Electric Vehicles:

Introduction:

An electric vehicle (EV) is a vehicle that uses one or more electric motors for propulsion. It can be powered by a collector system, with electricity from extravehicular sources, or it can be powered autonomously by a battery (sometimes charged by solar panels, or by converting fuel to electricity using fuel cells or a generator). EVs include, but are not limited to, road and rail vehicles, surface and underwater vessels, electric aircraft and electric spacecraft.

EVs first came into existence in the mid-19th century, when electricity was among the preferred methods for motor vehicle propulsion, providing a level of comfort and ease of operation that could not be achieved by the gasoline cars of the time. Internal combustion engines were the dominant propulsion method for cars and trucks for about 100 years, but electric power remained commonplace in other vehicle types, such as trains and smaller vehicles of all types.

In the 21st century, EVs have seen a resurgence due to technological developments, and an increased focus on renewable energy and the potential reduction of transportation's impact on climate change and other environmental issues.

Most electric vehicles use lithium-ion batteries (Li-Ions or LIBs). Lithium ion batteries have higher energy density, longer life span and higher power density than most other practical batteries. Complicating factors include safety, durability, thermal breakdown and cost. Li-ion batteries should be used within safe temperature and voltage ranges in order to operate safely and efficiently.[35]

Increasing the battery's lifespan decreases effective costs. One technique is to operate a subset of the battery cells at a time and switching these subsets.[36]

In the past, nickel–metal hydride battery batteries were used in some electric cars, such as those made by General Motors.[37] These battery types are considered outdated due to their tendencies to self-discharge in the heat.[38] Furthermore, a patent for this type of battery was held by Chevron, which created a problem for their widespread development.[39] These factors, coupled with their high cost, has led to lithium-ion batteries leading as the predominant battery for EVs.[40]

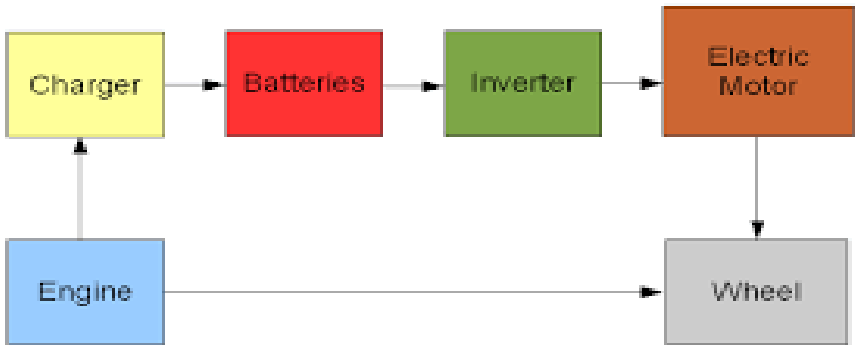
Types:

Pure-electric vehicles: A pure-electric vehicle or all-electric vehicle is powered exclusively through electric motors. The electricity may come from a battery (battery electric vehicle), solar panel (solar vehicle) or fuel cell (fuel cell vehicle).

Hybrid EVs: A hybrid electric vehicle is a type of hybrid vehicle that combines a conventional internal combustion engine) system with an electric propulsion system (hybrid vehicle drivetrain). The presence of the electric powertrain is intended to achieve either better fuel economy than a conventional vehicle or better performance. There is a variety of HEV types and the degree to which each function as an electric vehicle also varies. The most common form of HEV is the hybrid electric car, although hybrid electric trucks,buses, boats and aircraft also exist.

Plug-in electric vehicle: A plug-in electric vehicle is any motor vehicle that can be recharged from any external source of electricity, such as wall sockets, and the electricity stored in the Rechargeable battery packs drives or contributes to drive the wheels. PEV is a subcategory of electric vehicles that includes battery electric vehicles,plug-in hybrid vehicles, and electric vehicle conversions of hybrid electric vehicles and conventional internal combustion engine vehicles.

Block diagram:



Functioning:

Electric cars function by plugging into a charge point and taking electricity from the grid. They store the electricity in rechargeable batteries that power an electric motor, which turns the wheels. Electric cars accelerate faster than vehicles with traditional fuel engines – so they feel lighter to drive.

Components(electric vehicles):

Motor:

The motor converts electric energy into kinetic energy that moves the wheels. The advantage of using the motor instead of an engine is numerous: first, the noise and the vibration we typically associate with cars are minimized. Many passengers riding EVs for the first time are surprised by just how quiet and comfortable the ride feels. Moreover, the EV powertrain is smaller than the engine, thus providing

lots of additional space for efficient vehicle design—like expanded cabin space or storage.The motor is also in part an electric generator—it converts the kinetic energy generated while in neutral gear(e.g.while the car is going downhill) into electric energy saved to the battery. The same energy-saving idea applies when the car is reducing its speed, culminating in the so-called "regenerative braking system." Some of the Hyundai Motor Group's EVs are equipped with a mechanism that can control the levels of regenerative braking via paddle shifters on the steering wheel, which not only improves the fuel economy but also adds an interesting and fun element to driving.

Reducer:
The reducer is a kind of transmission in that it serves to effectively convey the motor's power to the wheel. But it carries the special name reducer.(for a reason: the motor has a far higher RPM than that of an internal combustion engine, so whereas transmissions change the engine RPM to match the driving circumstance, the reducer must always reduce the RPM to an appropriate level. With the reduced RPM, the EV powertrain can take advantage of the resulting higher torque.)

Battery:
The battery stores electrical energy and is the equivalent of a fuel tank in an internal combustion engine. The maximum driving distance of an EV is often determined by the battery capacity—the higher the capacity, the higher the driving distance. In that light, increasing the capacity may seem an obvious choice, since high driving distance reduces the annoying need for frequent stops at charging stations. But the choice actually isn't so obvious, because the battery's size and weight also have large implications on vehicle performance. The larger and heavier battery takes away from cabin/storage space and worsens the energy efficiency and fuel economy. The best way to optimize performance, then, is to maximize the battery's energy density—that is, having a small, lightweight battery that stores as much electric energy as possible.

Battery Heating System:
In lower temperatures, the battery sees a decrease in both charging capacity and speed. The battery heater exists to keep the battery within the ideal temperature range, preventing seasonal performance decreases and maintaining the max driving distance. The system functions while charging as well, ensuring the efficiency of the charge.

On-board Charger(OBC):
The On-board Charger(OBC) is used to convert Alternating Current(AC) from slow chargers or portable chargers used on home outlets into Direct Current(DC). This may make the OBC look similar to the traditional inverter, but they differ crucially in function; the OBC is for charging, and the inverter is for

acceleration/deceleration. Incidentally, the OBC is not needed in fast-charging, since fast chargers already supply the electricity in direct current.

Battery Management System(BMS):
The Battery Management System(BMS) manages the battery's many cells so that they can operate as if they are a single entity. The EV's battery consists of as little as tens to as many as thousands of mini-cells, and each cell needs to be in a similar condition to the others in order to optimize the battery's durability and performance.

Electric Power Control Unit(EPCU):
The Electric Power Control Unit(EPCU) is an efficient integration of nearly all devices that control the flow of the electric power in the vehicle. It consists of the inverter, the Low voltage DC-DC Converter(LDC), and the Vehicle Control Unit(VCU).

1. Inverter:
The inverter converts the battery's DC into AC, which then is used to control the motor speed. The device is responsible for executing acceleration and deceleration, so it serves a crucial part in maximizing the EV's drivability.

2. Low voltage DC-DC Converter:
The LDC converts the high voltage electricity from the EV's high-voltage battery into low-voltage(12V) and supplies it to the vehicle's various electronic systems. All electronic systems in the EV use electricity in low voltage, so the high voltage in the battery must be converted first to be useful for these systems.

3. Vehicle Control Unit:
As the control tower of all electric power control systems in the vehicle, The VCU is arguably the most important component of the EPCU. It oversees nearly all the vehicle's power control mechanisms, including the motor control, regenerative braking control, A/C load management, and power supply for the electronic systems.

Requirements:

Microcontrollers(8051)

Software

FGPA

GPS

Sensors

Artificial Intelligence(assistant)

Applications:

Consumer Electronics.
Public Transportation.
Aviation.
Electricity Grid.
Renewable Energy Storage.
Military.
Spaceflight.
Wearable Technology.

Conclusion:

Batteries are being engineered to have a long life. When the hybrid cars become more widespread, battery recycling will become economically possible. Research into other energy sources such as fuel cells and renewable fuels make the future look brighter for hybrid cars. Hybrid cars are definitely more environmentally friendly than internal-combustion vehicles. Batteries are being engineered to have a long life. When the hybrid cars become more widespread, battery recycling will become economically possible. Research into other energy sources such as fuel cells and renewable fuels make the future look brighter for hybrid cars.