



# **SNS COLLEGE OF TECHNOLOGY**

**(An Autonomous Institution)**

**COIMBATORE-35.**



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Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai.

## **DEPARTMENT OF AUTOMOBILE ENGINEERING**

**COURSE NAME : 23AUT101 – ELEMENTS OF AUTOMOTIVE SYSTEM**

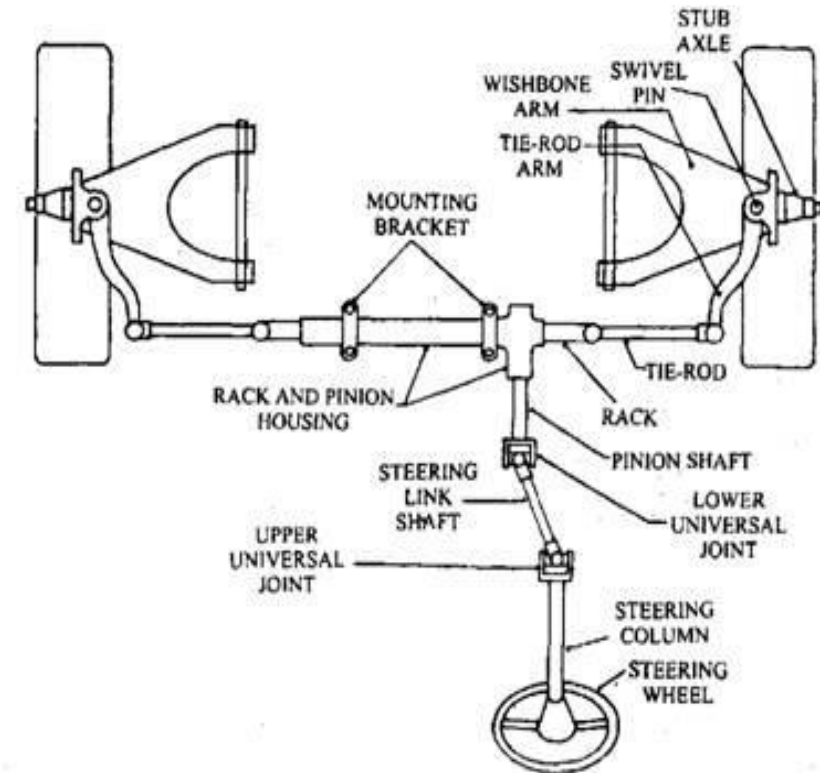
**I YEAR /II SEMESTER**

**Unit 1- STEERING SYSTEM**

**Topic : Steering principle, linkage layouts for rigid axle suspension**



Steering is the collection of components, linkages, etc. which allow a vessel (ship, boat) or vehicle (car, motorcycle, and bicycle) to follow the desired course. An exception is the case of rail transport by which rail tracks combined together with railroad switches (and also known as 'points' in British English) provide the steering function.





- The most conventional steering arrangement is to turn the front wheels using a hand-operated steering wheel which is positioned in front of the driver, via the steering column, which may contain universal joints (which may also be part of the collapsible steering column design), to allow it to deviate somewhat from a straight line.
- Other arrangements are sometimes found on different types of vehicles, for example, a tiller or rear-wheel steering. Tracked vehicles such as bulldozers and tanks usually employ differential steering—that is, the tracks are made to move at different speeds or even in opposite directions, using clutches and brakes, to bring about a change of course or direction.



## PURPOSE OF A STEERING SYSTEM

The **steering system** allows the driver to guide the car along the road and turn left **or** right as desired.

The system includes the following :

- (i) *The steering wheel* ..... which the driver controls.
  - (ii) *The steering gear* ..... which changes the rotary motion of the wheel into straight line motion, and
  - (iii) *The steering linkages* ..... which transmit the steering gear movement to the front wheels.
- The steering system configuration depends on vehicle design (the drive train and suspension system used, whether it is a passenger car **or** a commercial vehicle etc.). At present, the rack-and-pinion type and the recirculating-ball types are in use.
  - Most steering systems were *manual* until a few year back. Then **power steering** became popular. It is now installed on almost all costly cars.



## **Functions and Basic Principles:**

The steering system, along with the suspension system, allows the driver to safely and easily control the vehicle's direction while driving. To accomplish these goals the steering system works with components of the suspension to provide for the turning movement of the wheels. In addition to connecting the driver to the wheels, the steering system also provides feedback to the driver from the front tires. This feedback, called road feel, is used by the driver to determine how the vehicle is handling.



## **The Steering System:**

The steering system consists of the components that allow the driver to turn the front wheels of the vehicle, and for a few vehicles, provides for a limited amount of steering by the rear wheels. The overall function of the steering system has not changed much since the earliest days of the automobile.



**Functions of the Steering System:** The most basic function of the steering system is to allow the driver to safely and precisely steer the vehicle. Beyond this, the steering system also provides a way to reduce driver effort by making the act of steering the vehicle easier. The components of the steering system also absorb some of the road shock before it gets to the driver. Very little has changed in the operation of the steering system or in some of the components since the earliest automobiles. The things that have changed primarily have to do with increased ease and effectiveness of operation and longer-lasting components that require less maintenance.

**Primary function:** to achieve angular motion of the front wheels to negotiate a turn. This is achieved through linkages & steering gear which convert the rotary motion of the steering wheel into angular motion of the front road wheels.

**Secondary functions are;**

- Provide directional stability of the vehicle when going straight ahead.

- Provide perfect steering condition. i.e. perfect rolling of all wheels at all times.

- Facilitate straight ahead recovery after completing a turn.

- To minimize tyre wear.

- Absorb most of the road shocks going to the steering wheel.



## **Requirements of a good steering system:**

Steering system should be very accurate & easy to handle.

Effort required to steer should be minimal & must not be tiresome to the driver.

Steering mechanism should provide directional stability.

The vehicle should have a tendency to return to its straight ahead position after turning.

High rigidity.

Low friction resulting in high efficiency.





## GENERAL ARRANGEMENT OF A STEERING SYSTEM

Fig. shows the general arrangement of a steering system. The layout of steering system is shown in Fig.

*The main parts of a steering system are :*

1. Steering wheel.
2. Steering column.
3. Steering shaft.
4. Steering gear box.
5. Steering drop arm (Pitman arm).
6. Pull and push rod (Drag link).
7. Knuckle arm.
8. Tie rod and tie rod end.

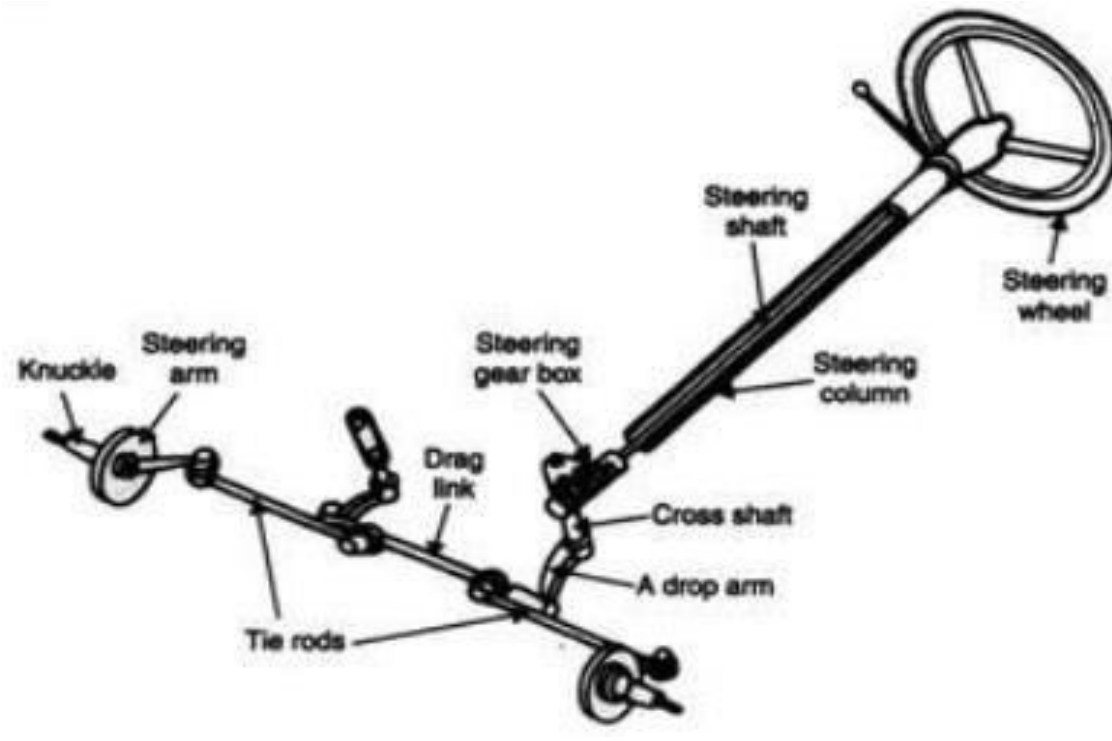


Fig. General arrangement of a steering system.

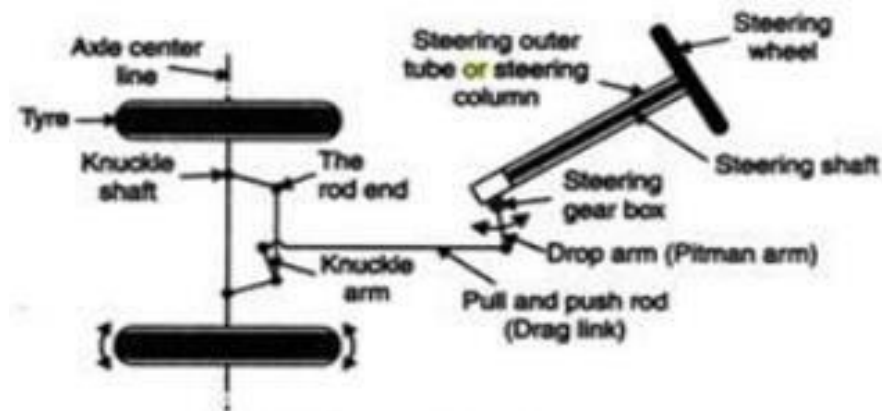


Fig. Layout of steering system.



### **Working of steering mechanism :**

- The *steering wheel* rotates the *steering column*. The *steering gear box* is fitted to the end of this column. Therefore, when the wheel is rotated, the *cross shaft* in the gear box oscillates. The cross shaft is connected to the *drop arm*. This arm is linked by means of a *drag link* to the *steering arms*. The steering arms on both wheels are connected by the *tie rods* to the drag link.
- When the steering wheel is operated, the knuckle moves to and fro, moving the wheels to the right or left. The ends of the tie rod and steering knuckle are connected to each other. One end of the drag link is connected to the tie rod. The other end is connected to the end of the drop arm. A ball and a socket joint gives the required movement to the joints between the tie rod, drag link and drop arm. When the vehicle is moving, the drop arm develops vibration. Shock springs are used in ball and socket system to absorb this vibration.



## **STEERING**

Manual steering system – relies solely on the driver to provide steering force  
Power assist (power steering) – uses hydraulic or electric power to help the driver apply steering

## **SYSTEMS:**

force.



THANK YOU