



# **SNS COLLEGE OF TECHNOLOGY**

**(An Autonomous Institution)**



**COIMBATORE-35**

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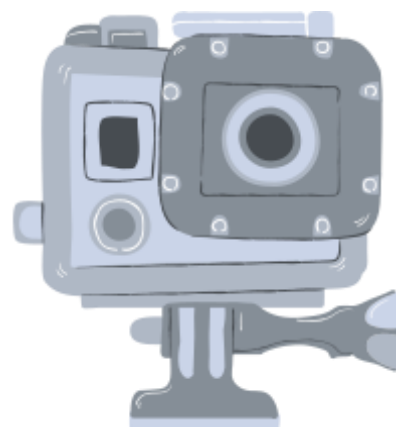
**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

**COURSE NAME: 19EET207/ SYNCHRONOUS AND INDUCTION  
MACHINES**

**II YEAR / IV SEMESTER**

**Unit 2 – SYNCHRONOUS MOTOR**

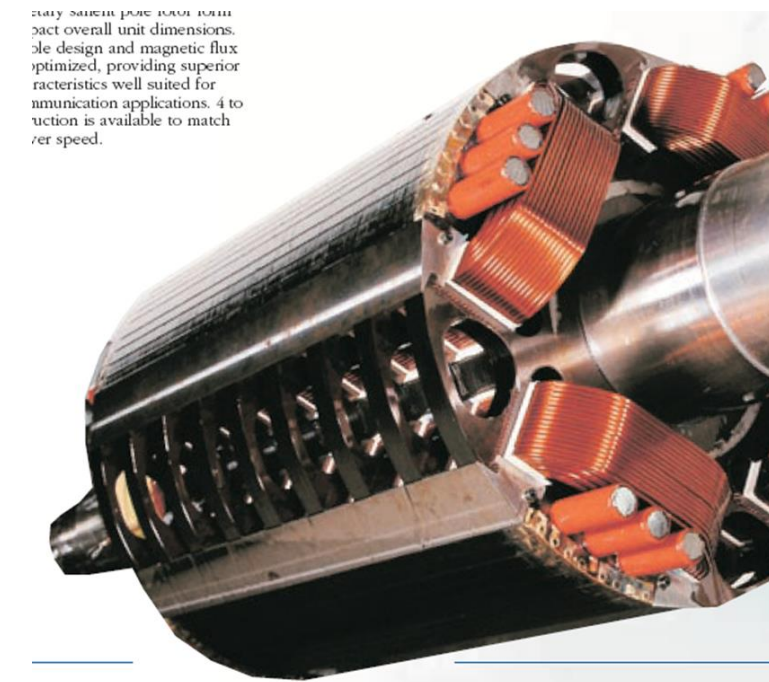
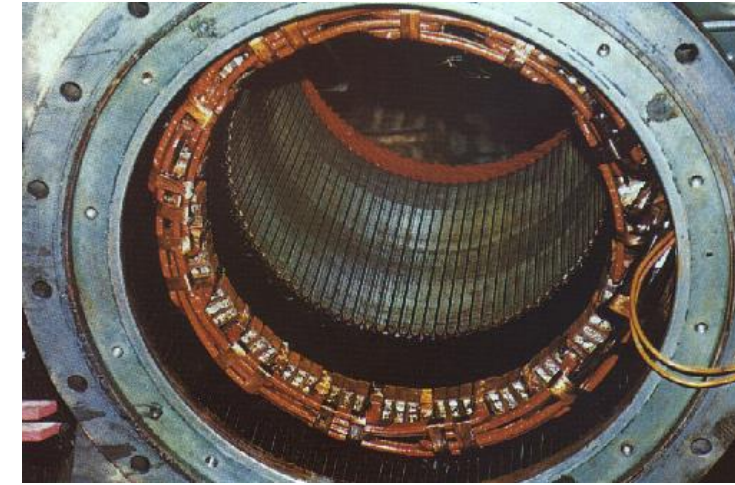
**Topic 1: Principle of operation**





# GUESS THE TOPIC NAME...

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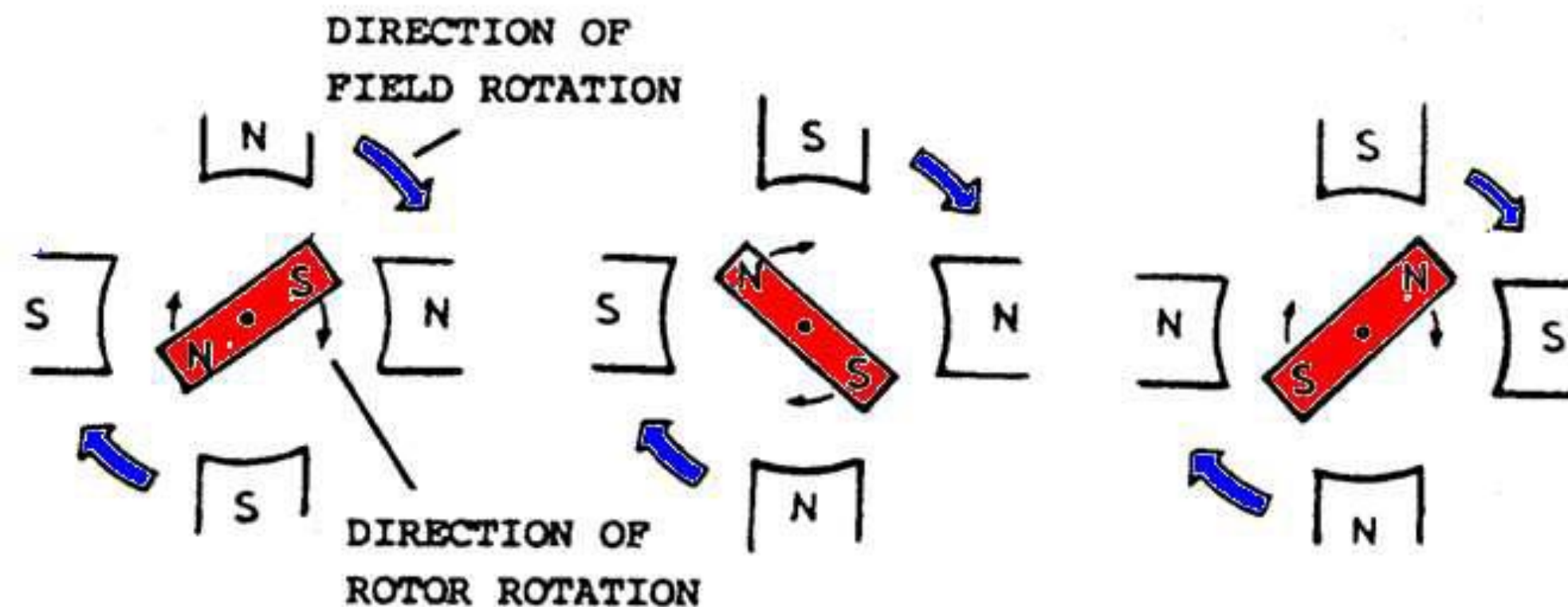
# Synchronous Motor- Introduction

- The synchronous motor rotates at the synchronous speed i.e. the speed of the RMF.
- Stator is similar in construction to that of an induction motor, so same principle is applied to the synchronous motor rotor.
- Field excitation is provided on the rotor by either permanent or electromagnets with number of poles equal to the poles of the RMF caused by stator



# Synchronous Motor-Principle

- Faradays Law of Electromagnetic Induction
- The rotor acting as a bar magnet will turn to line up with the rotating magnet field. The rotor gets locked to the RMF and rotates unlike induction motor at synchronous speed under all load condition

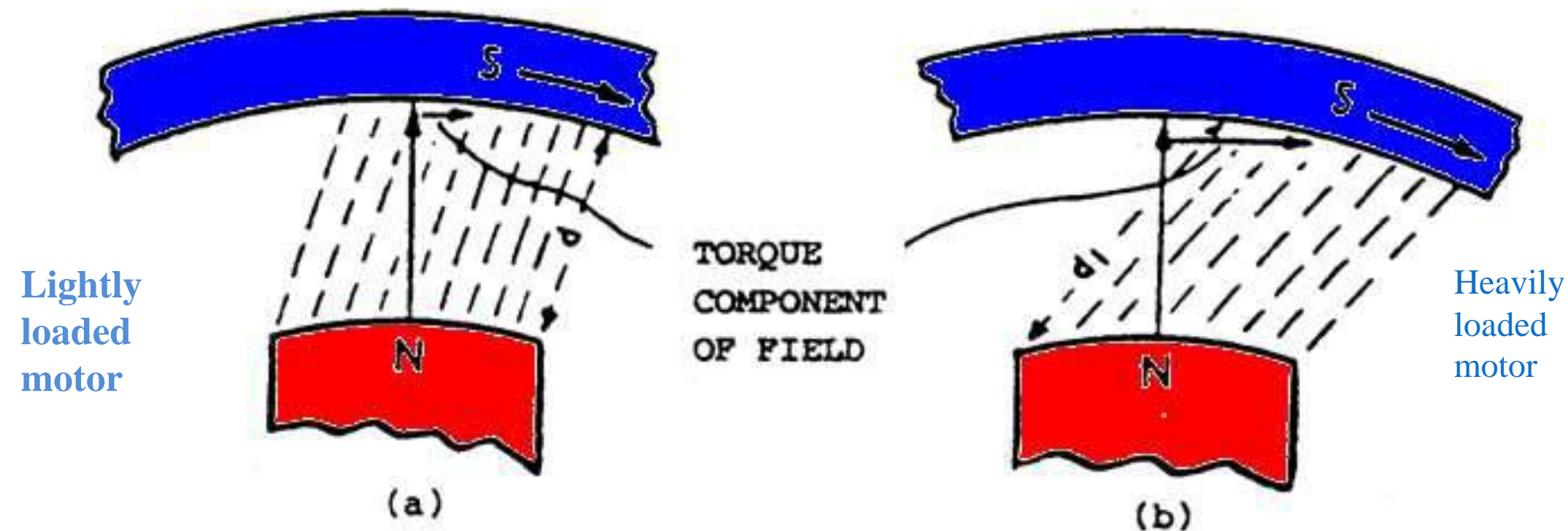




# Changing the Load

An increase in the load will cause the rotor to lag the stator field but still maintain synchronous speed. Increase in load has increased the torque component, but the field strength has decreased due to the increase in length of the air gap between the rotor and the stator.

If the synchronous motor is overloaded it pulls out of synchronism and comes to rest. The minimum amount of torque which causes this is called the “pull out torque”.





# Starting Torque



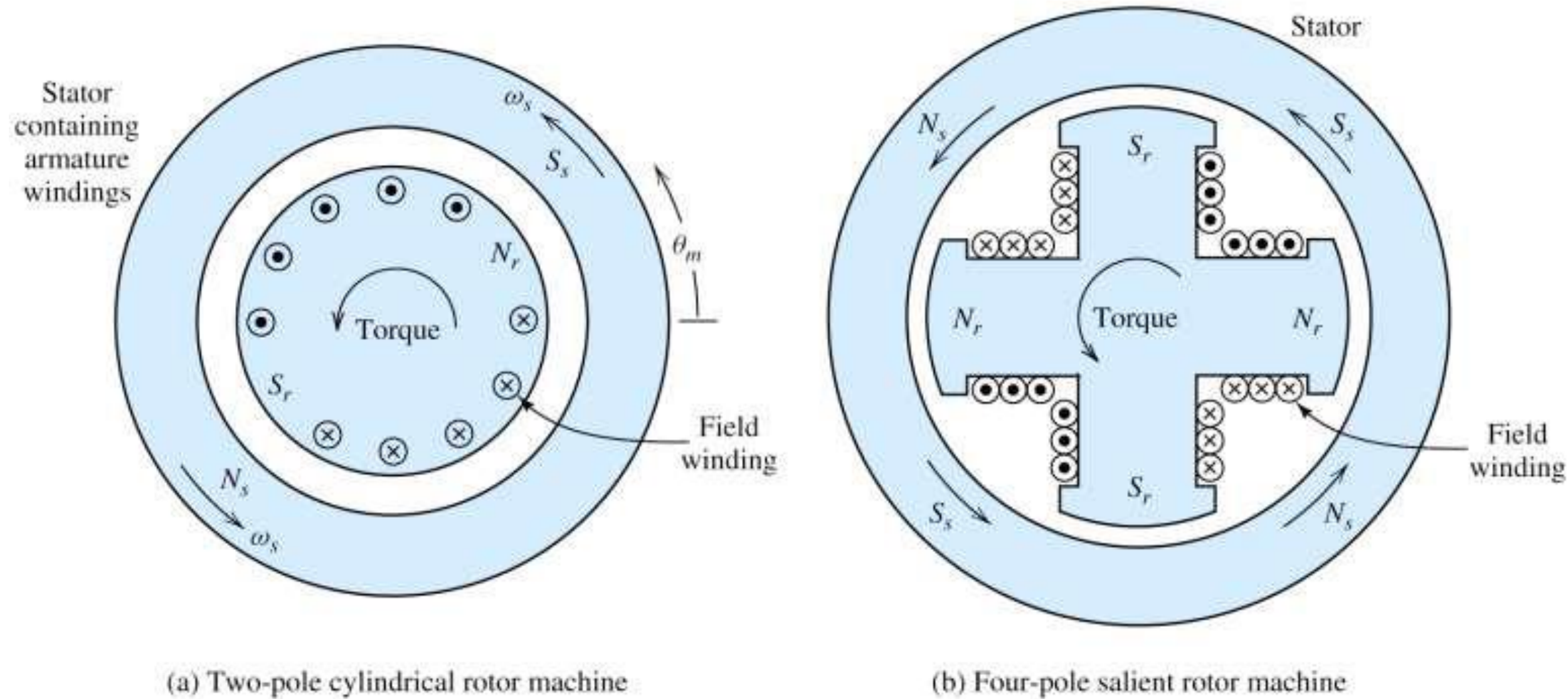
- It cannot be started from a standstill by applying ac to the stator
- When AC supply is applied to the stator a high speed RMF appears around the stator. This RMF rushes past the rotor poles so quickly that the rotor is unable to get started
- It is attracted first in one direction and then in the other and hence no starting torque

## Improvement of starting torque

- It is started by using a squirrel cage within a rotor construction and therefore starts as an induction motor
- At synchronous speed the squirrel cage has no part to play



# Synchronous Machine Construction



**Figure 17.17** Cross sections of two synchronous machines. The relative positions of the stator and rotor poles are shown for motor action. Torque is developed in the direction of rotation because the rotor poles try to align themselves with the opposite stator poles.



## Construction - Stator:



- Stationary Armature winding
- Stator core use a laminated construction
- Special steel stamping and insulated from each other with varnish or paper
- Reduce the eddy current loss Steel material Reduce hysteresis loss

## Construction - Rotor:

- Projected pole type as all the poles are projected out from the surface of the rotor.
- Rotor have large diameter and small axial length
- The poles have damper winding.
- The damper windings are used to reduce the 'Hunting'





# SUMMARY

- The synchronous motor requires to be started by an external prime mover.
- Runs only at synchronous speed, this is an advantage where continuous speed is required but a disadvantage where a variable speed is required.
- Can be used to adjust the power factor of a system at the same time it is driving a mechanical load.



KEEP  
LEARNING..  
**Thank u**

SEE YOU IN NEXT CLASS