



## **DEPARTMENT OF ELECTRICAL ENGINEERING**

**Govt. Polytechnic, Balasore**

**LESSON PLAN FOR ACADEMIC SESSION - 2023-24  
SWITCH GEAR AND PROTECTIVE DEVICES**

Course Code : Th.4	Semester : 6th
Total Periods : 75(60+15) Periods	Examination : 3 Hours
Theory Periods : 4 P/Week	Internal Assessment : 20 Marks
Tutorial : - 1 P/Week	End Semester Examination : 80 Marks
Maximum Marks : 100	
Semester From Date : 16/01/2024	To Date :
Name of Teaching Faculty: Er. ANITA SHIAL	

WEEK	PERIOD	TOPIC
1st	1 <sup>st</sup>	<b>INTRODUCTION TO SWITCHGEAR</b> Essential Features of switchgear.
	2 <sup>nd</sup>	Switchgear Equipment.
	3 <sup>rd</sup>	Bus-Bar Arrangement
	4 <sup>th</sup>	Switchgear Accommodation.
	5 <sup>th</sup>	Short Circuit.
2 <sup>nd</sup>	1 <sup>st</sup>	Faults in a power system.
	2 <sup>nd</sup>	<b>FAULT CALCULATION</b> Symmetrical faults on 3-phase system.
	3 <sup>rd</sup>	Limitation of fault current
	4 <sup>th</sup>	Percentage Reactance.
	5 <sup>th</sup>	Percentage Reactance and Base KVA.
3 <sup>rd</sup>	1 <sup>st</sup>	Short -- circuit KVA.
	2 <sup>nd</sup>	Reactor control of short circuit currents.
	3 <sup>rd</sup>	Location of reactors.
	4 <sup>th</sup>	Steps for symmetrical Fault calculations.
	5 <sup>th</sup>	Solve numerical problems on symmetrical fault.
4 <sup>th</sup>	1 <sup>st</sup>	Solve numerical problems on symmetrical fault.
	2 <sup>nd</sup>	<b>FUSES</b> Desirable characteristics of fuse element.

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	3 <sup>rd</sup>	Fuse Element materials. Types of Fuses and important terms used for fuses.	
	4 <sup>th</sup>	Low and High voltage fuses	
	5 <sup>th</sup>	Low and High voltage fuses Current carrying capacity of fuse element.	
	5 <sup>th</sup>	1 <sup>st</sup>	Difference Between a Fuse and Circuit Breaker.
		2 <sup>nd</sup>	<b>CIRCUIT BREAKERS</b> Definition and principle of Circuit Breaker.
		3 <sup>rd</sup>	Arc phenomenon and principle of Arc Extinction.
		4 <sup>th</sup>	Methods of Arc Extinction
		5 <sup>th</sup>	Definitions of Arc voltage, Re-striking voltage and Recovery voltage.
	6 <sup>th</sup>	1 <sup>st</sup>	Classification of circuit Breakers.
		2 <sup>nd</sup>	Oil circuit Breaker and its classification.
		3 <sup>rd</sup>	Plain brake oil circuit breaker.
		4 <sup>th</sup>	Arc control oil circuit breaker
		5 <sup>th</sup>	Low oil circuit breaker
	7 <sup>th</sup>	1 <sup>st</sup>	Maintenance of oil circuit breaker
		2 <sup>nd</sup>	Air-Blast circuit breaker and its classification.
		3 <sup>rd</sup>	Sulphur hexa-fluoride (SF <sub>6</sub> ) circuit breaker
		4 <sup>th</sup>	Vacuum circuit breakers.
		5 <sup>th</sup>	Switchgear component
	8 <sup>th</sup>	1 <sup>st</sup>	Problems of circuit interruption
		2 <sup>nd</sup>	Resistance switching.
		3 <sup>rd</sup>	Circuit Breaker Rating
		4 <sup>th</sup>	<b>PROTECTIVE RELAYS</b> Definition of Protective Relay.
		5 <sup>th</sup>	Fundamental requirement of protective relay.
	9 <sup>th</sup>	1 <sup>st</sup>	Basic Relay operation a) Electromagnetic Attraction type
		2 <sup>nd</sup>	b) Induction type
		3 <sup>rd</sup>	Definition of following important terms
		4 <sup>th</sup>	Definition of following important terms. a) Pick-up current. b) Current setting.
		5 <sup>th</sup>	c) Plug setting Multiplier. d) Time setting Multiplier.
	10 <sup>th</sup>	1 <sup>st</sup>	Classification of functional relays
		2 <sup>nd</sup>	Induction type over current relay (Non-directional)
		3 <sup>rd</sup>	Induction type directional power relay.
		4 <sup>th</sup>	Induction type directional over current relay.
		5 <sup>th</sup>	Differential relay a) Current differential relay
	11 <sup>th</sup>	1 <sup>st</sup>	b) Voltage balance differential relay.
		2 <sup>nd</sup>	Types of protection

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	3 <sup>rd</sup>	<b>PROTECTION OF ELECTRICAL POWER EQUIPMENT AND LINES</b> Protection of alternator.
	4 <sup>th</sup>	Differential protection of alternators.
	5 <sup>th</sup>	Balanced earth fault protection.
12 <sup>th</sup>	1 <sup>st</sup>	Protection systems for transformer
	2 <sup>nd</sup>	Buchholz relay.
	3 <sup>rd</sup>	Protection of Bus bar.
	4 <sup>th</sup>	Protection of Transmission line
	5 <sup>th</sup>	Different pilot wire protection (Merz-price voltage Balance system)
13 <sup>th</sup>	1 <sup>st</sup>	Explain protection of feeder by over current and earth fault relay.
	2 <sup>nd</sup>	<b>PROTECTION AGAINST OVER VOLTAGE AND LIGHTING</b> Voltage surge and causes of over voltage.
	3 <sup>rd</sup>	Internal cause of over voltage.
	4 <sup>th</sup>	Internal cause of over voltage.
	5 <sup>th</sup>	External cause of over voltage (lighting)
14 <sup>th</sup>	1 <sup>st</sup>	Mechanism of lightning discharge
	2 <sup>nd</sup>	Types of lightning strokes.
	3 <sup>rd</sup>	Harmful effect of lightning
	4 <sup>th</sup>	Lightning arresters
	5 <sup>th</sup>	Type of lightning Arresters. a) Rod-gap lightning arrester. b) Horn-gap arrester c) Valve type arrester.
15 <sup>th</sup>	1 <sup>st</sup>	Surge Absorber
	2 <sup>nd</sup>	<b>STATIC RELAY</b> Advantage of static relay
	3 <sup>rd</sup>	Instantaneous over current relay.
	4 <sup>th</sup>	Principle of IDMT relay.
	5 <sup>th</sup>	Tutorial

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