



## **DEPARTMENT OF ELECTRICAL ENGINEERING**

### **DELHI TECHNOLOGICAL UNIVERSITY**

GOVERNMENT OF NCT OF DELHI

SHAHBAD DAULATPUR, BAWANA ROAD, DELHI-110042

## **Chargers and Charging Infrastructure (EV355)**

### **ASSIGNMENT NO 2**

**Last Date of Submission: November 16, 2024**

Course Outcomes (CO's): Students will be able to

CO1	understand the different types of Electric Vehicles (EVs) such as Battery EVs, Hybrid EVs, Fuelled EVs, Solar-Powered EVs and associated technologies.
CO2	gain a detailed understanding of various energy storage systems and also able to evaluate key parameters such as battery sizing, charging/discharging cycles, and energy storage modelling for different types of EVs.
CO3	to analyse and design EV charging infrastructure, including the differences between slow and fast chargers, the necessary design ratings for chargers, and the standards used.
CO4	design and analyse the basic requirements of a charging system, the selection of appropriate power components (e.g., Boost PFC, Boost inductor sizing), and loss calculation in chargers.
CO5	select and specify the appropriate AC (Type-1, Type-2, Type-3) and DC chargers based on type of vehicle, battery pack, and infrastructure availability.

- Q1.** An electric vehicle has a 60 kWh battery. If it is charged from 0% to 100% using a Level 1 charger that provides 1.4 kW, how long will it take to fully charge? [CO4]
- Q2.** If the cost of electricity is \$0.10 per kWh, how much will it cost to charge a 40 kWh battery from 20% to 100% using a Level 2 charger that provides 7.2 kW? [CO3]
- Q3.** An EV has a consumption rate of 0.25 kWh/mile. If the vehicle's 60 kWh battery is charged from 0% to 100% using a Level 2 charger (7.2 kW), how many miles can it travel after charging? [CO4]
- Q4.** A charger has an efficiency of 90%. If it delivers 10 kW to the battery, how much energy is actually drawn from the grid? [CO4]
- Q5.** If three electric vehicles each have a 50 kWh battery and are charged from 20% to 100% using Level 2 chargers, how much total energy is needed? [CO4]
- Q6.** An electric vehicle with a 75 kWh battery is charged from 10% to 90% using a DC fast charger that outputs 150 kW. How long will this take? [CO4]
- Q7.** An EV battery starts with a capacity of 60 kWh. After 5 years, it loses 15% of its capacity. If the EV is charged to full capacity, what will be the effective charge capacity after 5 years? [CO4]
- Q8.** A battery with a capacity of 80 kWh is charged with an efficiency of 95%. If it requires a total of 50 kWh to charge, how much energy will be drawn from the grid? [CO4]
- Q9.** If a charging station has 5 Level 2 chargers, each providing 7.2 kW, what is the total power output of the charging station? [CO4]
- Q10.** If a solar panel system generates 6 kWh of electricity per day and the EV consumes 0.2 kWh/mile, how many miles can the EV drive using the solar energy generated in one day? [CO4]