LESSON PLAN FOR SWITCHGEAR AND PRITECTIVE DEVICES [Th2]

Discipline: Electrical Engineering	Semester: 6th	Name of the Teaching Faculty: DEEPAK KUMAR ROUL,Lect, Electrical
Subject: SWITCHGEAR AND PRITECTIVE DEVICES (Th-2)	Numbers of classes per week: 5	Semester from date 04/02/2025 to da te17/05/2025 No. of weeks: 12
week	Class day	Theory
1st	1st	**1. Introduction to switchgear:** 1.1 Essential Features of switchgear. 1.2 Switchgear Equipment
	2nd	1.3 Bus-Bar Arrangement.
	3rd	1.4 Switchgear Accommodation
	4th	1.5 Short Circuit.
	5th	Tutorial 1.6Faults in a power system.
2nd	1st	**2. Fault Calculation:** 2.1 Symmetrical faults on 3-phase system.
	2nd	2.2 Limitation of fault current.
	3rd	2.3 Percentage Reactance. 2.4 Percentage Reactance and Base KVA.
	4th	2.5 Short – circuit KVA.
	5th	Tutorial
3 rd	1st	2.6 Reactor control of short circuit currents.
	2nd	2.7 Location of reactors. 2.8 Steps for symmetrical Fault calculations.
	3rd	2.9 Solve numerical problems on symmetrical fault.
	4th	2.9 Solve numerical problems on symmetrical fault. (contd.)
	5th	Tutorial
4th	1st	**3.Fuses** introduction
	2nd	3.1 Desirable characteristics of fuse element.
	3rd	3.2 Fuse Element materials. 3.3 Types of Fuses and important terms used for fuses.
	4th	3.4 Low and High voltage fuses.
	5th	Tutorial 3.4 Low and High voltage fuses.
5th	1st	3.5 Current carrying capacity of fuse element.
	2nd	3.6 Difference Between a Fuse and Circuit Breaker.
	3rd	**4.Circuit Breaker** 4.1 Definition and principle of Circuit Breaker.
	4th	4.2 Arc phenomenon and principle of Arc Extinction. 4.3 Methods of Arc Extinction.

	5th	Tutorial 4.4 Definitions of Arc voltage, Re-striking voltage and Recovery voltage.
6th	1st	4.5 Classification of circuit Breakers. 4.6 Oil circuit Breaker and its classification.
	2nd	4.7 Plain brake oil circuit breaker. 4.8 Arc control oil circuit breaker.
	3rd	4.9 Low oil circuit breaker. 4.10 Maintenance of oil circuit breaker.
	4th	4.11 Air-Blast circuit breaker and its classification
	5th	Tutorial
7th	1st	4.12 Sulphur Hexa-fluoride (SF6) circuit breaker. 4.13 Vacuum circuit breakers.
	2nd	4.14 Switchgear component
	3rd	4.15 Problems of circuit interruption. 4.16 Resistance switching. 4.17 Circuit Breaker Rating.
	4th	**5.Protective Relays** 5.1 Definition of Protective Relay. 5.2 Fundamental requirement of protective relay.
	5th	Tutorial 5.3 Basic Relay operation 5.3.1. Electromagnetic Attraction type
8th	1st	5.3.2. Induction type
	2nd	5.5 Definitions 5.5.1. Pick-up current. 5.5.2. Current setting
	3rd	5.5.3. Plug setting Multiplier. 5.5.4. Time setting Multiplier.
	4th	5.6 Classification of functional relays 5.7 Induction type over current relay (Non-directional)
	5th	Tutorial
9th	1st	5.8 Induction type directional power relay.
	2nd	5.9 Induction type directional over current relay.
	3rd	5.10 Differential relay 5.10.1. Current differential relay
	4th	5.10.2. Voltage balance differential relay.
	5th	(Tutorial) 5.11 Types of protection
10th	1st	**6.Protection of Electrical Power Equipment and Lines** 6.1 Protection of alternator.
	2nd	6.2 Differential protection of alternators. 6.3 Balanced earth fault protection.
	3rd	6.4 Protection systems for transformer. 6.5 Buchholz relay.
	4th	6.6 Protection of Bus bar. 6.7 Protection of Transmission line.

	5th	Tutorial 6.8 Different pilot wire protection (Merz-price voltage Balance system) 6.9 Explain protection of feeder by over current and earth fault relay.
11th	1st	**7.Pritection against over Voltage and Lighting** 7.1. Voltage surge and causes of over voltage.
	2nd	7.2. Internal cause of over voltage. 7.3. External cause of over voltage (lighting)
	3rd	7.4. Mechanism of lightning discharge. 7.5. Types of lightning strokes.
	4th	7.6. Harmful effect of lightning. 7.7. Lightning arresters and Type of lightning Arresters.
	5th	Tutorial
12th	1st	7.7.1. Rod-gap lightning arrester. 7.7.2. Horn-gap arrester.
	2nd	7.7.3. Valve type arrester. 7.8. Surge Absorber
	3rd	**8.Static Relay** 8. 1 Advantage of static relay.
	4th	8. 2 Instantaneous over current relay.
	5th	Tutorial 8. 3 Principle of IDMT relay.

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