

**ACADEMIC LESSON PLAN OF SUMMER 2024**

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

7 <sup>th</sup>	1 <sup>st</sup>	4.5 Classification of circuit Breakers. 4.6 Oil circuit Breaker and its classification. 4.7 Plain brake oil circuit breaker.
	2 <sup>nd</sup>	4.8 Arc control oil circuit breaker.
	3 <sup>rd</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>	Tutorial Period
8 <sup>th</sup>	1 <sup>st</sup>	4.12 Sulphur Hexa-fluoride (SF6) circuit breaker.
	2 <sup>nd</sup>	4.13 Vacuum circuit breakers. 4.14 Switchgear component.
	3 <sup>rd</sup>	4.15 Problems of circuit interruption
	4 <sup>th</sup>	4.16 Resistance switching. 4.17 Circuit Breaker Rating.
	5 <sup>th</sup>	Tutorial Period
9 <sup>th</sup>	1 <sup>st</sup>	<b>5. PROTECTIVE RELAYS</b> 5.1 Definition of Protective Relay.
	2 <sup>nd</sup>	5.2 Fundamental requirement of protective relay.
	3 <sup>rd</sup>	5.3 Basic Relay operation
	4 <sup>th</sup>	5.3.1 Electromagnetic Attraction type 5.3.2 Induction type
	5 <sup>th</sup>	Tutorial Period
10 <sup>th</sup>	1 <sup>st</sup>	5.4 Definition of following important terms 5.5 Definition of following important terms
	2 <sup>nd</sup>	5.5.1 Pick-up current.
	3 <sup>rd</sup>	5.5.2 Current setting. 5.5.3 Plug setting Multiplier. 5.5.4 Time setting Multiplier.
	4 <sup>th</sup>	5.6 Classification of functional relays 5.7 Induction type over current relay (Non-directional)
	5 <sup>th</sup>	Tutorial Period
11 <sup>th</sup>	1 <sup>st</sup>	5.8 Induction type directional power relay.
	2 <sup>nd</sup>	5.9 Induction type directional over current relay.
	3 <sup>rd</sup>	5.10 Differential relay 5.10.1 Current differential relay 5.10.2 Voltage balance differential relay
	4 <sup>th</sup>	5.11 Types of protection
	5 <sup>th</sup>	Tutorial Period
12 <sup>th</sup>	1 <sup>st</sup>	<b>6. PROTECTION OF ELECTRICAL POWER EQUIPMENT AND LINES</b> 6.1 Protection of alternator. 6.2 Differential protection of alternators.
	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>	1 <sup>st</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.
	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.)
	2 <sup>nd</sup>	7.5 Types of lightning strokes.

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



Signature of Teaching Faculty

