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DEPARTMENT OF ELECTRICAL ENGINEERING

Govt. Polytechnic, Balasore

LESSON PLAN FOR ACADEMIC SESSION – (2026-27)

SWITCHGEAR AND PROTECTION

Course Code : EEPE303(a) (Th-4(a))	Semester : 5th
Total Periods : 45 Hours	Examination : 3 Hours
Theory Periods : 3 P/Week	Progressive Assessment: 30 Marks
Maximum Marks : 100	End Semester Examination : 70 Marks
Semester From Date : 01/07/2026	To Date : 05/11/2026
Name of the Teaching Faculty: Er. Bikash Jena, Lect. Stage-I (ELECT)	

WEEK	PERIOD	TOPIC
1st	1st	Basics of Protection: Necessity and functions of protective system.
	2nd	Normal and abnormal conditions; Types of faults and their causes.
	3rd	Protection zones and backup protection.
2nd	1st	Short circuit fault calculations in lines fed by generators through transformers.
	2nd	Short circuit fault calculations (numerical problems).
	3rd	Need of current limiting reactors and their arrangements.
3rd	1st	Circuit Interruption Devices: Isolators - Vertical break, Horizontal break, and Pantograph type.
	2nd	HRC fuses – Construction, working, characteristics, and applications.
	3rd	Arc formation process and methods of arc extinction (High resistance and Low resistance).
4th	1st	Arc voltage, Recovery voltage, Re-striking voltage, and Rate of Rise of Restriking Voltage (RRRV).
	2nd	HT Circuit Breakers: Sulphur-hexa Fluoride (\$SF_6\$) circuit breaker - Working and construction.
	3rd	\$SF_6\$ circuit breaker - Specifications and applications.
5th	1st	Vacuum Circuit Breaker (VCB) - Working and construction.
	2nd	VCB - Specifications and applications.
	3rd	LT Circuit Breakers: Air Circuit Breaker (ACB) and Miniature Circuit Breaker (MCB) - Working and applications.
6th	1st	Moulded Case Circuit Breaker (MCCB) and Earth Leakage Circuit Breaker (ELCB) - Working and applications.
	2nd	Selection of LT and HT circuit breakers (ratings).
		Selection of MCCB for motors.

	3rd	Gas Insulated Switchgear (GIS) - Construction and applications.
7th	1st	Protective Relays: Fundamental quality requirements: Selectivity, Speed, Sensitivity, Reliability, Simplicity, Economy.
	2nd	Basic relay terminology: Protective relay, Relay time, Pick up, Reset current, current setting.
	3rd	Plug setting multiplier (PSM), Time setting multiplier (TSM), and related calculations.
8th	1st	Electromagnetic Relays: Classification, Attracted armature type, Solenoid type.
	2nd	Watt-hour meter type relay. Thermal relay - Working and applications.
	3rd	Static Relay: Block diagram and principle of working.
9th	1st	Overcurrent relay - Time current characteristics.
	2nd	Microprocessor-based overcurrent relays: Block diagram and working.
	3rd	Distance Relaying: Principle and operation of Definite distance relays.
10th	1st	Directional Relay: Need and principle of operation.
	2nd	Operation of current differential relay.
	3rd	Operation of voltage differential relay.
11th	1st	Protection of Alternator and Transformer: Alternator faults and Differential protection.
	2nd	Alternator protection: Overcurrent, earth fault, and overheating protection.
	3rd	Alternator protection: Field failure protection and Reverse power protection.
12th	1st	Transformer faults and Differential protection.
13th	2nd	Transformer protection: Overcurrent, earth fault, and overheating protection.
	3rd	Limitations of differential protection in transformers.
	1st	Buchholz relay: Construction and operation.
13th	2nd	Buchholz relay: Merits and demerits.
	3rd	Protection of Motors, Bus-bars, and Transmission Lines: Motor faults and Short circuit protection.
14th	1st	Motor protection: Overload protection and Single phase preventer.
	2nd	Bus-bar protection: Faults on bus-bars and Differential protection.
	3rd	Fault bus protection for bus-bars.
15th	1st	Transmission line faults and Overcurrent protection.
	2nd	Distance protection for transmission lines.
	3rd	Pilot wire protection for transmission lines.

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