# Section-B
# Lecture-1

Topics covered:

- POWER LINES
- Transmission of Electrical Energy;
- Overhead transmission lines;
- Characteristics of low frequency transmission lines,
- Effect of length;

# Contiii….

- calculation of Inductance,
- Capacitance;
- circle diagram,
- Receiving-end power diagrams,
- sending-end power diagram;

# Transmission line:-

- The electricity is generated in bulk in the generating stations and then transmitted over long distancesto the load points.
- The transmission system interconnects all the generating stations and major loadcenters in the system.
- It forms the back bone of the power system

# Contiii…

- High voltage transmission lines are terminated at substations. Very large industrial customers may be provided power directly from these substations.
- At these substations, the voltage is stepped down to a lower level and fed into the sub-transmission system. This part of the transmission system

# Contiii…

- connects the high voltage substation through step down transformers to distribution substation.
- Typically the sub-transmission voltage levels are from 66 KV to 132 KV.
- Some large industrial consumers may be served directly from the sub-transmission system.

# Lecture-2

- (a) Quality: The voltage profile of the transmission network improves as more generators contribute to the system, resulting in an increased total system capability.
- This also improves the frequency behavior of the system following any load perturbation due to increased inertia of the system.

- (b) Economy: In interconnected systems, it is possible to reduce the total set of generating plants required to maintain the desired level of generation reserve.
- This results in reduction of operational and investment costs. Also, operational (including plant start-ups and shut down).

- generation scheduling of units can be more economically coordinated.
- (c) Security: In case of emergency, power can be made available from the neighboring systems and  each system can benefit even when individual spinning reserves may not be sufficient for isolated operation.

## Load frequency control:

- In LFC, two feedback loops namely, primary and secondary loops are provided.

- Both the loops help in maintaining the real power balance by adjusting the turbine input power.
- The primary LFC loop senses the generator speed and accordingly controls the turbine input.

# Inductance:

- The basic inductive device is a coil of wire, called an inductor a solenoid.
- Its functioning is based on the physical fact that an electric current produces a magnetic field around it.
- This magnetic field describes a circular pattern around a current-carrying wire;

# Contiii….

- the direction of the field can be specified with a "right-hand rule."
- When a wire is coiled up as shown fig in it effectively amplifies this magnetic field, because the contributions from the individual loops add together.

- The sum of these contributions is especially great in the center, pointing along the central axis of the coil.
- The resulting field can be further amplified by inserting a material of high magnetic permeability (such as iron) into the coil; this is how an electromagnet is made

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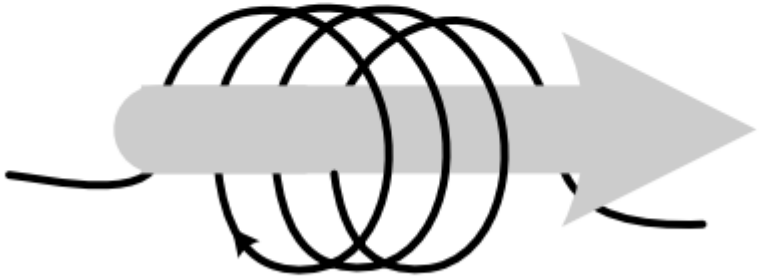
# Lecture-3
# Inductance:

Current

**Magnetic field**



A basic inductor, or solenoid.

# Capacitance:

- The other type of reactance is capacitive reactance, whose effect is opposite that of
- inductive reactance. The basic capacitive device is a capacitor.
- A capacitor consists of two conducting surfaces or plates that face each other and are separated by a small gap .

# Contiii…

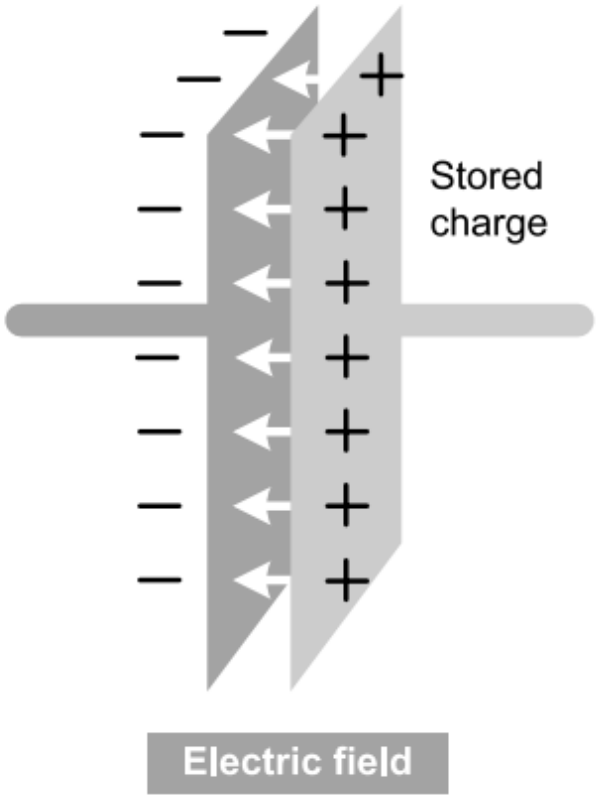
- These plates can carry an electric charge;

specifically, their charges will be opposite.

By having an opposite charge on the opposing plate, very nearby but not touching,

it is possible to collect a large amount of charge on each plate

# Capacitor plate:




A basic capacitor.

- Conductors of overhead transmission and distribution lines typically consist of aluminum, which is lightweight and relatively inexpensive, and are often reinforced with steel for strength.
- Stranded cable is often used, which, as the name suggests, is twisted from many individual strands.

# Contii..

- At the same diameter orgauge, stranded cable is much easier to bend and manipulate. For underground lines, cables with insulation are used.
- Here heat dissipation is more of an issue, whereas weight is not.
- Copper is the material of choice for underground cables because, while it is more expensive,

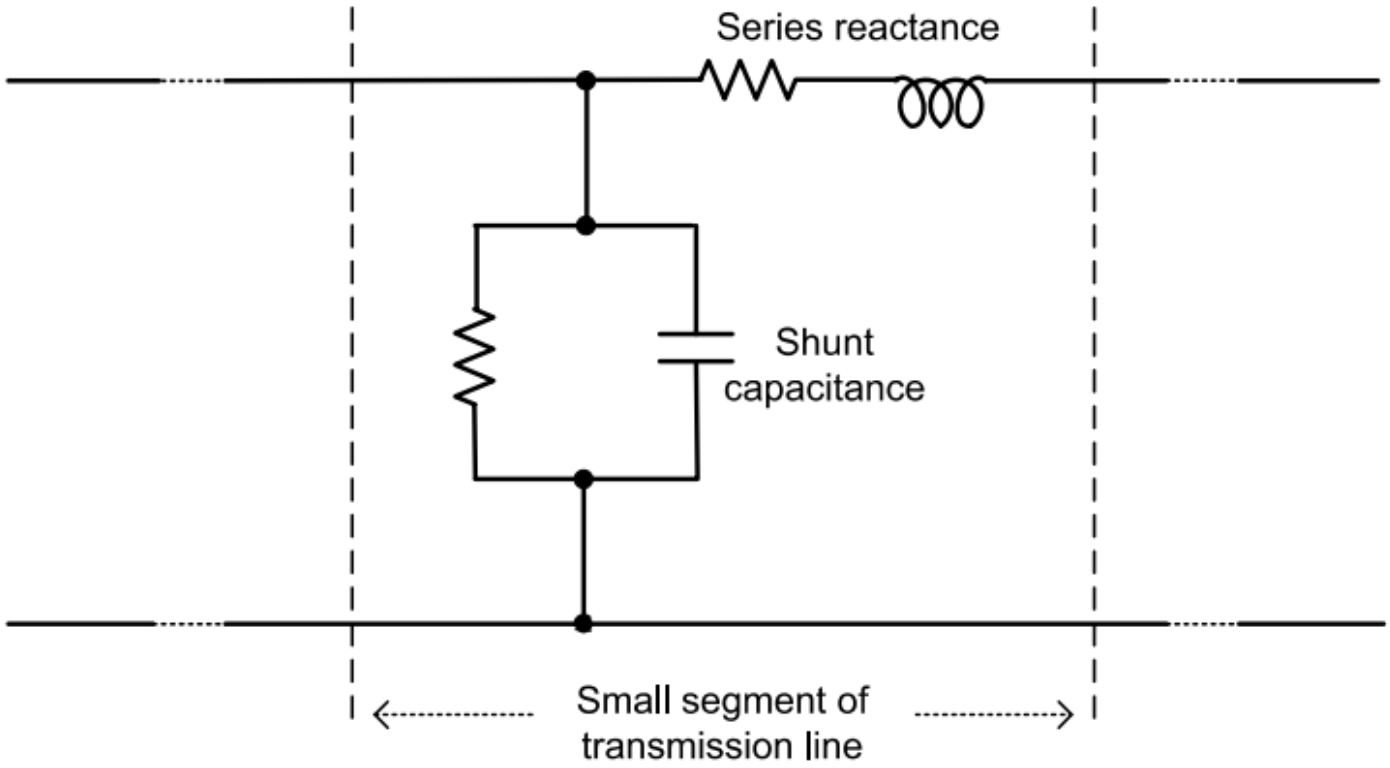
# Contiii…

- It has a lower resistance than aluminum.
- Low resistance is generally desirable for power lines to minimize energy losses but also because heating limits the conductor's ability to carry current.

# Contii…

- The electrical resistance of a power line thus increases linearly with distance and decreases with the conductor cross section (which, in turn, isproportional to the square of the radius or wire diameter).
- For the purpose of minimizing resistance, then, conductors should be chosen large.

# Line model:




Transmission-line modeling.