GOVT. POLYTECHNIC KANDHAMAL, (PHULBANI)

LESSON PLAN-Th(4a) SWITCHGEAR AND PROTECTION

5TH – SEMESTER, 2026 (W)

Discipline: **Electrical Engineering**	Semester: **Winter 2026**	Name of the teaching faculty: **Bichitrananda Padhiary**
Subject: **SG&P**	No of days/per week class allotted: **03**	Semester From Date:**01.07.2026** To Date: **05.11.2026** No of weeks:**16**
Week:	Class day:	**Theory/practical topics:**
1ST	**1ST**	**UNIT-I (BASICS OF PROTECTION)** Necessity, functions of protective system
	2ND	Normal and abnormal conditions
	3RD	Types of faults and their causes.
2ND	**1ST**	Protection zones and backup protection
	2ND	Short circuit fault calculations in lines fed by generators through transformers
	3RD	Need of current limiting reactors and their arrangements
3RD	**1ST**	Revision
	2ND	**UNIT-II(CIRCUIT INTERRUPTION DEVICES)** Isolators- Vertical break, Horizontal break and Pantograph type
	3RD	HRC fuses – Construction, working, characteristics and applications
4TH	**1ST**	Arc formation process, methods of arc extinction (High resistance and Low resistance),
	2ND	Arc voltage, Recovery voltage, Re-striking voltage, RRRV
	3RD	HT circuit breakers (Sulphur-hexa Fluoride (SF6), - Working, construction, specifications and applications
5TH	**1ST**	HT circuit breakers Vacuum circuit breaker - Working, construction, specifications and applications
	2ND	L.T. circuit breaker (Air circuit breakers (ACB) - Working and applications.
	3RD	Miniature circuit breakers (MCB) - Working and applications.
6TH	**1ST**	Moulded case circuit breakers (MCCB) - Working and applications.
	2ND	Earth leakage circuit breaker (ELCB)) - Working and applications

	3RD	Selection of LT and HT circuit breakers (ratings), Selection of MCCB for motors.
7TH	1ST	Gas insulated switchgear.
	2ND	**UNIT-III(PROTECTIVE RELAYS)** Fundamental quality requirements: Selectivity, Speed, Sensitivity, Reliability, Simplicity, Economy
	3RD	Basic relay terminology- Protective relay, Relay time, Pick up, Reset current, current setting, Plug setting multiplier, Time setting multiplier
8TH	1ST	Protective relays: Classification, principle of working, construction and operation of – Electromagnetic (Attracted armature type, Solenoid type, Watt-hour meter type) relay
	2ND	Thermal relay. Block diagram and working of Static relay.
	3RD	Overcurrent relay-Time current characteristics
9TH	1ST	Microprocessor based over current relays: Block diagram, working
	2ND	Distance relaying- Principle, operation of Definite distance relays.
	3RD	Directional relay: Need and operation
10TH	1ST	Operation of current and voltage differential relay.
	2ND	Revision.
	3RD	**UNIT-IV(PROTECTION OF ALTERNATOR AND TRANSFORMER** Alternator Protection Faults, Differential protection Over current, earth fault,
11TH	1ST	Alternator overheating and field failure, protection
	2ND	Alternator Reverse power protection.
	3RD	Transformer Protection Faults, Differential protection
12TH	1ST	Transformer over current, earth fault protection
	2ND	Transformer over heating protection, Limitations of differential protection
	3RD	Buchholz relay: Construction,
13TH	1ST	Buchholz relay operation, merits and demerits
	2ND	Revision
	3RD	**UNIT-V(PROTECTION OF MOTORS)** Bus-bar and Transmission Line Motor Faults. Short circuit protection, Overload protection, Single phase preventer.
14TH	1ST	Bus bar and Transmission line
	2ND	Faults on Bus bar and Transmission Lines.
	3RD	Bus bar protection: Differential and Fault bus protection
15TH	1ST	Transmission line: Over current protection
	2ND	Transmission line: Distance protection

	3RD	Transmission line: Pilot wire protection
16TH	1ST	Previous semester question discussion
	2ND	Previous semester question discussion
	3RD	Previous semester question discussion

COURSE OUTCOMES

CO1: Understand the basics of protection systems, circuit interruption devices, and their working principles for safe operation of electrical power systems.

CO2: Analyze the construction, operation, and characteristics of protective relays including electromagnetic, static, and microprocessor-based relays for fault detection.

CO3: Apply protection schemes for alternators, transformers, motors, bus-bars, and transmission lines to ensure reliable and selective fault clearing.

29-06-26
Asst. Prof. (St-I), Elect. Engg. Dept., GP, Kandhamal

Sign. of Faculty Concerned

29-06-26
Asst. Prof. (St-I), Electrical Engg. Dept., GP, Kandhamal

Sign. of HOD