



**GOVERNMENT POLYTECHNIC,
KORAPUT DEPARTMENT OF MECHANICAL ENGINEERING**

Discipline: ELECTRICAL ENGINEERING	Semester: 6 TH	Name of the Teaching Faculty: MR RUHIA HANSDA
Subject: Th2. SWITCH GEAR AND PROTECTIVE DEVICES	No. of days/per week class allotted: 5	Semester From date: 10.03.2022 To Date: 10.06.2022 No. of Weeks: 13
PRE-REQUISITE	: Knowledge in Electrical Machines, Power Transmission and Distribution, Measurement and Instrumentation	
COURSE OUTCOMES	On successful completion of the course, the student will be able to:	
	CO-1 Acquire the knowledge of various abnormal conditions that could occur in power system	
	CO-2 Select suitable switchgear for deferent applications	
	CO-3 Analyze different circuit breakers, their design and constructional details.	
	CO-4 Describe the relay for protection of generators, transformers and protection of feeders.	
Week	Class Day	Theory/Practical Topics
1 ST	1 ST T	1. INTRODUCTION TO SWITCHGEAR-6 -Essential Features of switchgear. Switchgear Equipment.
	2 ND N D	Bus-Bar Arrangement.
	3 RD R D	Switchgear Accommodation.
	4 TH	Short circuit. Faults in a power system
	5 TH	TUTORIAL
2 ND	1 ST T	2. FAULT CALCULATION -10 -Symmetrical faults on 3-phase system
	2 ND N D	Limitation of fault current,
	3 RD R D	Percentage Reactance and Base KVA
	4 TH	Short – circuit KVA.
	5 TH	TUTORIAL
3 RD	1 ST T	Reactor control of short circuit currents.
	2 ND N D	Location of reactors
	3 RD R	Steps for symmetrical Fault calculations.

	D	
	4 TH	Solve numerical problems on symmetrical fault.
	5 TH	Solve numerical problems on symmetrical fault.
4 TH	1 S T	QUIZ TEST
	2 N D	3. FUSES-6-3.1 Desirable characteristics of fuse element.
	3 R D	Fuse Element materials
	4 TH	Types of Fuses and important terms used for fuses
	5 TH	TUTORIAL
5 TH	1 S T	Low and High voltage fuses
	2 N D	Current carrying capacity of fuse element, Difference Between a Fuse and Circuit Breaker.
	3 R D	4. CIRCUIT BREAKERS-10- Definition and principle of Circuit Breaker. Arc phenomenon and principle of Arc Extinction
	4 TH	Methods of Arc Extinction. Definitions of Arc voltage, Re-striking voltage and Recovery voltage
	5 TH	Classification of circuit Breakers. Oil circuit Breaker and its classification.
6 TH	1 S T	Plain brake oil circuit breaker, Arc control oil circuit breaker
	2 N D	Low oil circuit breaker. Maintenance of oil circuit breaker
	3 R D	Air-Blast circuit breaker and its classification
	4 TH	Sulphur Hexa-fluoride (SF ₆) circuit breaker. Vacuum circuit breakers.
	5 TH	Switchgear component. Problems of circuit interruption
7 TH	1 S T	Resistance switching, Circuit Breaker Rating
	2 N D	QUIZ TEST
	3 R D	5. PROTECTIVE RELAYS-8- Definition of Protective Relay. Fundamental requirement of protective relay.
	4 TH	Basic Relay operation Electromagnetic Attraction type Induction type
	5 TH	TUTORIAL
8 TH	1 S T	Definition of following important terms. Pick-up current. Current setting. Plug setting Multiplier. Time setting Multiplier. Classification of functional relays
	2 N D	Induction type over current relay (Non-directional)

	3 R D	Induction type directional power relay. Induction type directional over current relay.
	4 TH	Differential relay .Current differential relay. Voltage balance differential relay.
	5 TH	Types of protection
9 TH	1 ^S T	QUIZ TEST
	2 N D	6. PROTECTION OF ELECTRICAL POWER EQUIPMENT AND LINES-6- Protection of alternator. Differential protection of alternators.
	3 R D	Balanced earth fault protection. Protection systems for transformer.
	4 TH	Buchholz relay. Protection of Bus bar.
	5 TH	Protection of Transmission line.
10 TH	1 ^S T	Different pilot wire protection (Merz-price voltage Balance system) Explain protection of feeder by over current and earth fault relay.
	2 N D	QUIZ TEST
	3 R D	7. PROTECTION AGAINST OVER VOLTAGE AND LIGHTING-8 7.1. Voltage surge and causes of over voltage. 7.2. Internal cause of over voltage.
	4 TH	7.3. External cause of over voltage (lighting)
	5 TH	7.4. Mechanism of lightning discharge.
11 TH	1 ^S T	7.5. Types of lightning strokes
	2 N D	7.6. Harmful effect of lightning.
	3 R D	7.7. Lightning arresters and Type of lightning Arresters. 7.7.1. Rod-gap lightning arrester.
	4 TH	7.7.2. Horn-gap arrester. 7.7.3. Valve type arrester.
	5 TH	7.8. Surge Absorber
12 TH	1 ^S T	8.STATIC RELAY 8. 1 Advantage of static relay.
	2 N D	Tutorial
	3 R D	8. 2 Instantaneous over current relay.
	4 TH	8. 3 Principle of IDMT relay.
	5 TH	8. 3 Principle of IDMT relay.
13 TH	1 ^S T	REVISION


	2 N D	REVISION
	3 R D	REVISION
	4 TH	SAMPLE PAPER PRACTICE
	5 TH	SAMPLE PAPER PRACTICE

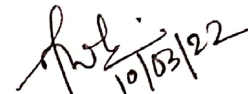
LEARNING RESOURCES:

1. Principle of power system
2. Electrical power
3. Power system protection & switch gear

V. K. Mehta,
Soni, Gupta and Bhatnagar
Bhuvanesh Oza

S Chand
Dhanpat Rai & Sons
TMH


Sign. of Faculty concerned
10/3/22


Sign. of HOD
10/03/22