



# **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 : 19AUB204 – AUTOMOTIVE ELECTRICAL AND ELECTRONICS ENGINEERING**

**II YEAR / IV SEMESTER**

**Unit 4 – Sensors and Actuators**

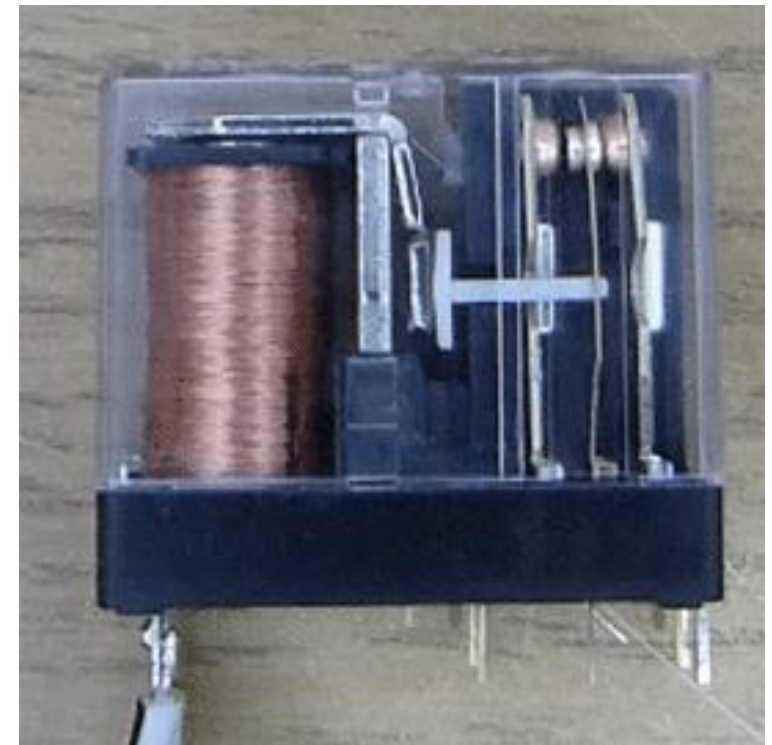
**Topic : Relay**



# RELAY



- ❖ Relay is an electromechanical or solid-state device used to control a circuit by a low-power signal or to control several circuits with one signal.
- ❖ When combined with an actuator, the relay serves as an intermediary to trigger the actuator, which then performs a mechanical action.





# COMPONENTS



## ❖ Electromagnet

- ❖ **Coil:** A wire wound into a coil that generates a magnetic field when an electric current passes through it.
- ❖ **Core:** A piece of iron or other ferromagnetic material placed inside the coil to concentrate the magnetic field.
- ❖ **Armature:** A movable iron piece that is attracted to the electromagnet when it is energized. The movement of the armature is what actuates the switching mechanism.



# COMPONENTS



- ❖ **Spring:** A component that returns the armature to its original position when the electromagnet is de-energized. This ensures that the relay returns to its default state when not activated.
- ❖ **Contacts**
  - **Normally Open (NO) Contacts:** These contacts are open when the relay is not energized and close when the relay is energized.
  - **Normally Closed (NC) Contacts:** These contacts are closed when the relay is not energized and open when the relay is energized.
  - **Common (COM) Contacts:** The moving part of the switch that connects to either the NO or NC contacts depending on the state of the relay.



# COMPONENTS



- ❖ **Yoke:** A part of the magnetic circuit that helps direct the magnetic field efficiently from the coil to the armature.
- ❖ **Frame or Housing:** The outer shell that holds all the internal components of the relay in place and provides insulation and protection.
- ❖ **Terminals:** Electrical connection points for the coil (input terminals) and the contacts (output terminals) to connect the relay to external circuits.



# WORKING



- ❖ When a control voltage is applied across the relay coil terminals, current starts flowing through the coil.
- ❖ The current through the coil generates a magnetic field in the core of the electromagnet.
- ❖ The magnetic field attracts the armature towards the core. The movement of the armature is against the force of the spring.
- ❖ As the armature moves, it pushes or pulls the contact mechanism, switching the connection from NC to NO.



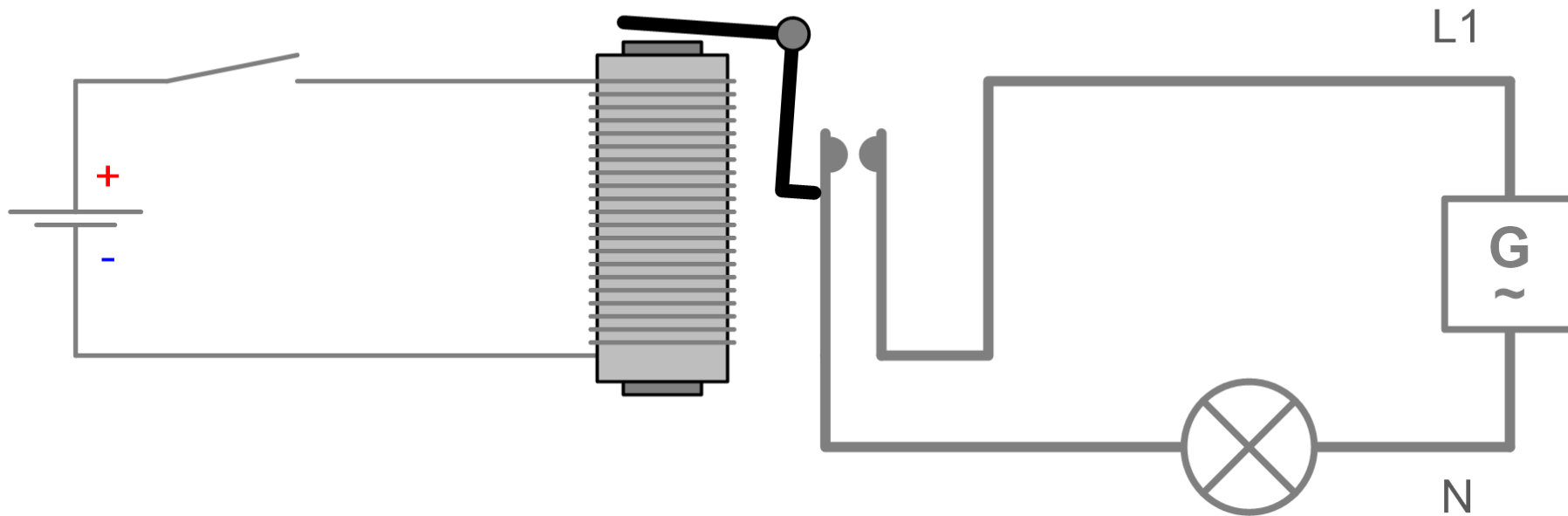
# WORKING



- ❖ As long as the coil remains energized, the armature stays in this position, keeping the NO contact closed.
- ❖ When the control voltage is removed, the current through the coil stops.
- ❖ The magnetic field collapses, and the spring returns the armature to its default position.
- ❖ The contact mechanism returns to its original state, reconnecting COM to NC.



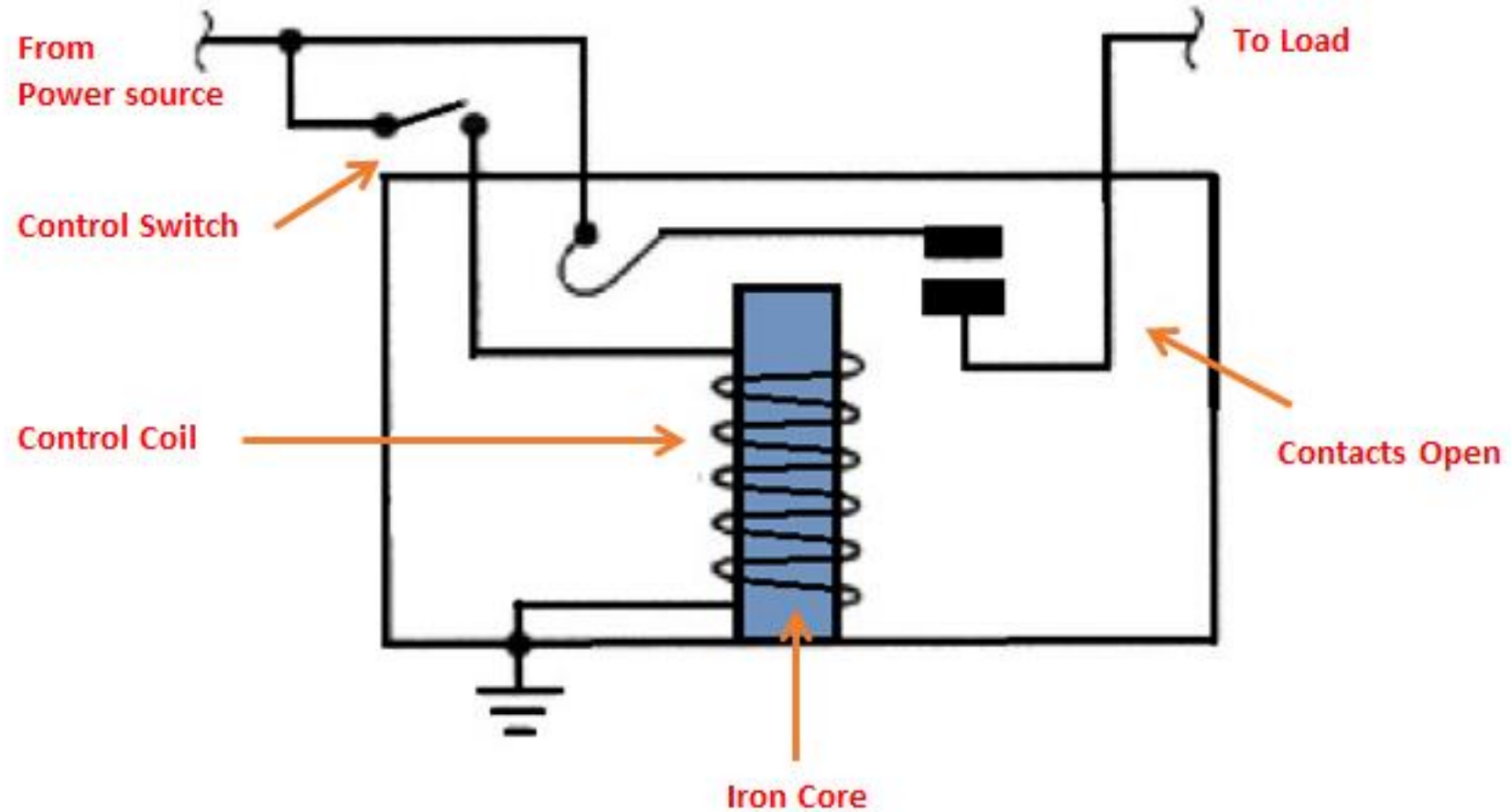
# WORKING







# WORKING





# ADVANTAGES AND DISADVANTAGES



## ADVANTAGES

- ❖ Electrical isolation between the control circuit and the high-power circuit.
- ❖ Ability to control large loads with a small control signal.
- ❖ Protects delicate control circuits from high-power circuits.
- ❖ Can switch multiple circuits using one relay.

## DISADVANTAGES

- ❖ Mechanical Wear and Tear
- ❖ Switching speed
- ❖ Power consumption



# APPLICATIONS



- ❖ **Automotive:** Controlling headlights, horn, and other systems.
- ❖ **Industrial:** Managing high power loads with low power control circuits.
- ❖ **Home Appliances:** Switching motors, heating elements, etc.
- ❖ **Telecommunications:** Signal switching and routing.



THANK YOU !!!