



ADVANCED  
AUTOMOTIVE  
ENGINEERING  
EDUCATION

# AUTOMOTIVE TECHNICAL INFORMATION





**Together for Road Safety**



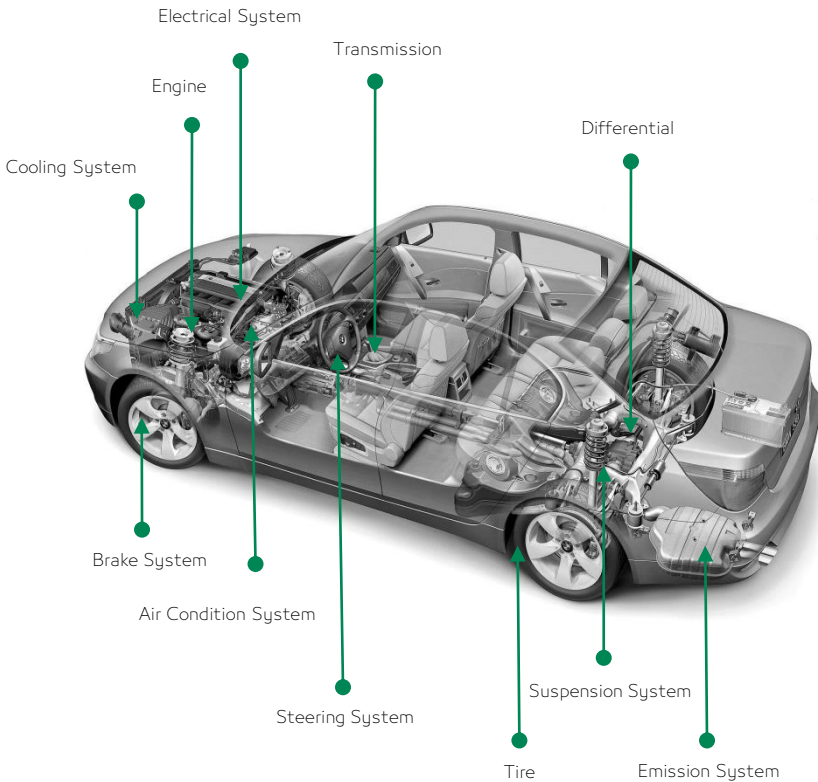
## INDEX:

- Vehicle Inspection
- Vehicle Maintenance
- Engine
- Cooling System
- AT and Manual Transmission
- Differential System
- Electrical System
- Fuel System
- Emission System
- Steering System
- Brake System
- Suspension System
- Tires
- Seat Belt
- Airbags
- Over speed
- Over Load
- Accidents avoid / vehicle maintenance
- Driver tips
- Tips for Traveling by land

## VEHICLE INSPECTION

Every driver must thoroughly check all parts of the vehicle before making any trip in order to avoid any technical problems that he may encounter, especially for the length of the distance that the vehicle will travel during a long trip, and the most important parts that must be checked are as follows:

Engine - Transmission - Differential - Electrical and Ignition System - Cooling System - Emission System - Brake System - Air Condition System - Steering System - Suspension System - Tires.



## VEHICLE MAINTENANCE

Vehicle maintenance includes any operation that will keep vehicle in good running condition. Without proper care, thousands of kilometers can reduce the life of vehicle. For example, a vehicle's fluids can become contaminated and changed chemically after prolonged use. This can cause parts wear, corrosion, and mechanical failures.

A poorly serviced vehicle will wear out and break down sooner than a well maintained vehicle. In the long run, vehicle maintenance keep a vehicle in good condition and saves the owner money.

### Purpose of periodic maintenance:

An automobile is constructed of many parts. With frequent use, the performance of the functional components (including lubricants) is reduced due to wear, deterioration, corrosion. These changes occur gradually in different parts during normal vehicle operation.

The factory therefore specifies certain periodic inspection intervals and the suggested adjustment or replacement of the parts and components that can be anticipated to undergo these changes with time or use. This is referred to as 'periodic maintenance'.

The purpose of periodic maintenance is to restore a vehicle's performance to the best possible condition, in order to prevent small problems from becoming bigger in the future, and ensure that the vehicle is safe and conforms to local laws and regulations.

Through performance of the specified periodic maintenance, the owner can be assured of longer vehicle life, better driving economy, and more reliable operation.

### Periodic Maintenance:

- Inspection
- Adjustment
- Replacement

### Vehicle maintenance in best condition:

- Prevent of problems
- Safe driving
- Conformity to local laws and regulations

### Customer satisfaction:

- Longer vehicle life
- Good driving economy
- Reliable operation



## ENGINE

An engine supplies the power to move the vehicle and operate other systems. Most vehicle engines use gasoline or diesel, both of which burn in the engine to produce the power that operate the vehicle. Always make sure to supply the necessary fuel (Super - Leaded - Unleaded - Regular - Diesel) to avoid damage to your vehicle engine. It is very important to avoid mixing the fuel with impurities.

The engine should also be noted to ensure the following:

- The engine rotates normally without any sounds or vibrations.
- No blue or black smoke comes out from exhaust.
- The oil level, and replace it if necessary.
- No oil leaks.
- There is No water leakage from the engine.

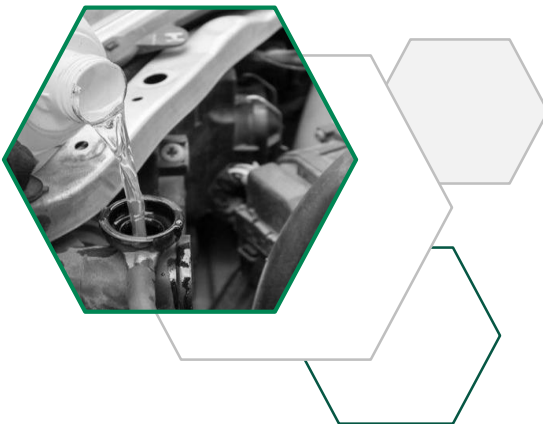


## COOLANT SYSTEM

The cooling system works by circulating water inside the engine with the help of air blowing fans, in order to regulate the engine temperature according to the specifications prescribed by the manufacturer. Note that the scale temperature ranges from 80 to 90 degrees Celsius.

To maintain this system, the following must be noted:

- Check the condition of the radiator, and the engine temperature is normal.
- Ensure that there are no leaks of water from their hoses.
- Ensure that there is no water leakage from the water pump or radiator.
- Ensure the validity of the thermostat.
- Ensure that there is no engine pressure leakage into the cooling system.



## TRANSMISSION

### Transmissions:

There are two types of Transmission that are used in all vehicles, which are manual and automatic transmissions, in order to transfer the driving force from the engine to the axles (differential gears) by means of the spindle.

### Manual Transmission:

It works manually when switching from one speed to another.

### Automatic Transmission:

It works in the way of the hydraulic system, and some modern types have been added to it with some parts that work with the electronic system.

To ensure the serviceability of the transmission, the following must be checked:

- Check the oil level, make sure of its color and smell, and change it if necessary.
- It must be ensured that the gears are changed regularly (Automatic Transmission).
- It must be ensured that there is no abnormal sound when changing.
- Ensure that there is No oil leakage from the Transmission.
- Ensure the clutch is in motion and when changing gears (Manual Transmission)





## DIFFERENTIAL

The differential takes the power from the engine and splits it, allowing the wheels to spin at different speeds. Differential is a system that transmits an engine's torque to the wheels to move the vehicle as well as maintain its balance when turning and in curves.

To make sure that there is no defect in this system, we examine the following:

- Check the oil level, confirm its condition, and change it if necessary.
- Ensure that there is No abnormal sound when driving.
- Ensure that there are No oil leaks.



## ELECTRICITY AND IGNITION SYSTEM:

This system spins the engine at the start of the movement to generate an electric spark to ignite the fuel inside the engine as well as provide the vehicle and its devices with the electrical current required to operate it.

To ensure the validity of this system, the following checks must be performed:

- Check the battery capacity.
- Check the validity of the dashboard warning lights.
- Check the starter switch.
- Inspect the spark plug with its wires.
- Checking the electrical regulator.
- Inspect the wiper motor and change the wipers if necessary.
- Check all lights

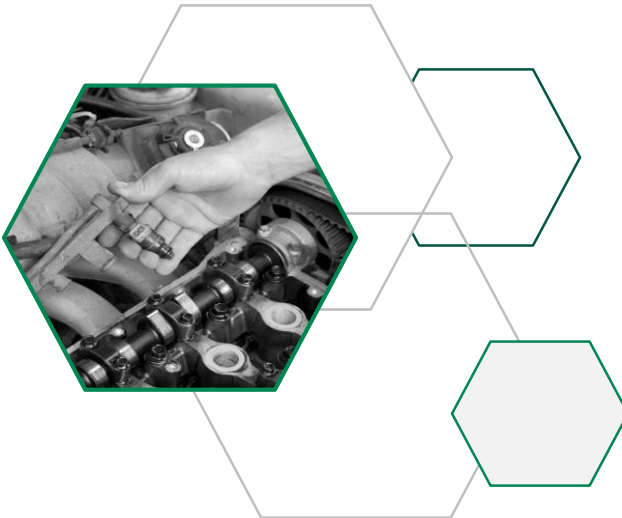


## FUEL SYSTEM:

This system supplies the engine with the necessary fuel after it is withdrawn from the tank by the fuel pump. This system must be carefully examined so that the driver avoids any technical problems that may occur on the road.

Therefore, the following should be examined:

- Fuel tank.
- Fuel pump.
- Fuel filter.
- Injectors.
- Fuel delivery pipes and hoses.



## EMISSION SYSTEM:

This system consists of the muffler box and the exhaust pipe, which is a part of emission system and is connected to the engine to release the gases that are produced during the internal combustion process in the engine and for its validity, the following must be checked:

- It does Not have any abnormal sounds.
- There is No leakage of these gases from them.
- Exhaust silencer case (Muffler) is not clogged.



## STEERING SYSTEM:

The steering System is the main part of the vehicle and it connects the front wheels to control the vehicle's steering.

For the safety of this system, the following must be checked:

- Check steering arms.
- Check the steering pump.
- Check the oil level.
- Ensure that there are no oil leaks.

### Advice:

Do Not cut, weld or change the steering system or any part of it, as this may cause accidents. (Especially for those who change the steering system from right to left).

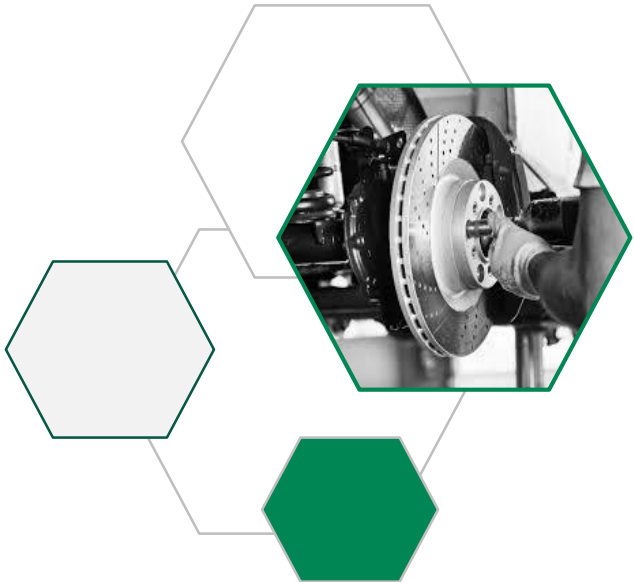


## BRAKE SYSTEM:

This system is called emergency and safety, and it is considered one of the most important systems in the vehicle. The efficiency and effectiveness of this system must be checked and carefully examined.

For the safety of this system, the following must be checked:

- Check the level and cleanliness of the oil and change it if necessary.
- Ensure that there are No oil leaks.
- Check the condition of the brakes pads and drums and change them when needed.
- Check the brakes when driving and note the balance of the vehicle when pressing the brakes and not to deviate in either direction.



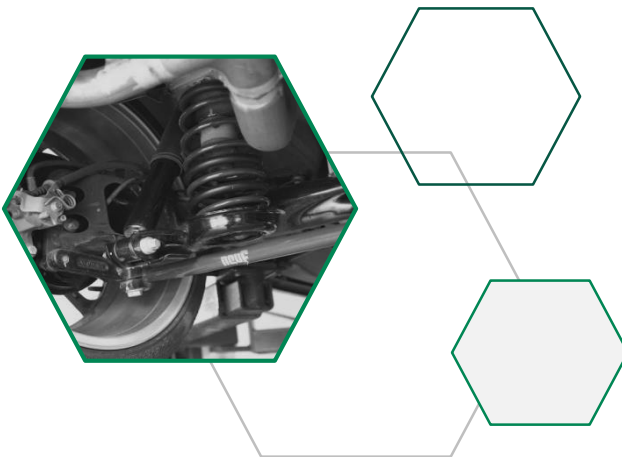
## SUSPENSION SYSTEM:

The driver must make sure of the validity of this system as it is one of the important parts of the vehicle as it provides comfort for passengers and safety for the vehicle, especially in the case of having many passengers and overloads, as it affects the balance of the vehicle during vibrations and turns.

Therefore, all the parts of this system must be in good condition and must be changed if necessary, and these parts are: Coil springs - Shock absorbers - Upper Control Arms - lower Control Arms.

### Tips:

- Do not raise the vehicle more than necessary, as this will cause the vehicle to become uncontrollable on the road.
- When changing parts of the suspension system, it must comply with the required specifications.
- Not to load the vehicle more than the prescribed load.



## TIRES:

Tires are the only vehicle components that have direct contact with the road. The function of the tires is to act as a soft cushion, where it adhesion and friction with the ground surface. The tires control the transmission of steering power, braking and turning to the road in normal, rainy and hot conditions. At the same time, it is resistant to deflating and wear.

### Tire Specifications:

On the sidewall of the tire, there is information about tire size, load-grip capacity, inflation pressure, speed rating, ID number and make.

### Frame problems:

Tire problems usually appear as vibration, abnormal noises, effortless steering wheel pull, wear in the form of an abnormal thin color streak, and other similar symptoms.

### Tire wear:

Tire wear is caused by many factors such as distance in kilometers mainly, driving style, tire pressure, wheel bias, and the lack of balance can cause excessive tire wear. Always use a tire pressure gauge to check inflation pressure and never rely on a visual inspection.

### Some information to keep in mind about tires:

- Buy excellent quality tires.
- Not to buy used tires, even if their external appearance is in good condition.
- The tire must bear one of the two International Standard Codes, E or DOT.
- The tire production date has to be taken into consideration and must be printed on the side of the tire.
- Do not mix different types of tires in the vehicle, to ensure safety.
- When changing tires, it is recommended to check the validity of the suspension and braking system.
- In the case of having any bulge or cut in the tire, even if it is slight, it must be changed.
- When purchasing tires, you must adhere to the specifications and standards that have been set by the vehicle manufacturer in terms of size, width and height.

### Notes:

Tires are the connecting point between the vehicle and the road and considered among the most important factors for your safety.



## SEAT BELT:

Safety belts are among the most effective means of saving lives and reducing serious injuries in traffic crashes. Safety belts, air bags and proper child safety seats when used consistently and correctly, can significantly reduce the rate of injury in a crash.

### Life - saving advice:

- Seat belt safety and security.
- Seat belts must be properly attached.
- Seat belts lose their effectiveness if they are loose or not worn correctly.
- All Passengers should get used to wearing a seat belt.
- Use of child recommended seats.
- The rear seats are always the place for those under 12 years old.



## AIR BAGS:

In the event of a collision occurring beyond (operating level), the air bag sensor system realizes that the vehicle has stopped suddenly or senses the impact of a side blow in the event of a collision from one side. The sensing system releases the air bag very quickly. However, seat belts should be used in conjunction with the air bags that designed to enhance the protection provided by seat belts. The Air bags distribute the impact force more widely over the upper part of the person sitting in the seat and stop his body more gradually.

### Tips to avoid air bag dangers:

- Do not place the leg or knee on the air bag.
- Not to sit close to the air bag while driving, the distance should be at least 25 cm.
- Always wear a safety belt as the air bag does not replace a belt.
- The air bags are designed to be used in conjunction with the seat belts.
- Children (under 12 years old) should not be placed in the front seats.
- If there is a collision and the seat belt is not fastened, your injury may be much more serious even if the air bag is inflated.



## OVER SPEEDS:

There is no doubt that every driver understands that driving is an art, taste and ethics. Therefore, we see that a driver who is aware of this is keen to take into account all road users and respect traffic laws and regulations to avoid himself and others any risks.

These are some of the downsides of speeding up:-

- Not controlling the vehicle, especially when any surprise occurs on the road.
- Failure to control the vehicle when using the brakes.
- Not parking the vehicle within the required distance.
- When an accident occurs, human injuries are severe.
- More brake system spare parts consumption.
- More fuel consumption.
- Tire consumption, especially when using the brakes.
- High financial costs to repair the vehicle after the accident.
- Harm other road users.
- Pay off radar violations due to excessive speed.



## OVER LOAD:

Vehicles are manufactured according to specifications and standards that should not be exceeded, and therefore each vehicle has a specific weight and load that cannot be overloaded, so the vehicle's manuals must be reviewed in order to avoid accidents and damage to the vehicle.

These are some of the disadvantages of being overweight:-

- Imbalance of the vehicle on the road, especially when turning.
- Failure to control the vehicle when the tire bursts.
- Not stopping the vehicle within the required distances when applying the brakes.
- The occurrence of severe material and human elements in the event of an accident.
- Brake system spare parts consumption.
- More fuel consumption.
- Tire consumption.
- Suspension system consumption.
- Body depreciation.
- Low engine power.



## ACCIDENTS AVOID / VEHICLE REPAIR

Many traffic accidents happen due to the vehicle's inappropriateness or a technical malfunction in the vehicle that makes it unsuitable to driving safely. Therefore, it must be inspected from time to time, and not letting minor faults increase or worsen.

There are many reasons that may make the vehicle unsuitable for driving safely, such as include the work of welds or connections in the parts of the chassis base or the steering device (steering wheel), the wear of the brakes or tires, the presence of leaks in the fuel, oil or water tanks and tubes in the vehicle, the presence of a malfunction in the lighting or electrical connections, and damage or shortage of mirrors, glass, or wipers.

### Tips:

- Ensure that the vehicle has enough oil, fuel and water, because the shortage of these fluids leads to vehicle failure.
- Ensure the safety of electrical devices, especially the battery, front and back lighting, and wipers.
- Ensure the safety of the brakes by checking them before starting to travel by pressing them in the normal way and noting the resistance. If the vehicle is weak or the brake pedal movement is abnormal, the vehicle should be repaired.
- Ensure the safety of the tires, as it is noticed that many accidents occur as a result of tire bursting.
- Ensure that you have tire removal tools, and any other tasks that can be used to eliminate a minor accident.
- If the vehicle breaks down while it is on the road, the vehicle must be removed from the road whenever possible. The driver should take steps to warn other drivers by using warning lights or the red triangle.
- If the vehicle breaks down on the road, you must not park near it so that it will not be subject to a collision from vehicles coming from behind.

## DRIVER TIPS:

- Pay attention and apply general traffic signs.
- Do not drive the vehicle faster than the required speed, knowing that each street has a specific speed.
- In the event that children ride in the vehicle, place them in the back chairs while using the necessary precautions for their safety, such as Special chairs or seat belts according to the age of the children, and never forget to use the safety lock in the doors Background inside.
- The headrest is very important for every driver as it protects the neck bones from fractures in the event of a collision, especially from the back.
- Before opening the door, especially the door next to the driver, that is, when someone wants to leave the vehicle, make sure that no vehicle or any movement will pass Another is close to the door before opening it.
- Do not leave the children alone in a locked vehicle, as you may have to be absent for a long time in unforeseen circumstances if this happens. This will lead to a decrease in the oxygen inside the vehicle, which exposes them to respiratory discomfort or sometimes suffocation.
- Often on the streets we see boys in vehicle s stretching their heads or hands and this is very Dangerous. To avoid this, all windows must be closed.
- Do not drive while under the influence of alcohol or painkillers, as this affects your alertness while driving.
- Ensure safety seat belts in the vehicle and seat belts for all passengers before departure.
- Do not purchase commercial (counterfeit) parts in order to avoid breakdowns in the vehicle that may cause accidents.
- Using lights is an art and a taste like driving, so it is obvious that you use your lights without disturbing others and exposing them to danger.
- You must use your high beam with caution and do not dazzle the eyes of other drivers.

## TIPS FOR TRAVELING BY LAND:

Every traveler must verify all travel documents, including:

- Ensure that passports are valid for all family members.
- The validity of the vehicle ownership, as well as the tourist permit and the customs pass book
- Obtaining
- visas for the countries you pass through.

The driver must also observe the traffic and safety rules, wherever and including:

- Follow the traffic signs on the road.
- Take a rest after a distance of (200/250) km.
- The use of the interior and side mirrors, especially when overtaking.
- Not to load the vehicle more than the prescribed load to avoid accidents.
- Adhere to the lane on the right side while walking or immediately after overtaking.
- Not park the vehicle on the edge of the road.
- Always use traffic lights when overtaking.
- The traveler must make sure that there is a first aid box in the vehicle.
- The driver's posture must be comfortable and correct, so that he does not feel fatigued.
- When driving a vehicle, the traveler should pay attention to the indicators on the control panel.
- Ensure the vehicle's validity before driving and repair any faults that may arise in it before leaving.
- Be sure to fasten your seat belt before moving.
- Children are not allowed to sit on the front seats or near the doors, and it is preferable to use the existing safety lock with the vehicle so that the door does not open from the inside.
- Take precautions, especially when there is a dangerous curve or an unpaved road, and adhere to the required speed.