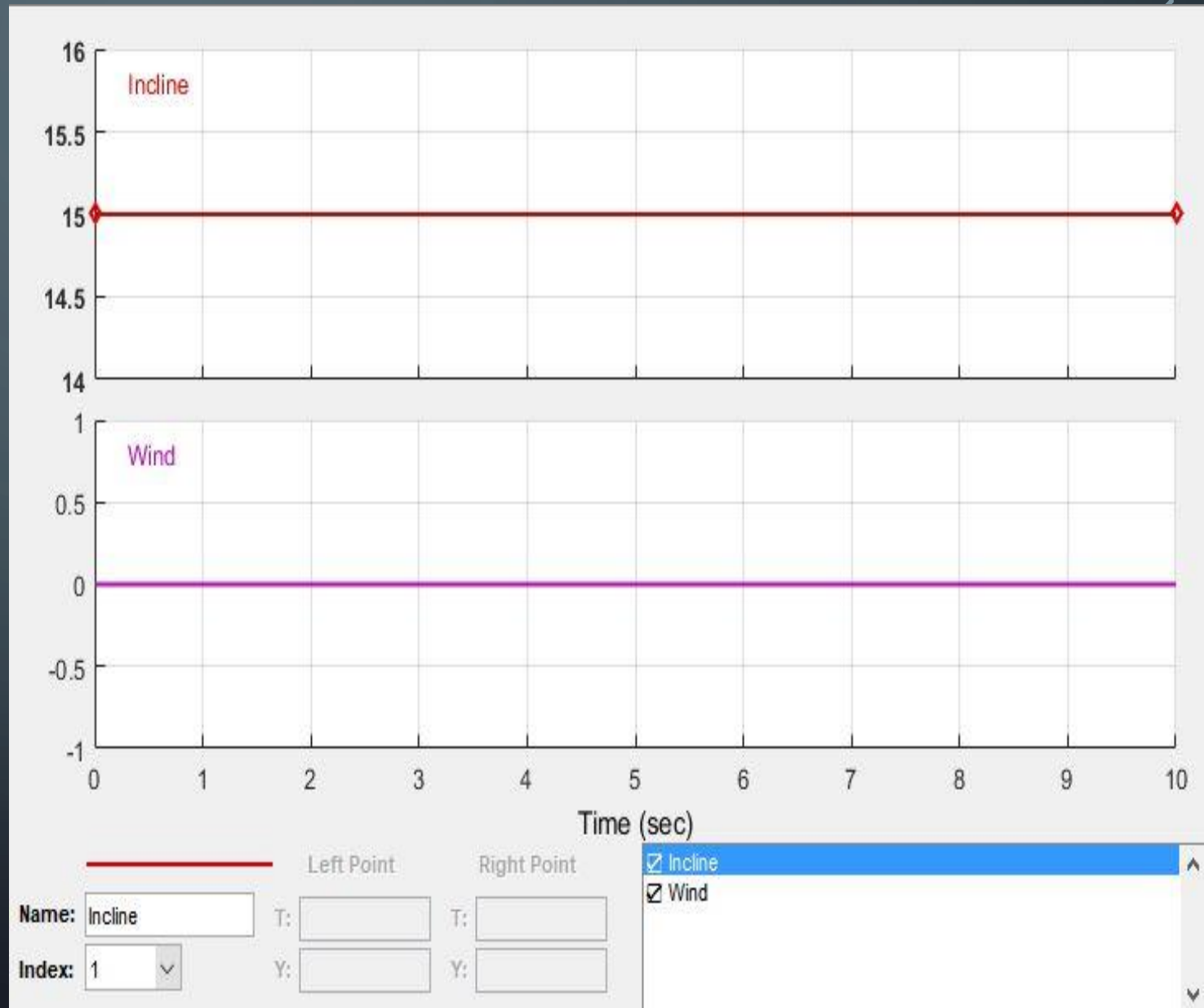
ELECTRIC VEHICLE

BLOCK DIGRAM

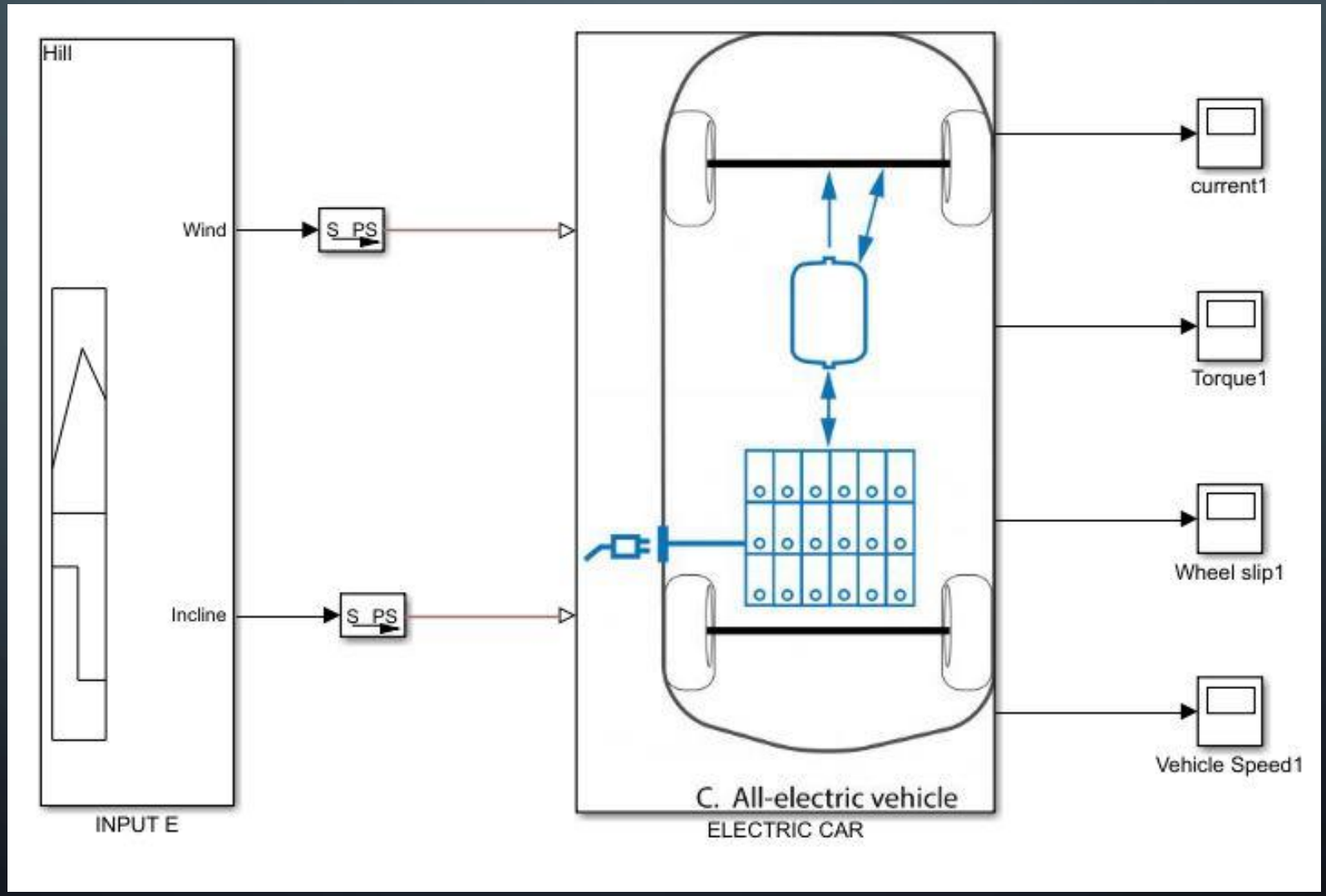


INPUTS TO THE BLOCK DIGRAM

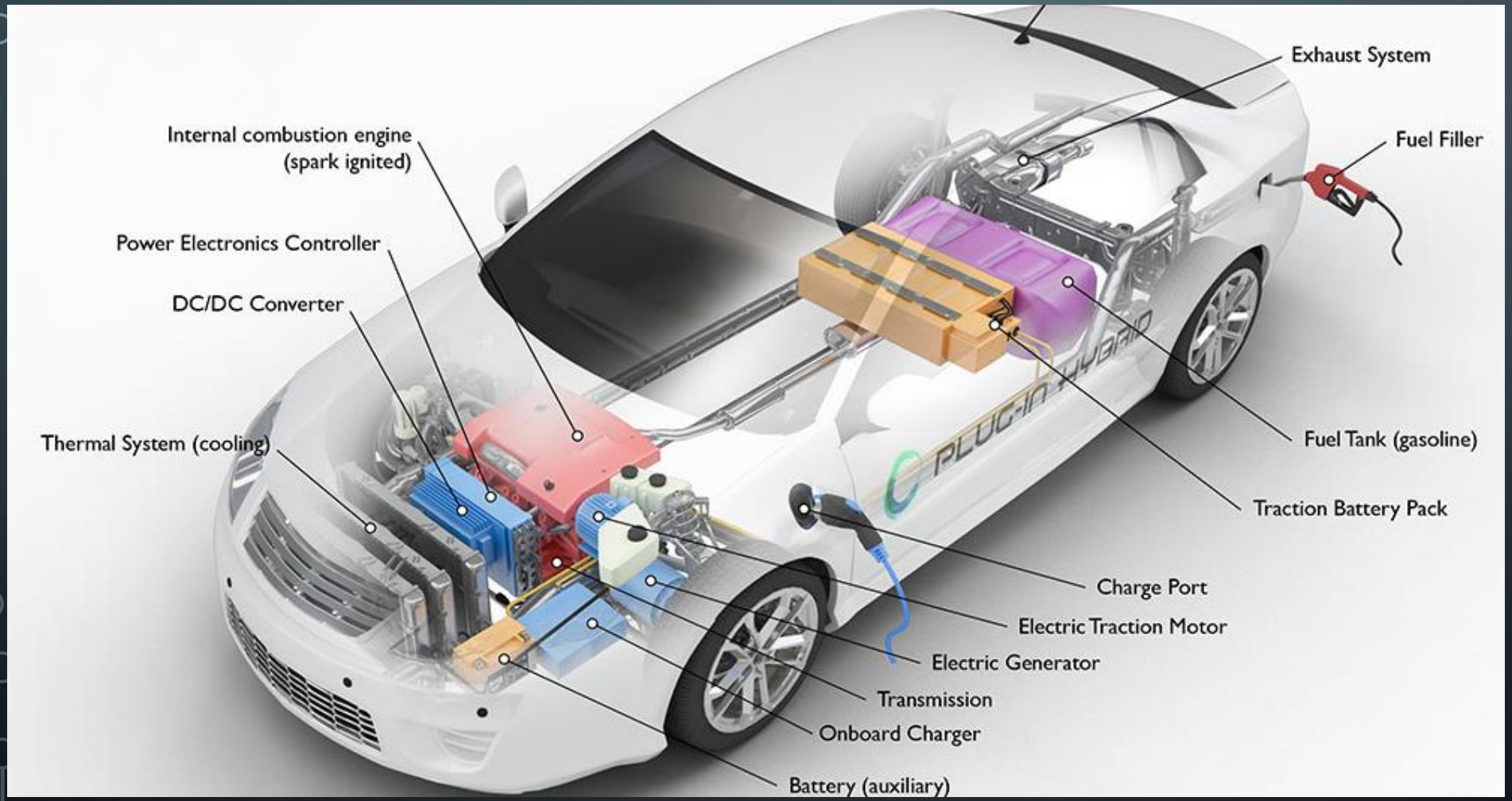
- Engine type: spark engine
- Maximum power : 45000W
- Speed at maximum power : 3800rpm
- Maximum speed : 6000rpm
- Stall speed : 350 rpm
- Engine inertia : 0.2 kg-m2
- Fuel consumption per revolution:25mg/rev
- Inertia of shaft 1 : 0.2 kg-m2
- Inertia of shaft 2 : 1kg-m2
- Single Gear, No meshing and viscous losses



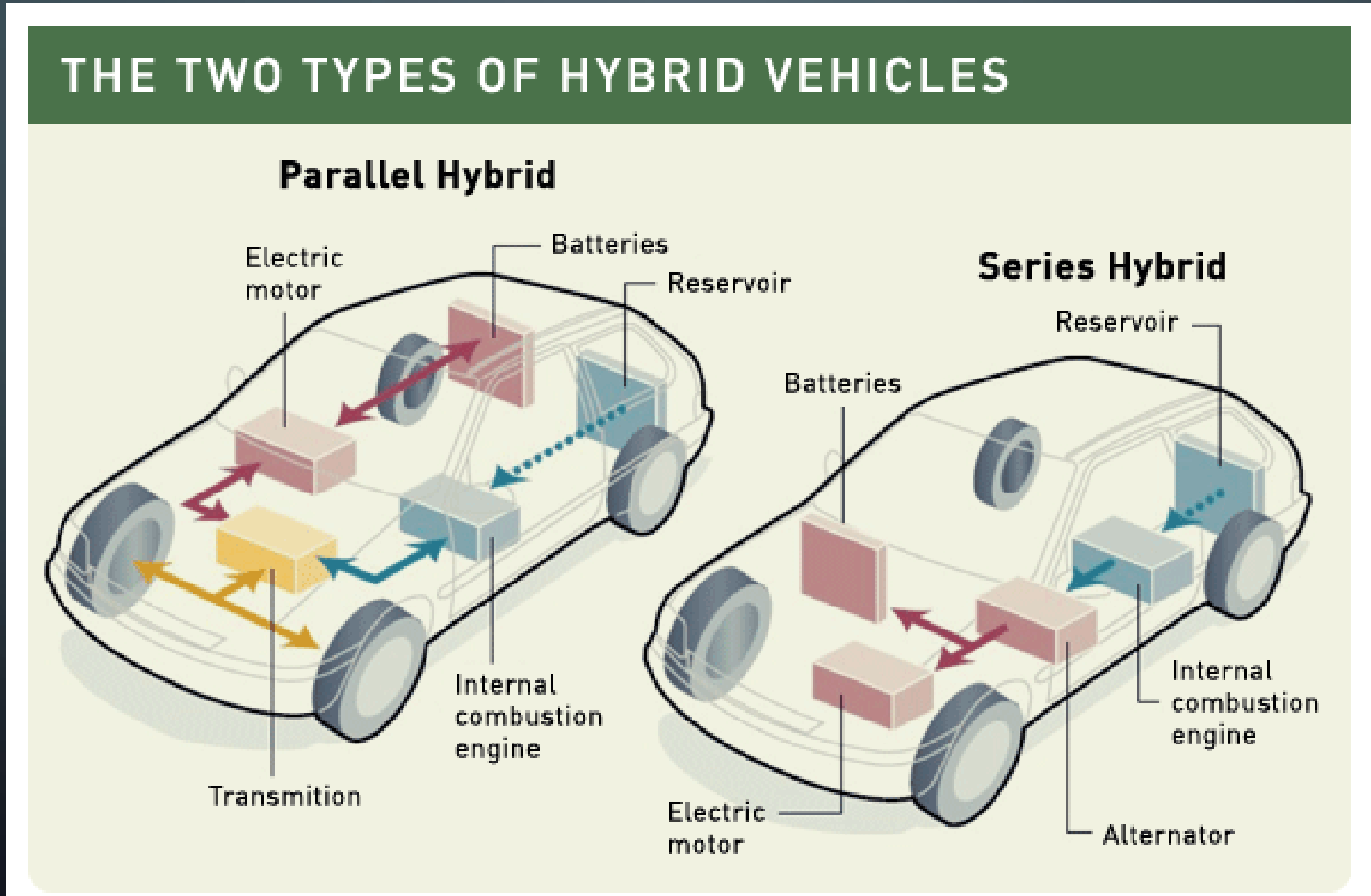
GRAPHIC USER INTERFACE

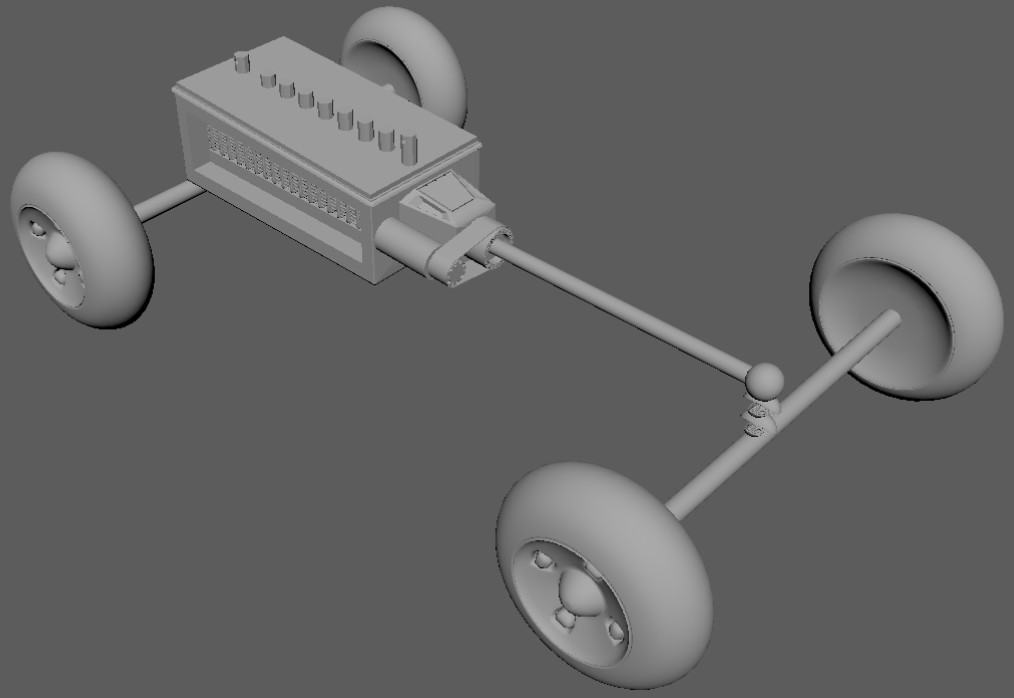


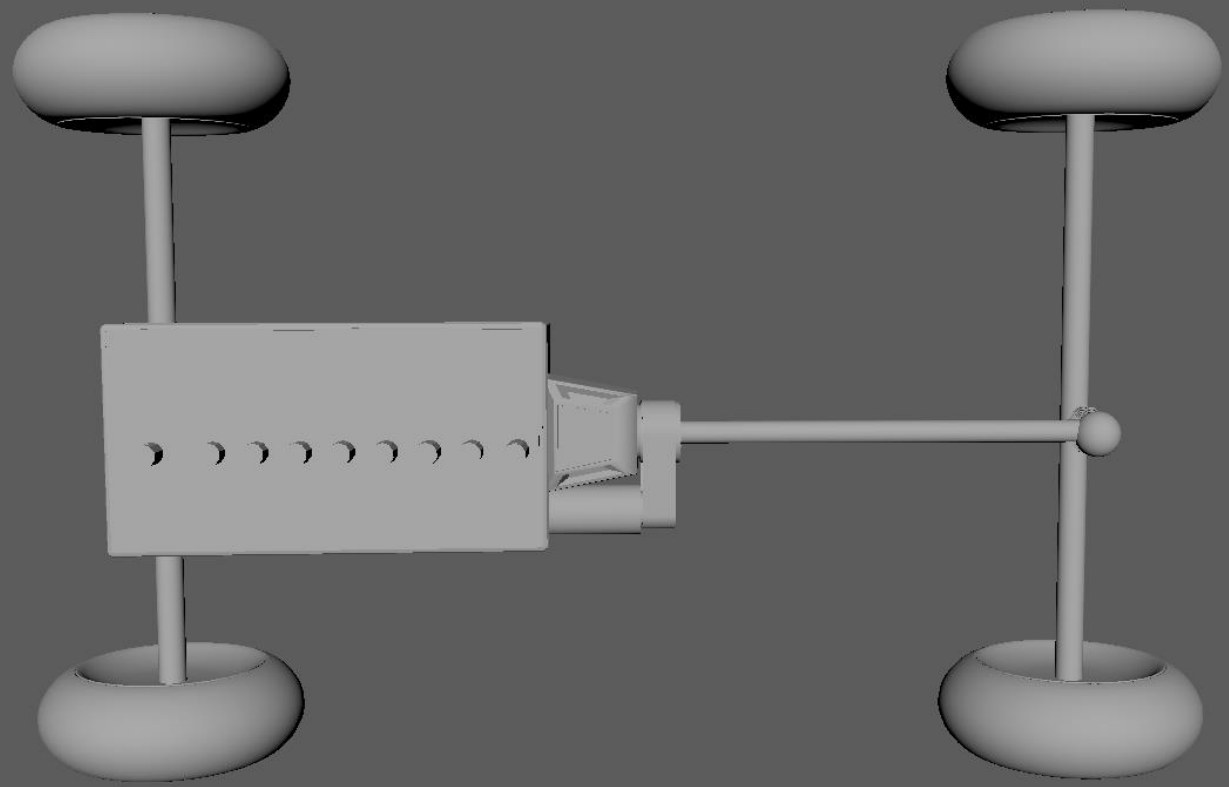
HYBRID VEHICLE LAYOUT



TYPES OF HYBRID VEHICLE LAYOUT

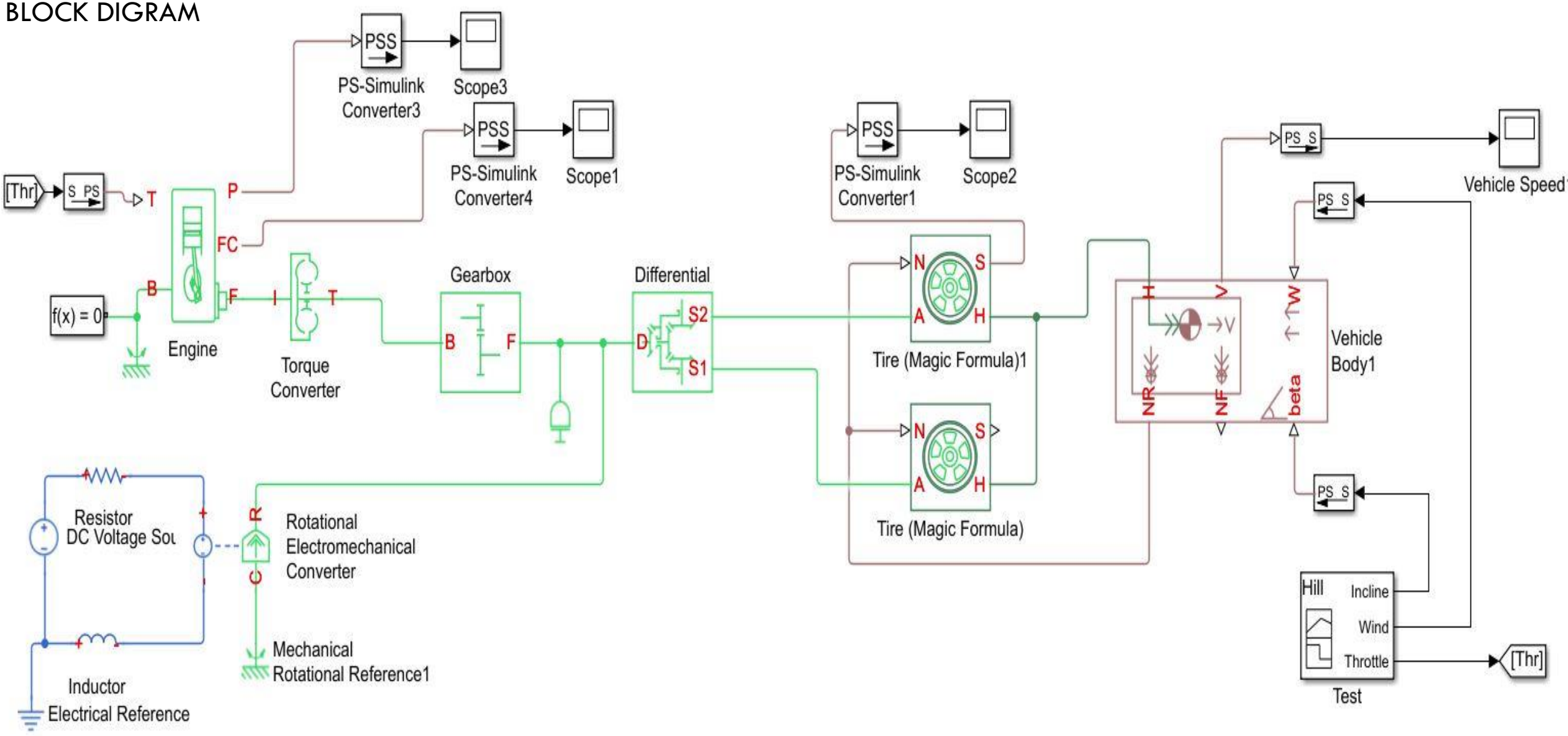






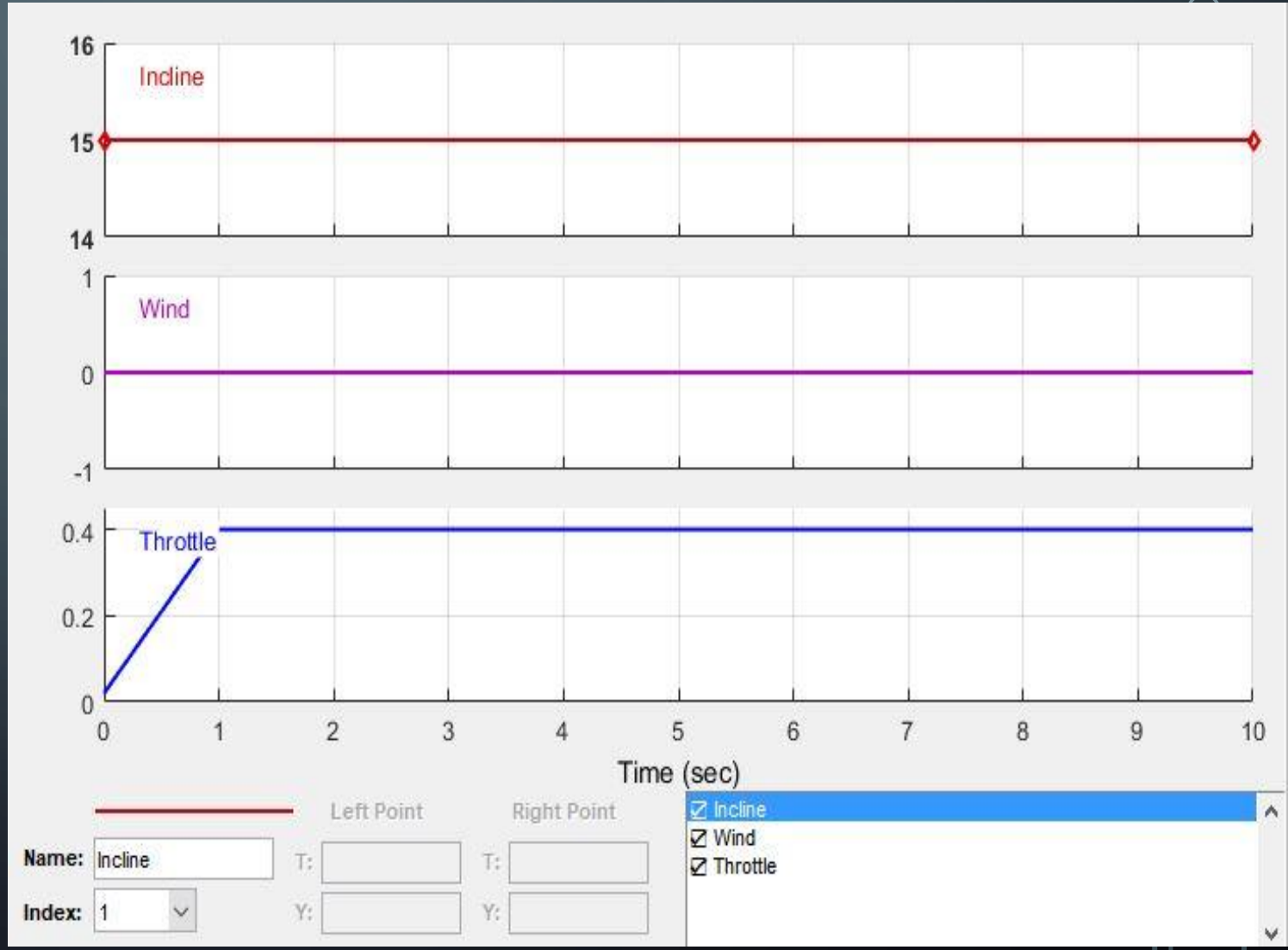
PARALLEL HYBRID VEHICLE

BLOCK DIGRAM

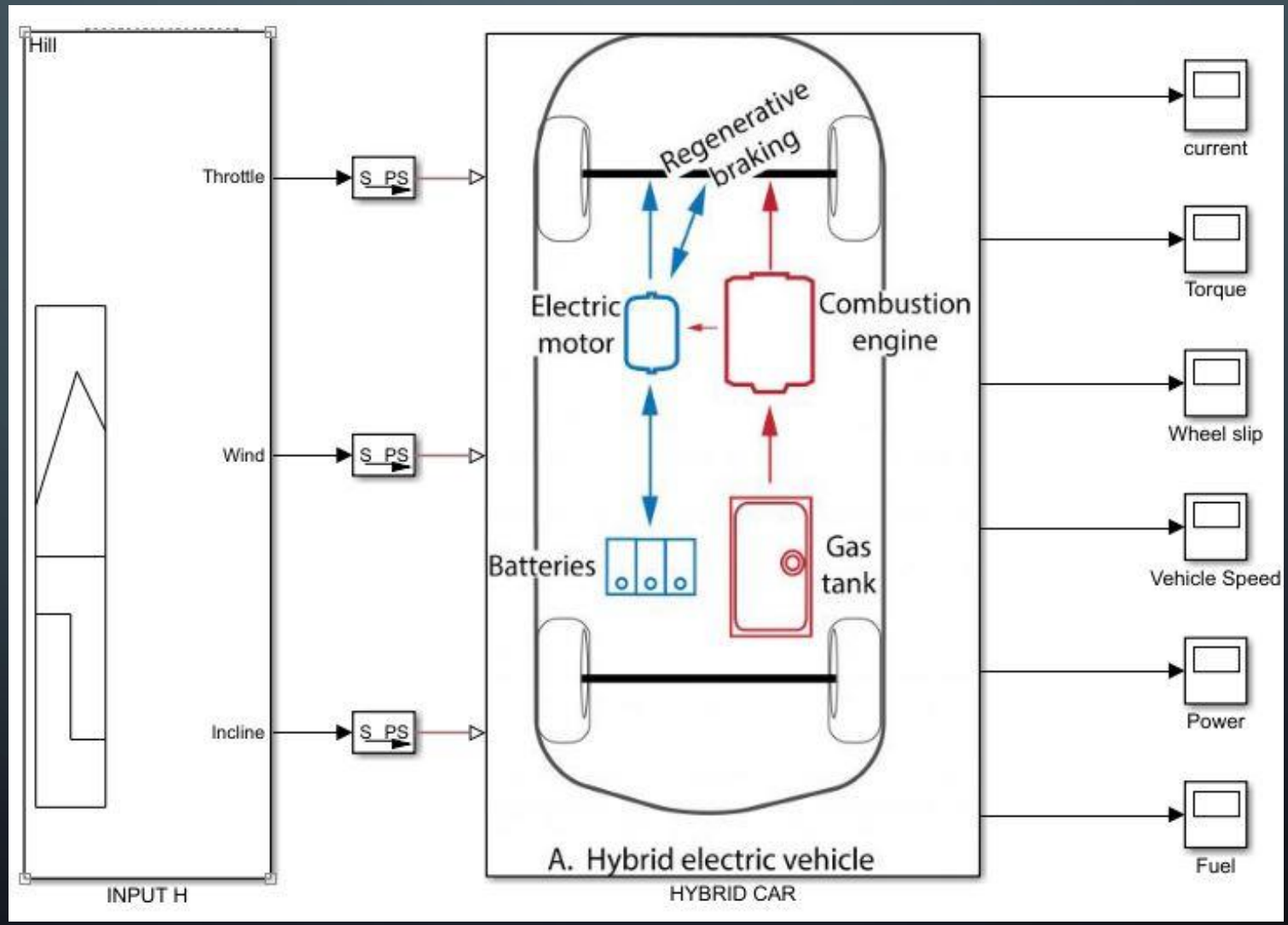


INPUTS TO THE BLOCK DIGRAM

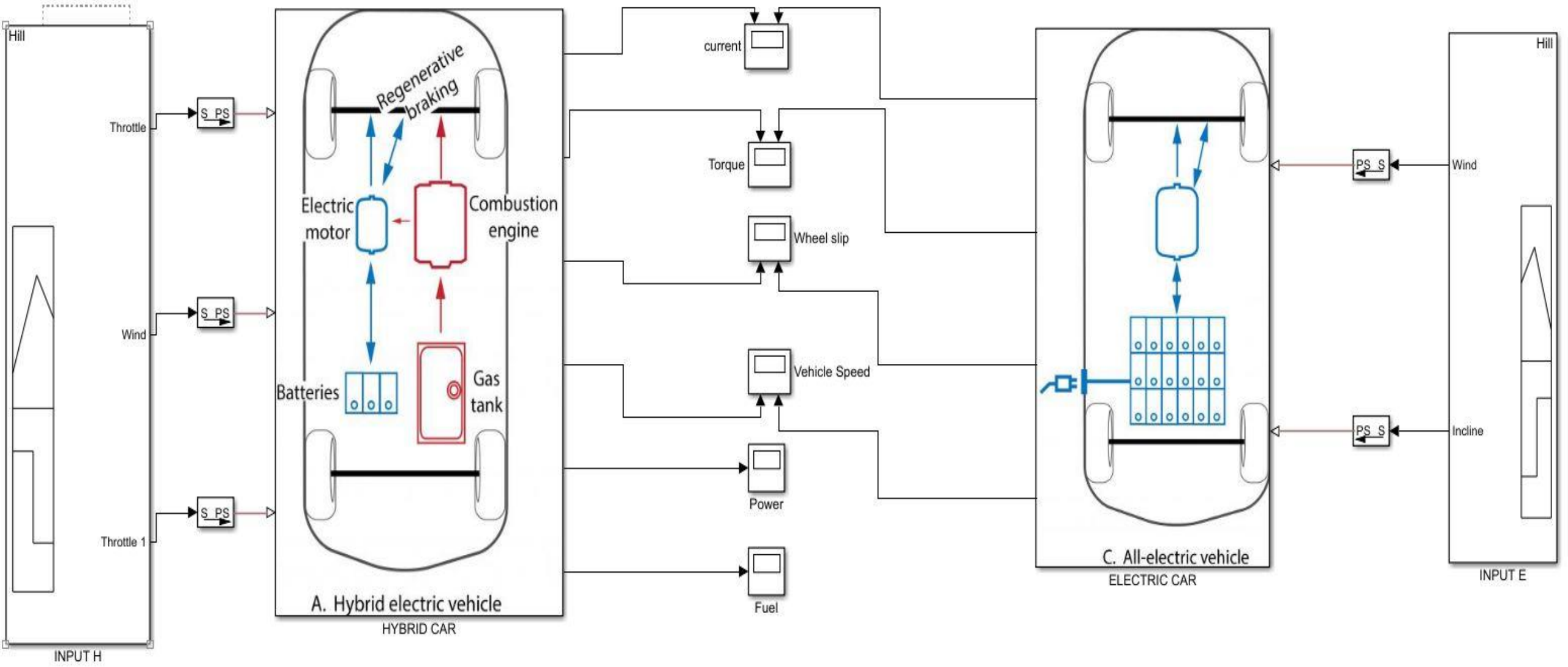
- Engine type: spark engine
- Maximum power : 45000W
- Speed at maximum power : 3800rpm
- Maximum speed : 6000rpm
- Stall speed : 350 rpm
- Inertia : 2 kg-m2
- Fuel consumption per revolution:25mg/rev
- Single Gear, No meshing and viscous losses



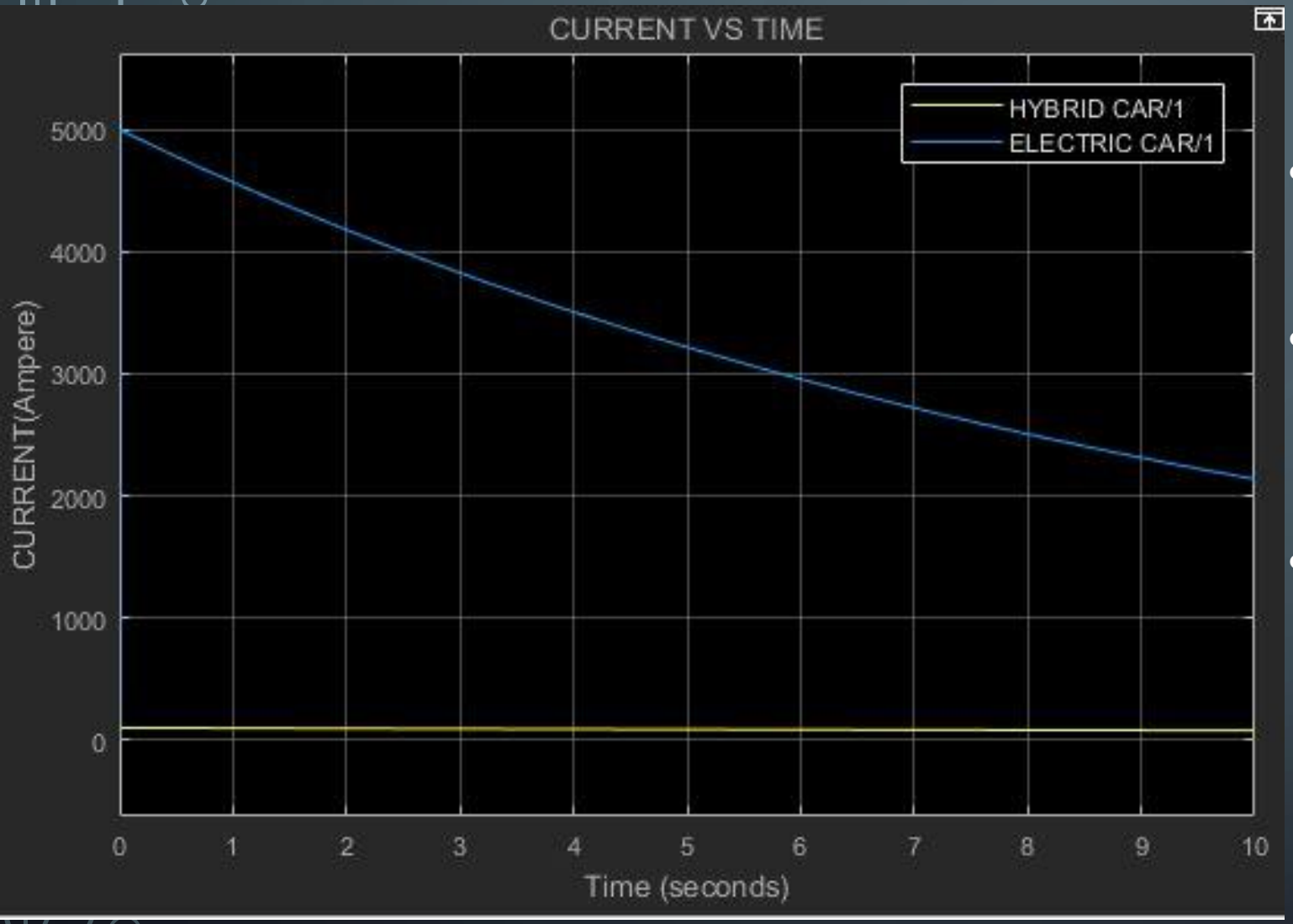
GRAPHIC USER INTERFACE



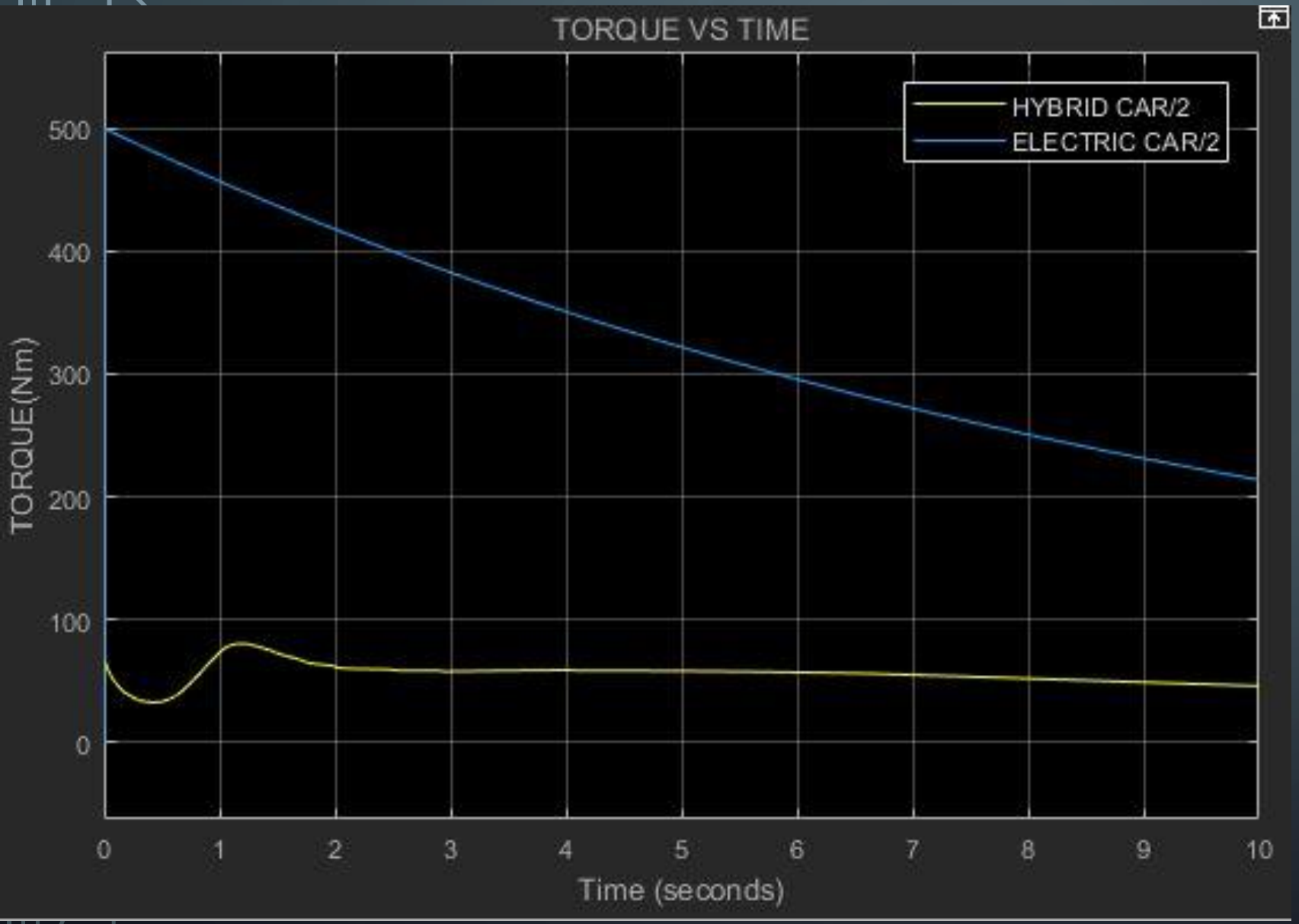
GUI OF THE TOTAL SIMULATION



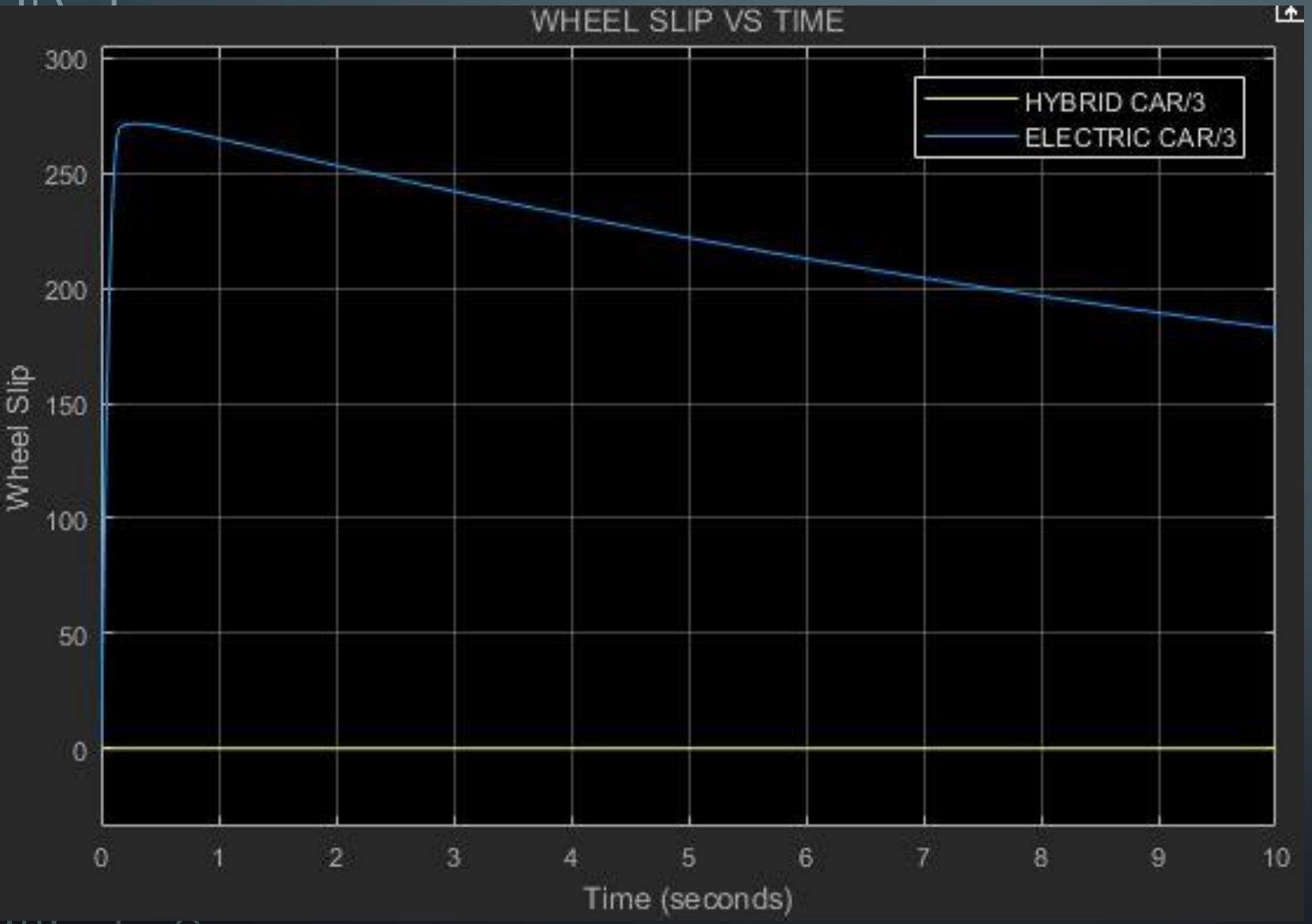
RESULTS



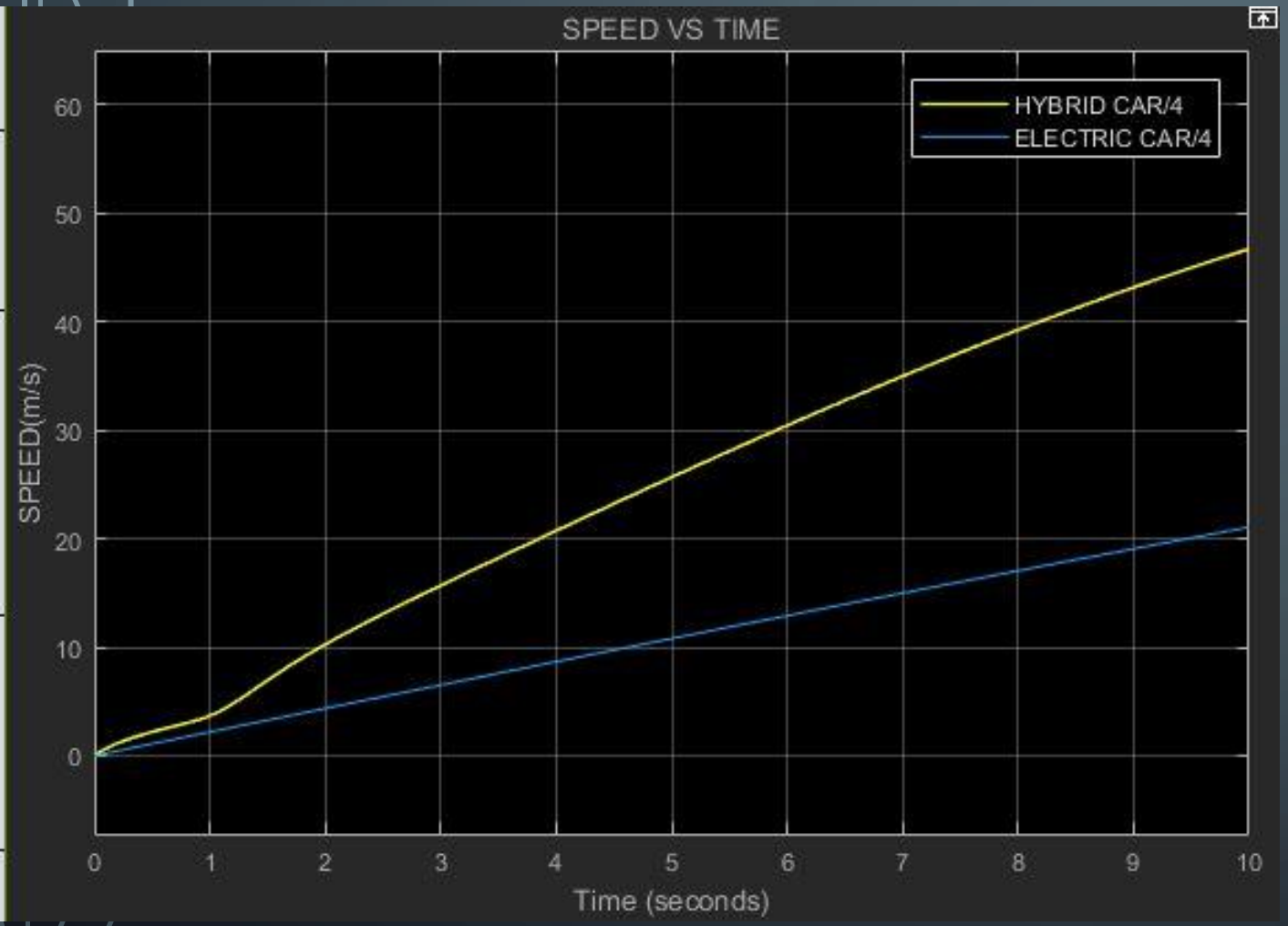
- We can see that the current line of hybrid cars is lower than electric car and is constant.
- This can be attributed to the fact that an electric car has only one power source i.e. the battery, which discharges and hence the current falls with time.
- Whereas the hybrid car has multiple power sources apart from the battery, which can provide additional power as required, and the current drawn is hence constant, as well as lesser than that of an electric car.



- The torque of an electric car is higher than that of a hybrid car, but it tends to fall with time.
- The torque of a hybrid car generally follows a constant trend.
- This is because of additional power supply in a hybrid car, which gives a constant torque.
- But in case of an electric car, as the battery dissipates, the torque provided also falls with time.



- The wheel slip of an electric car is much higher than that of a hybrid car.
- This is because hybrid cars generally have a more advanced control systems which can give a proper control over slippages by using instantaneous bursts of energy from the alternative power source.
- This cannot happen in an electric car as the power supplied cannot be altered quickly according to need.



The speed vs time graph of a hybrid car is higher than that of the electric car.

This is quite intuitive, as there are more available power sources which give additional power to the hybrid car.

Summary:

Hybrid cars in general are more versatile with higher accelerations, maximum speeds and fuel capacity.

Hybrid cars generally have better and more developed control systems to prevent wheel slippages and lateral slips.

The electric cars have nearly all their limitations stemming from the fact that the only power source is a battery, which also tells us that in future as the batteries become more powerful and less expensive, there is tremendous potential in electric vehicles.

REFERENCE

- https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=4168023
- https://in.mathworks.com/products/simulink.html
- https://www.iith.ac.in/~ashok/teaching.htm
- https://www.iith.ac.in/~ashok/VD/VD_Project_2015/VD_PPT/GroupB_Driveline.pdf

THANK YOU