## **ACADEMIC LESSON PLAN OF SUMMER 2024**

Discipline: Electrical Engineerin g		
5		
	No. of days/per	Semester From: 16 <sup>th</sup> January2024 to 26 <sup>th</sup> April 2024
Subject:TH -2	week class allotted: <b>4p/week</b>	No. of weeks:15 weeks
(SWITCH GEAR AND PROTECTI VE	Tutorial:1p/week	
DEVICE)	Class Day	Theory Topics
Week	-	Theory Topics
	$1^{st}$	1. INTRODUCTION TO SWITCHGEAR
		1.1 Essential Features of switchgear.
$1^{st}$	- nd	1.2 Switchgear Equipment.
1	$2^{nd}$	1.3 Bus-Bar Arrangement.
	3 <sup>rd</sup>	1.4 Switchgear Accommodation.
	4 <sup>th</sup>	1.5 Short Circuit.
	5 <sup>th</sup>	Tutorial Period
	1 <sup>st</sup>	1.6 Short circuit
	$2^{nd}$	1.7 Faults in a power system
$2^{nd}$	$3^{rd}$	2. FAULT CALCULATION
		2.1 Symmetrical faults on 3-phase system.(Contd.)
	$4^{th}$	2.1 Symmetrical faults on 3-phase system.
	$5^{\text{th}}$	2.2 Limitation of fault current.
	$1^{st}$	Tutorial Period
hu	$2^{na}$	2.3 Percentage Reactance.
$3^{rd}$	ord	2.4 Percentage Reactance and Base KVA.(Contd.)
_	$3^{rd}$	2.4 Percentage Reactance and Base KVA.
_	4 <sup>th</sup>	2.5 Short – circuit KVA
	$\frac{5^{\text{th}}}{1^{\text{st}}}$	Tutorial Period
-	2 <sup>nd</sup>	2.6 Reactor control of short circuit currents.
4 th	$\frac{2}{3^{rd}}$	2.7 Location of reactors.
4 <sup>th</sup>	3	2.8 Steps for symmetrical Fault calculations.
-	4 <sup>th</sup>	2.9 Solve numerical problems on symmetrical fault.(Contd.)
-	4 5 <sup>th</sup>	2.9 Solve numerical problems on symmetrical fault. Tutorial Period
	1 <sup>st</sup>	
	1	<b>3. FUSES</b> 3.1 Desirable characteristics of fuse element.
		3.2 Fuse Element materials.
$5^{\text{th}}$	$2^{na}$	3.3 Types of Fuses and important terms used for fuses.
-	3 <sup>ra</sup>	3.4 Low and High voltage fuses.(Contd.)
-	4 <sup>th</sup>	
-	•	3.4 Low and High voltage fuses.
	$5^{\text{th}}$	Tutorial Period
F	2 <sup>nd</sup>	3.5 Current carrying capacity of fuse element.
6 <sup>th</sup>	$\frac{2}{3^{rd}}$	3.6 Difference Between a Fuse and Circuit Breaker.
	3	4. CIRCUIT BREAKERS
	4 <sup>th</sup>	4.1 Definition and principle of Circuit Breaker.
	4	4.2 Arc phenomenon and principle of Arc Extinction.
		4.3 Methods of Arc Extinction.
	$5^{\text{th}}$	4.4 Definitions of Arc voltage, Re-striking voltage and Recovery voltage. Tutorial Period

1         1         Construction Breaker and its classification.           4         0         1         Control of Circuit breaker.           3         4         9         Low oil circuit breaker.           4         4         10         Maintenance of al circuit breaker.           4 <sup>th</sup> 4         11         Air-Blast circuit breaker.           4 <sup>th</sup> 4         11         Air-Blast circuit breaker.           4 <sup>th</sup> 4         12         Suphur Hexa-fluorid (SF6) circuit breaker.           2 <sup>th</sup> 4         13         Vacuum circuit breakers.           4 <sup>th</sup> 4         15         Problems of circuit interruption           4 <sup>th</sup> 4         16         Resistance switching.           4 <sup>th</sup> 17         S. PROFECTIVE RELAYS           5         10 <sup>th</sup> S. Basic Relay operation           4 <sup>th</sup> 5.3         Bioteromagnetic Attraction type           5         1 <sup>th</sup> 5.4         Definition of following important terms           5         5.1         Proceating Multiplier.         5.5         2.5           10 <sup>th</sup> 3 <sup>th</sup> 5.5         Curent string Multiplier.         5.7         Mutorin type directional power relay.		. 91	
$10^{6} = \frac{4.7 Plain brake oil circuit breaker. 4.8 Arc control oil circuit breaker. 4.9 Low oil circuit breaker. 4.10 Maintenance of oil circuit breaker. 4.10 Maintenance of oil circuit breaker. 4.11 An Plast circuit breaker. 4.11 An Plast circuit breaker. 4.11 An Plast circuit breaker. 4.12 Sulphur Hexa-fluoride (SF6) circuit breaker. 4.13 Vacuum circuit breakers. 4.13 Vacuum circuit breakers. 4.14 Switchgear component. 4.15 Voltems of circuit interruption 4.15 Voltems of circuit interruption 4.16 Resistance switching. 4.17 Circuit Breaker Rating. 5^{ref} Tutorial Period 4.16 Resistance switching. 4.17 Circuit Breaker Rating. 5.1 Definition of Protective Relay. 5.1 Definition of Protective Relay. 5.1 Definition of Fortective Relay. 5.1 Definition of following important terms 5.5 Definition of following important terms 5.10 Voltage submed differential relay 5.10 Voltage submed differential relay 5.10.1 Current differential relay 5.10.2 Voltage submed differential relay $		$1^{st}$	4.5 Classification of circuit Breakers.
7 <sup>th</sup> 2 <sup>th</sup> 4.8 Arc control oll circuit breaker.           3 <sup>th</sup> 4.9 Low oil circuit breaker.         4.10 Maintenance of oil circuit breaker.           4 <sup>th</sup> 4.11 Air-Blast circuit breaker and its classification.           5 <sup>th</sup> Turorial Period           1 <sup>th</sup> 4.12 Sulphur Hexa-fluoride (SF6) circuit breaker.           2 <sup>th</sup> 4.13 Vacuum circuit breakers.           4.14 Switchegar component.         4.14 Switchegar component.           3 <sup>th</sup> 3 <sup>th</sup> 4 <sup>th</sup> 4.16 Resistance switching.           4 <sup>th</sup> 4.16 Resistance switching.           4 <sup>th</sup> 1.0 REDTECTIVE RELAYS           5.1 Definition of Protective Relay.         5.1 Definition of Protective Relay.           9 <sup>th</sup> 2 <sup>th</sup> 5.3 Electromagnetic Attraction type           5 <sup>th</sup> Turorial Period         5.3 Theorial Period           4 <sup>th</sup> 5.4 Definition of following important terms           5.5 Definition of following important terms         5.5 A Fine setuing Multiplier.           5.5.4 Fine setuing Multiplier.         5.4 Classification of functional pelay           5 <sup>th</sup> 5.1 Pick-up current relay (Non-directional)           1 <sup>th</sup> 5.8 Induction type directional power relay.           5 <sup>th</sup> 5.4 Clas			
3 <sup>ad</sup> 4.0 Low oil circuit breaker.           4 <sup>in</sup> 4.10 Maintenance of oil circuit breaker.           4 <sup>in</sup> 4.11 Air-Blast circuit breaker.           1 <sup>it</sup> 4.12 Air-Blast circuit breakers.           1 <sup>it</sup> 4.13 Vacuum circuit breakers.           4 <sup>in</sup> 4.13 Vacuum circuit breakers.           4 <sup>in</sup> 4.15 Problems of circuit interruption           4 <sup>in</sup> 4.16 Resistance switching.           4.17 Circuit Breaker Rating.         5 <sup>in</sup> 5 <sup>in</sup> Futorial Period           1 <sup>id</sup> 5.1 Definition of Protective Relay.           5 <sup>in</sup> Futorial Period           1 <sup>id</sup> 5.2 Fundamental requirement of protective relay.           5 <sup>in</sup> Futorial Period           4 <sup>id</sup> 5.3 Edelay operation           4 <sup>id</sup> 5.3 Electromagnetic Attraction type           5.1 Dick-up current.         5.2 Endition of following important terms           5.5 Definition of following important terms         5.5 Selfinition of following important terms           5.1 Dick-up current relay         5.1 Pick-up current relay           10 <sup>in</sup> 5.1 Dick-up current relay           5.1 Pick-up current relay         5.1 Fick-up current relay           5.1 Induction type directional power relay. <td></td> <td>nd</td> <td></td>		nd	
4 <sup>10</sup> 4.10 Maintenance of oil circuit breaker.           4 <sup>10</sup> 4.11 Air-Blast circuit breaker and its classification.           1 <sup>10</sup> 4.12 Sulphur Hexa-fluoride (SFO) circuit breaker.           2 <sup>10</sup> 4.13 Vacuum circuit breakers.           2 <sup>11</sup> 4.15 Problems of circuit interruption           4 <sup>11</sup> 4.15 Problems of circuit interruption           4 <sup>11</sup> 4.15 Problems of circuit interruption           4 <sup>11</sup> 4.16 Resistance switching.           4 <sup>11</sup> 4.17 Circuit Breaker Rating.           5 <sup>11</sup> Futorial Period           5 <sup>11</sup> Futorial Period           5 <sup>12</sup> Futorial Period           1 <sup>13</sup> S. PROTECTIVE RELAVS           5.1         Definition of Protective relay.           3 <sup>13</sup> 5.3 Basic Relay operation           4 <sup>14</sup> S.1 Definition of following important terms           5.2         S.1 Indection type           5.3         Ingenetic Attraction type           5.4         Tutorial Period           1 <sup>18</sup> S.4 Definition of following important terms           5.5         Definition of following important terms           5.5.4         Funce setting Multiplier.           5.5.4         S.5.4	7 <sup>th</sup>	-	
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3 <sup>th</sup> Tutorial Period           1 <sup>th</sup> 4.12 Sulphur Hexa-fluoride (SP6) circuit breaker.           2 <sup>ab</sup> 4.13 Yacumur circuit breakers.           3 <sup>th</sup> 4.15 Problems of circuit breakers.           3 <sup>th</sup> 4.16 Resistance switching.           3 <sup>th</sup> 4.16 Resistance switching.           3 <sup>th</sup> 4.16 Resistance switching.           4 <sup>th</sup> 5.1 Definition of Protective Relay.           5 <sup>th</sup> 5.1 Definition of Protective Relay.           5 <sup>th</sup> 5.1 Definition of Protective Relay.           5 <sup>th</sup> 5.1 Definition of following important terms           5.3.1 Electromagnetic Attraction type         5 <sup>th</sup> 5 <sup>th</sup> Tutorial Period           4 <sup>th</sup> 5.1 Definition of following important terms           5.5 Definition of following important terms         5.5 Definition of following important terms           2 <sup>th</sup> 5.5.1 Pick-up current.           2 <sup>th</sup> 5.5.2 Pug setting Multiplier.           5.4 Time setting Multiplier.         5.5.4 Time setting Multiplier.           5.5.1 Pick-up directional power relay.         5.7 Induction type directional power relay.           11 <sup>th</sup> 3 <sup>th</sup> 5.10.1 Current differential relay           5.10.1 Current differential relay         5.10.			
$1^{n} = 4.12 Sulphar Hexa-fluoride (SF6) circuit breaker. 2^{ni} = 4.13 Vacuum circui breakers. 4.14 Switchgear component. 4^{n} = 4.15 Problems of circuit interruption 4^{n} = 4.15 Problems of circuit interruption 4^{n} = 4.16 Resistance switching. 4.17 Circuit Breaker Rating. 5^{n} Tutorial Period 1^{n} = 5.2 Fundamental requirement of protective relay. 5.1 Definition of Protective Relay. 5.1 Definition of Protective Relay. 5.1 Definition of Protective Relay. 5.2 Fundamental requirement of protective relay. 5.3 Laske Relay operation 4^{n} = 5.3 Laske Relay operation 4^{n} = 5.3 Lectromagnetic Attraction type 5.3 Definition of following important terms 5.5 Definition of following important terms 5.5 Definition of following important terms 5.5 Definition of following inportant terms 5.5 Definition of following representation 10^{n} = 5.1 Pick-up current. 5.5 J Pick-up current. 5.5 J Pick-up current terlay 5.5 J Pick-up current terlay 5.5 J Induction type directional relays 5.7 Induction type directional relays 5.7 Induction type directional over current relay. 11^{n} = 5.8 Induction type directional over current relay. 12^{na} = 5.10 Differential relay 5.10.1 Current differential relay 5.10.2 Voltage balance differential relay 5.10.2 Voltage balance differential relay 5.10.2 Voltage balance differential relay 6.1 Protection of alternators. 6.2 Differential protection. 5^{ni} Tutorial Period 1^n = 6. PROTECTION OF ELECTRICAL POWER EQUIPMENT AN LINES 6.1 Protection of Balternators. 6.2 Differential protection. 5^n Tutorial Period 1^n = 6.4 Protection of Bus bar. 6.7 Protection of Instantision line. 5^n Tutorial Period 1^n = 6.8 Different plot wire protection. 5^n Tutorial Period 1^n = 6.8 Different plot wi$		-	4.11 Air-Blast circuit breaker and its classification.
2 <sup>nd</sup> 1.13 Vacum circuit breakers.           8 <sup>th</sup> 3 <sup>nd</sup> 4.15 Vacum circuit ibreakers.           8 <sup>th</sup> 3 <sup>nd</sup> 4.15 Resistance switching.           4 <sup>th</sup> 4.16 Resistance switching.         4.17 Circuit Breaker Rating.           5 <sup>th</sup> Tutorial Period         5 <sup>th</sup> 1 <sup>th</sup> 5. PROTECTIVE RELAYS         5.1 Definition of Protective Relay.           2 <sup>th</sup> 3 <sup>th</sup> 5.3 Basic Relay operation           4 <sup>th</sup> 5.1 Electromagnetic Attraction type           5 <sup>th</sup> Tutorial Period           4 <sup>th</sup> 5.4 Electromagnetic Attraction type           5 <sup>th</sup> Tutorial Period           1 <sup>th</sup> 5.4 Definition of following important terms           5.5 Definition of following important terms           5.5 Procenting Multiplier.           5.5 Procenting Multiplier.           5.5 Procenting Multiplier.           5.5 Procenting Multiplier.           5.5 Procenting Vacuum Circuit and Period           1 <sup>th</sup> 5.6 Classification of functional relays           5.7 Induction type directional power relay.           2 <sup>th</sup> 5.8 Induction type directional over current relay.           11 <sup>th</sup> 5.8 Induction type directional over current relay.		-	Tutorial Period
8 <sup>th</sup>		_	4.12 Sulphur Hexa-fluoride (SF6) circuit breaker.
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9         3 <sup>rd</sup> 4.15 Problems of circuit interruption           4 <sup>rn</sup> 4.16 Resistance switching,         4.17 Circuit Breaker Rating,           5 <sup>rd</sup> Tutorial Period         1 <sup>rd</sup> 5 <sup>rd</sup> 5.1 Definition of Protective Relay.         5.1 Definition of Protective Relay.           9 <sup>rh</sup> 2 <sup>rd</sup> 5.2 Fundamental requirement of protective relay.           5.1 Definition of Protective Relay.         5.3.2 Induction type           5.3.2 Induction type         5.3.2 Induction type           5.3.1 Electromagnetic Auraction type         5.3.2 Induction type           5.3.1 Flick-up current.         5.5 Definition of following important terms           5.5 Definition of following important terms         5.5.2 Current setting.           10 <sup>rh</sup> 3 <sup>rd</sup> 5.5.2 Current.           10 <sup>rh</sup> 5.5.2 Classification of functional relays           5.5.3 Plug setting Multiplier.         5.5.4 Time setting Multiplier.           5.5.4 Time setting Multiplier.         5.7 Induction type directional power relay.           1 <sup>rd</sup> 5.8 Induction type directional power relay.           1 <sup>rd</sup> 5.8 Induction type directional over current relay.           5.10 Differential relay         5.10 Differential relay           5.10 Differential relay         5.10 Differential relay	oth		4.14 Switchgear component.
$11^{th} = \frac{1}{5^{th}} = \frac{1}{1^{tutorial Period}}$ $9^{th} = \frac{1}{3^{tutorial Period}} = \frac{1}{5^{tutorial Period}}$ $9^{th} = \frac{2^{tutorial Period}}{3^{tutorial Period}} = \frac{2^{tutorial Period}}{5^{tutorial Period}}$ $10^{th} = \frac{2^{tutorial Period}}{5^{tutorial Period}} = \frac{2^{tutorial Period}}{5^{tutorial Period}}$ $10^{th} = \frac{2^{tutorial Period}}{5^{tutorial Period}} = \frac{2^{tutorial Period}}{5^{tutorial Period}}$ $10^{th} = \frac{2^{tutorial Period}}{5^{tutorial Period}} = \frac{2^{tutorial Period}}{5^{tutorial Period}}$ $10^{th} = \frac{2^{tutorial Period}}{5^{tutorial Period}} = \frac{2^{tutorial Period}}{5^{tutorial Period}} = \frac{2^{tutorial Period}}{5^{tutorial Period}}$ $10^{th} = \frac{2^{tutorial Period}}{5^{tutorial Period}} = \frac{2^{tutorial Period}}{5^{tutorial Period}} = \frac{2^{tutorial Period}}{5^{tutorial Period}} = \frac{2^{tutorial Period}}{5^{tutorial Period}} = \frac{1^{tutorial Period}}{5^{t$	8	$3^{rd}$	
14         5 <sup>th</sup> 18         5           14         5.1 Definition of Protective Relay.           31         5.2 Fundamental requirement of protective relay.           31         5.3 Basic Relay operation           4th         5.3.1 Electromagnetic Attraction type           5.3.2 Induction type         5.3.2 Induction type           5.4         5.5 Definition of following important terms           5.5         5.5 Definition of following important terms           5.5         5.5.2 Current setting.           5.5.3 Plug setting Multiplier.         5.5.3 Plug setting Multiplier.           5.5.4 Time setting.         5.6 Classification of fonctional relays           5.7 Induction type directional power relay.         5.10 Differential relay           5.10 Differential relay         5.10.1 Current differential relay           5.10.2 Voltage balance differential relay         5.10.2 Voltage balance differential relay           5.10.2 Voltage balance differential relay         6.1 Protection of alternators.           6.2 Differential protection         5.4 Differential relay           5.10.1 Current differential relay         6.1 Protection of alternators.           6.2 Differential protection         6.1 Protection of alternator.           6.3 Differential protection of alternator.         6.2 Differential protection of alter		$4^{\text{th}}$	4.16 Resistance switching.
$11^{ab} = \frac{5^{ab}}{1000} = \frac{1}{1}^{ab} = \frac{5}{2} \text{ Purdamental requirement of protective relay.} \\ 5.1 Definition of Protective Relay.} \\ \frac{2^{ab}}{3^{ab}} = 5.2 \text{ Fundamental requirement of protective relay.} \\ \frac{2^{ab}}{3^{ab}} = 5.2 \text{ Fundamental requirement of protective relay.} \\ \frac{3^{ab}}{3^{ab}} = 5.3 \text{ Electromagnetic Attraction type} \\ \frac{4^{ab}}{5.3.2 \text{ Induction type}} \\ \frac{5^{ab}}{5.3.2 \text{ Induction type}} \\ \frac{5^{ab}}{5.3.2 \text{ Induction of following important terms}} \\ \frac{5.5 \text{ Definition of following important terms}}{5.5 \text{ Definition of following important terms}} \\ \frac{2^{ab}}{5.5.4 \text{ Definition of following important terms}} \\ \frac{5.5.4 \text{ Time setting,}}{5.5.4 \text{ Time setting,}} \\ \frac{5.5 \text{ A Time setting,}}{5.5.4 \text{ Time setting,}} \\ \frac{5^{ab}}{5.1 \text{ Induction type over current relay (Non-directional)}} \\ \frac{5^{ab}}{5.1 \text{ Induction type directional power relay.}} \\ \frac{4^{ab}}{5.8 \text{ Induction type directional over current relay}} \\ \frac{5^{ab}}{5.10 \text{ L Current differential relay}} \\ \frac{5^{ab}}{5.10.1 \text{ Current differential relay}} \\ \frac{5^{ab}}{5.10.2 \text{ Voltage balance differential relay}} \\ \frac{5^{ab}}{5.10.2 \text{ Voltage balance differential relay}} \\ \frac{5^{ab}}{5.10.2 \text{ Voltage balance differential relay} \\ \frac{5^{ab}}{5.10.2 \text{ Voltage balance differential relay}} \\ \frac{11^{ab}}{5.10.2 \text{ Voltage balance differential relay}} \\ \frac{11^{ab}}{5.10.2 \text{ Voltage balance differential relay} \\ \frac{5^{ab}}{5.10.2 \text{ Voltage balance differential relay}} \\ \frac{11^{ab}}{5.10.2 \text{ Voltage balance differential relay}} \\ \frac{11^{ab}}{5.10.2 \text{ Voltage balance differential}} \\ \frac{11^{ab}}{5.3 \text{ B Choction of alternator.}} \\ \frac{5.2 \text{ Differential protection of alternators.} \\ \frac{5.2 \text{ Differential protection of alternator.} \\ \frac{5.3 \text{ Buchholz relay.}}{6.3 \text{ Balanced earth fault protection.} \\ \frac{5.7 \text{ Protection of Transmission line.} \\ \frac{5^{ab}}{100000000000000000000000000000000000$			•
$11^{16} \qquad \begin{array}{ c c c } \hline 1^{16} & \hline S. PROTECTIVE RELAYS \\ \hline 5.1 Definition of Protective Relay. \\ \hline 5.2 Fundamental requirement of protective relay. \\ \hline 3^{170} & \hline 5.3 Basic Relay operation \\ \hline 4^{16} & \hline 5.3.1 Electromagnetic Attraction type \\ \hline 5.3.2 Induction type \\ \hline 5^{116} & Tutorial Period \\ \hline 1^{181} & \hline 5.4 Definition of following important terms \\ \hline 5.5 Definition of pole verent. \\ \hline 5.5 Definition of pole verent. \\ \hline 5.5 Definition of pole verent relay (Non-directional) \\ \hline 10^{16} & \hline 10^{16$		5 <sup>th</sup>	
$9^{th} = \frac{5.1 \text{ Definition of Protective Relay.}}{5.2 \text{ Fundamental requirement of protective relay.}}{5.3 \text{ Basic Relay operation}} \\ \frac{3^{rd}}{4^{tn}} = \frac{5.3 \text{ Basic Relay operation}}{5.3.1 \text{ Electromagnetic Attraction type}} \\ \frac{5^{th}}{5.3.2 \text{ Induction type}} \\ \frac{5^{th}}{5.3.2 \text{ Induction type}} \\ \frac{5^{th}}{5.5.2 \text{ Current Priod}} \\ \frac{2^{rd}}{5.5.2 \text{ Current setting.}} \\ \frac{2^{rd}}{5.5.2 \text{ Current setting.}} \\ \frac{5.5.3 \text{ Plug setting Multiplier.}}{5.5.3 \text{ Plug setting Multiplier.}} \\ \frac{5.5.4 \text{ Time setting Multiplier.}}{5.5.4 \text{ Time setting Multiplier.}} \\ \frac{4^{th}}{5.5.3 \text{ Plug setting fultiplier.}} \\ \frac{4^{th}}{5.7 \text{ Induction type over current relay (Non-directional)} \\ \frac{1^{th}}{5.8 \text{ Induction type over current relay (Non-directional)} \\ \frac{1^{th}}{5.8 \text{ Induction type directional power relay.}} \\ \frac{2^{100}}{5.9 \text{ Induction type directional over current relay.} \\ \frac{2^{100}}{5.9 \text{ Induction type directional over current relay.} \\ \frac{1^{th}}{5.10 \text{ Differential relay}} \\ \frac{1^{th}}{5.10 2 \text{ Voltage balance differential relay}} \\ \frac{4^{th}}{5.10 2 \text{ Voltage balance differential relay}} \\ \frac{1^{th}}{6.4 \text{ Protection of alternator.}} \\ \frac{1^{th}}{6.3 \text{ Balanced earth fault protection.} \\ \frac{1^{th}}{6.4 \text{ Protection of Bus bar.}} \\ \frac{6.7 \text{ Protection of Bus bar.}}{6.7 \text{ Protection of Bus bar.}} \\ \frac{5^{th}}{6.7 \text{ Protection of Bus bar.}} \\ \frac{5^{th}}{6.4 \text{ Protection of Bus bar.}} \\ \frac{5^{th}}{6.4 \text{ Protection of Bus bar.}} \\ \frac{5^{th}}{6.4 \text{ Protection of Bus bar.}} \\ \frac{6.7 \text{ Protection of Bus bar.}}{6.7 \text{ Protection of Bus bar.}} \\ \frac{5^{th}}{6.4 \text{ Protection of Bus bar.}} \\ \frac{5^{th}}{6.4 \text{ Protection of Bus bar.}} \\ \frac{5^{th}}{6.4 \text{ Protection of Bus bar.}} \\ \frac{5^{th}}{7.1 \text{ Voltage surge and causes of over voltage.} \\ \frac{1^{th}}{7.4 \text{ Voltage surge and causes of over voltage.} \\ \frac{1^{th}}{7.4  Mechanism$		$1^{st}$	
9 <sup>th</sup> $ \begin{array}{c c c c c c c c c c c c c c c c c c c $		_	
9         3 <sup>rd</sup> 5.3 Basic Relay operation           4 <sup>rn</sup> 5.3 Electromagnetic Attraction type           5.3.1 Electronic type           5 <sup>rn</sup> Tutorial Period           1 <sup>rd</sup> 5.4 Definition of following important terms           5.5 Definition of following important terms           2 <sup>rnd</sup> 5.5.1 Pick-up current.           3 <sup>rd</sup> 5.5.2 Current setting.           5.4 Time setting Multiplier.         5.4 Time setting Multiplier.           5.4 Time setting Multiplier.         5.7 Induction type directional relays           5.7 Induction type directional power relay.         5.8 Induction type directional over current relay.           1 <sup>nd</sup> 5.8 Induction type directional over current relay.           2 <sup>rnd</sup> 5.9 Induction type directional over current relay.           1 <sup>nd</sup> 5.10 Differential relay           5.10.2 Voltage balance differential relay         5.10.2 Voltage balance differential relay           5.10.2 Voltage balance differential relay         6.1 Protection of alternator.           6.2 Differential protection         6.1 Protection of alternator.           6.2 Differential protection of alternator.         6.2 Differential protection.           6.4 Protection of Bus bar.         6.7 Protection of Bus bar.           6.7 Protection of Bus bar.         6.7 Protect	4	$2^{nd}$	
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12 <sup>th</sup> 6.2 Differential protection of alternators.         12 <sup>th</sup> 2 <sup>nd</sup> 6.3 Balanced earth fault protection.         3 <sup>rd</sup> 6.4 Protection systems for transformer.       6.5 Buchholz relay.         4 <sup>th</sup> 6.6 Protection of Bus bar.       6.7 Protection of Transmission line.         5 <sup>th</sup> Tutorial Period         13 <sup>th</sup> 6.8 Different pilot wire protection (Merz-price voltage Balance system)         2 <sup>nd</sup> 6.9 Explain protection of feeder by over current and earth fault relay.         13 <sup>th</sup> 3 <sup>rd</sup> <b>7. PROTECTION AGAINST OVER VOLTAGE AND LIGHTING</b> 7.1 Voltage surge and causes of over voltage.       7.2 Internal cause of over voltage.         4 <sup>th</sup> 7.3 External cause of over voltage (lighting)         5 <sup>th</sup> Tutorial Period         14 <sup>th</sup> 1 <sup>st</sup> 7.4 Mechanism of lightning discharge.(Contd.)			LINES
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13 <sup>th</sup> 6.5 Buchholz relay.         4 <sup>th</sup> 6.6 Protection of Bus bar.         6.7 Protection of Transmission line.         5 <sup>th</sup> Tutorial Period         13 <sup>th</sup> 6.8 Different pilot wire protection (Merz-price voltage Balance system)         13 <sup>th</sup> 6.9 Explain protection of feeder by over current and earth fault relay.         13 <sup>th</sup> 3 <sup>rd</sup> <b>7. PROTECTION AGAINST OVER VOLTAGE AND LIGHTING</b> 7.1 Voltage surge and causes of over voltage.       7.1 Voltage surge and causes of over voltage.         4 <sup>th</sup> 7.3 External cause of over voltage (lighting)         5 <sup>th</sup> Tutorial Period         14 <sup>th</sup> 1 <sup>st</sup> 7.4 Mechanism of lightning discharge.(Contd.)		$3^{ra}$	6.4 Protection systems for transformer.
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2 <sup>nd</sup> 7.5 Types of lightning strokes.		$2^{nd}$	7.5 Types of lightning strokes.

	3 <sup>ra</sup>	7.6 Harmful effect of lightning.
		7.7 Lightning arresters and Type of lightning Arresters.
	$4^{\mathrm{tn}}$	7.7.1 Rod-gap lightning arrester
		7.7.2 Horn-gap arrester
	$5^{\text{th}}$	Tutorial Period
	$1^{st}$	7.7.3 Valve type arrester.
	$2^{na}$	7.8 Surge Absorber
15 <sup>th</sup>	3 <sup>rd</sup>	8. STATIC RELAY
(Extra Class)		8.1 Advantage of static relay.(Contd.)
	$4^{th}$	8.1 Advantage of static relay.
	$5^{\text{th}}$	Tutorial Period
	$1^{st}$	8.2 Instantaneous over current relay.(Contd.)
$16^{\text{th}}$	$2^{nd}$	8.2 Instantaneous over current relay.
(Extra	$3^{rd}$	8.3 Principle of IDMT relay.(Contd.)
Class)	$4^{th}$	8.3 Principle of IDMT relay.
	$5^{\text{th}}$	Tutorial Period



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