SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

An Autonomous Institution

Accredited by NAAC – UGC with 'A' Grade

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

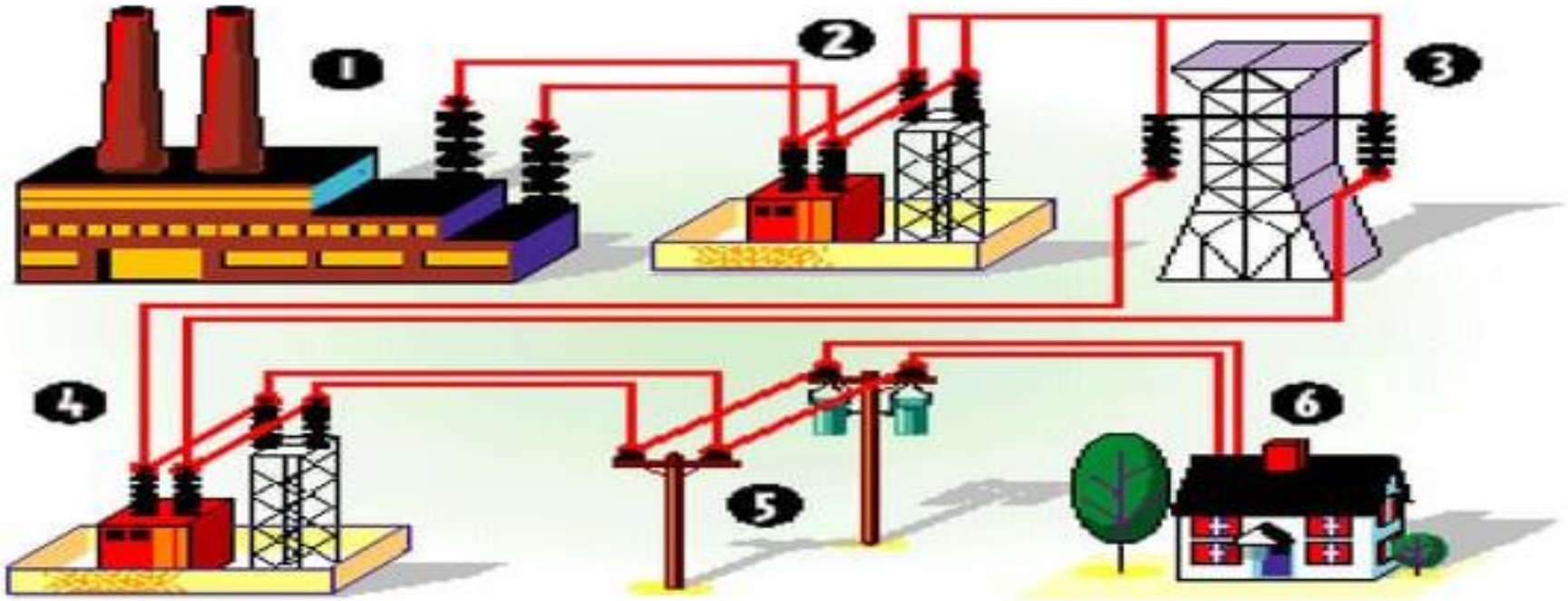
COURSE NAME : 19EE605-PROTECTION AND SWITCHGEAR

III YEAR /VI SEMESTER EEE

POWER SYSTEM BASICS

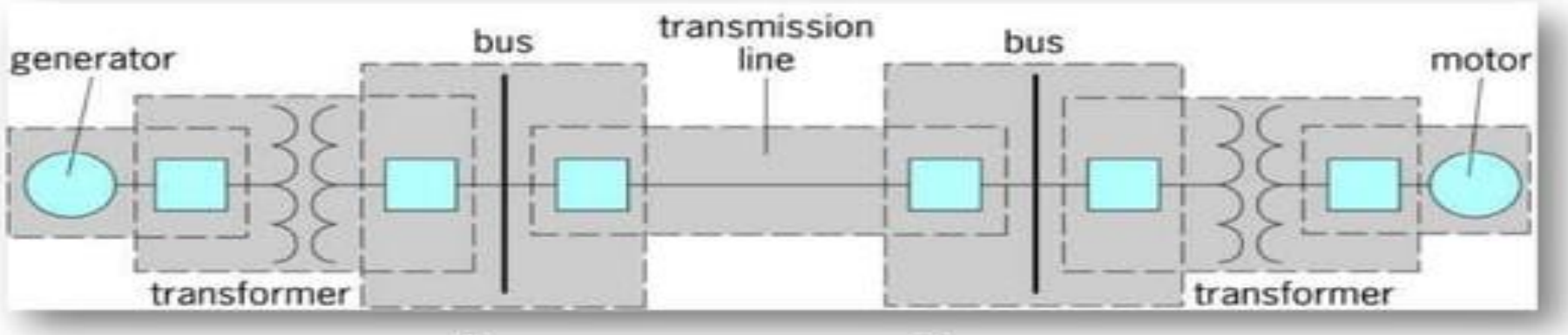
Power system basics

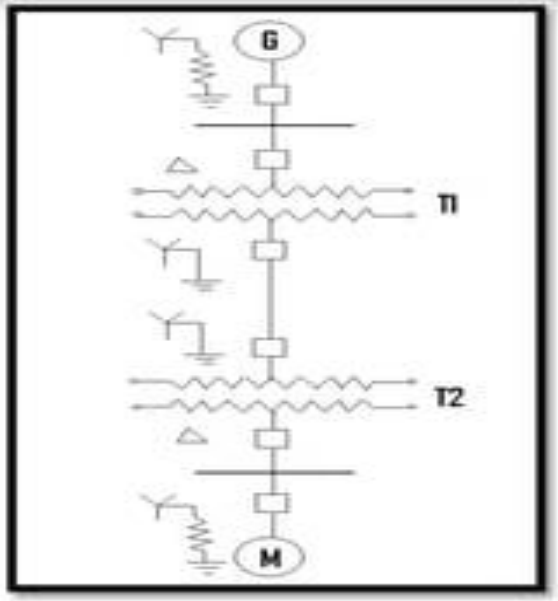
Electric Power System



Electricity is generated at a power plant (1),
voltage is "stepped-up" for transmission(2)
Energy travels along a transmission line to the area where the power is needed (3)
voltage is decreased or "stepped-down," at another substation (4),
& a distribution power line (5)
carries that electricity until it reaches a home or business (6).

SINGLE LINE DIAGRAM





Importance of protective schemes for electrical apparatus and power system

PROTECTION SYMBOL

	two-winding transformer		current transformer
	two-winding transformer		voltage transformer
	generator		capacitor
	bus		circuit breaker
	transmission line		circuit breaker
	delta connection		fuse
	wye connection		surge arrestor
	static load		disconnect

Primary Equipment & Components

- Transformers - to step up or step down voltage level
- Breakers - to energize equipment and interrupt fault current to isolate faulted equipment
- Insulators - to insulate equipment from ground and other phases
- Isolators (switches) - to create a visible and permanent isolation of primary equipment for maintenance purposes and route power flow over certain buses.
- Bus - to allow multiple connections (feeders) to the same source of power (transformer).

Primary Equipment & Components

- Grounding - to operate and maintain equipment safely
- Arrester - to protect primary equipment of sudden overvoltage (lightning strike).
- Switchgear – integrated components to switch, protect, meter and control power flow
- Reactors - to limit fault current (series) or compensate for charge current (shunt)
- VT and CT - to measure primary current and voltage and supply scaled down values to P&C, metering, SCADA, etc.
- Regulators - voltage, current, VAR, phase angle, etc.

Why A System Needs Protection?

- There is no '**fault free**' system.
- Ensure safety of personnel.
- Usually faults are caused by breakdown of insulation due to various reasons: system over current, over voltage, lighting, etc.

PROTECTION SYSTEM

A series of devices whose main purpose is to protect persons and primary electric power equipment from the effects of faults

BLACKOUTS

Characteristics

Loss of service in a large area or population region

Hazard to human life

May result in enormous economic losses

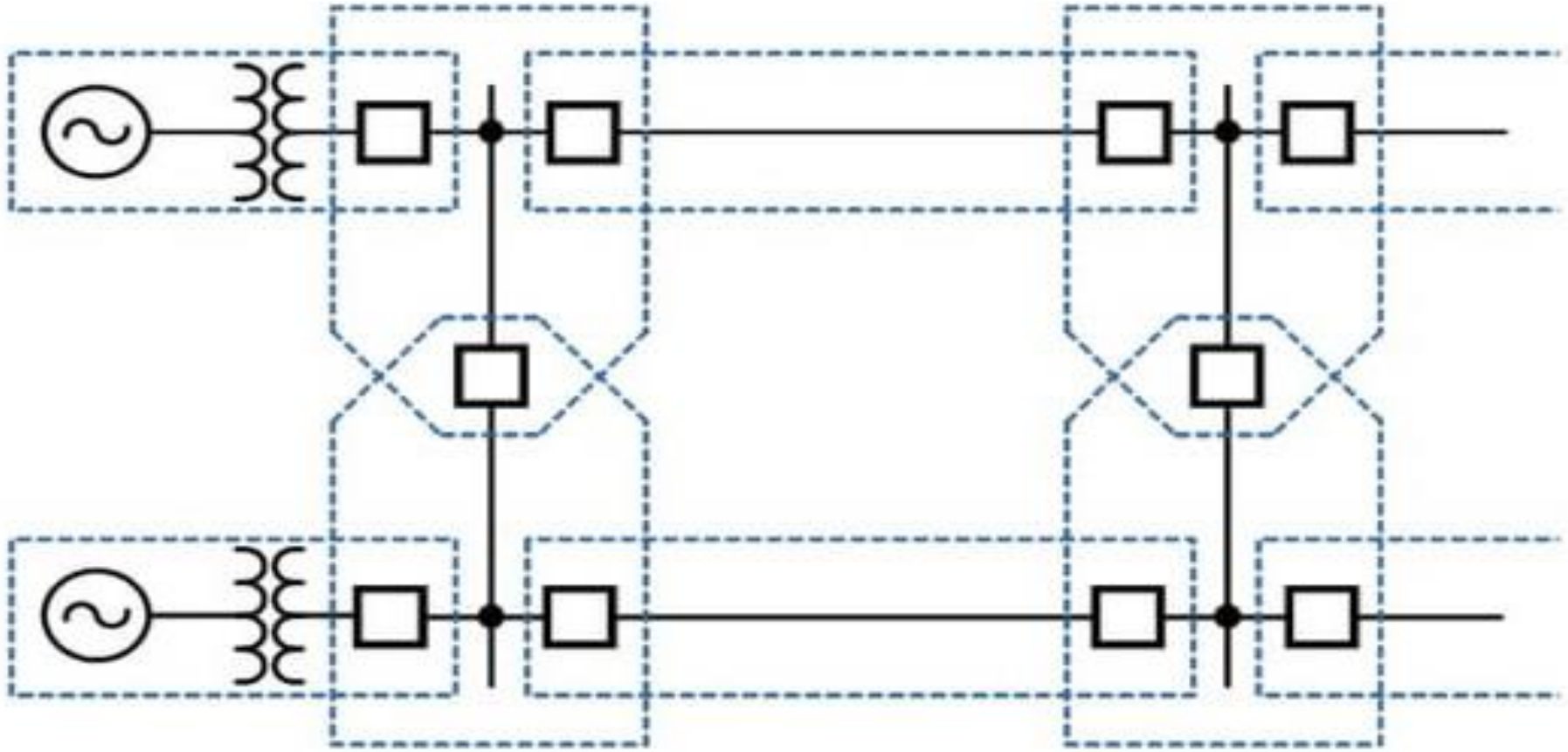
Main Causes

Overreaction of the protection system

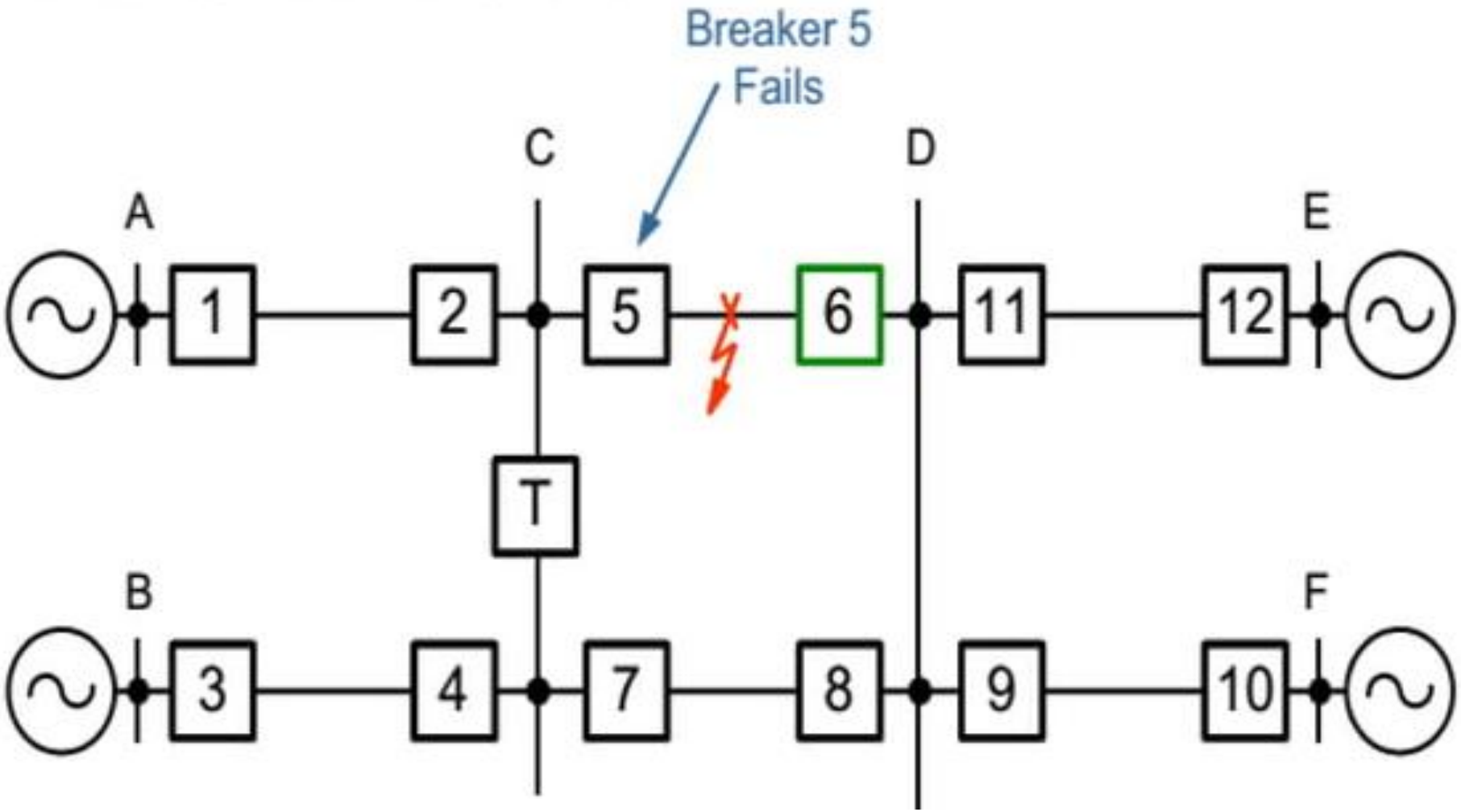
Bad design of the protection system

14

PRIMARY PROTECTION



BACKUP PROTECTION



POWER SYSTEM WITHOUT PROTECTION

- Short circuits and other abnormal conditions often occur on the power system. The heavy current associated with short circuits is likely to cause damage to the equipment