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Switch Gear and Protection — Complete Syllabus

BTEUP Diploma in Electrical Engineering • 5th Semester • Session 2026-27

Subject 5.1 (Theory) • Total 100 Marks • 4 Credits • L 3 – T 1 – P 0

Examination Scheme

Code	Paper	Type	L - P	Credits	Internal	External	Total
5.1	Switch Gear and Protection	Theory	3 - 0	4	40	60 (3 hrs)	100
Switch Gear and Protection Total				4	40	60	100

What This Subject Aims To Do

To help students maintain switchgear and protection schemes used in electrical power systems.

Unit-Wise Complete Topic List

Unit	Topic	Periods	Marks Share
I	Basics of Protection & Fundamental quality requirements	10	17%
II	Circuit Interruption Devices Isolators	11	20%
III	Protective Relays	13	23%
IV	Protection of Alternator, Transformer and Motors	11	20%
V	Protection of Busbar, Transmission Line and Concept of Neutral Grounding	11	20%

Unit - I: Basics of Protection & Fundamental quality requirements (10 Periods, 17%)

Topics: Necessity, purpose and functions of protective switchgear; Characteristics of a protection system, Normal and abnormal conditions; Types of faults, their causes and effects; Protection zones and backup protection, Need of current limiting reactors and their arrangements.

Unit - II: Circuit Interruption Devices Isolators (11 Periods, 20%)

Topics: Vertical break, Horizontal break and Pantograph type; HRC fuses - Construction, working, characteristics and applications; Arc formation process, methods of arc extinction (High resistance and Low resistance), Arc voltage, Recovery voltage, Re-striking voltage, RRRV; HT circuit breakers (Sulphur-hexa Fluoride (SF₆), Vacuum circuit breaker) - Working, construction; L.T. circuit breaker (Air circuit breakers (ACB), Miniature circuit breakers (MCB)) - Working and applications; Selection of LT and HT circuit breakers (ratings); Gas insulated switchgear.

Unit - III: Protective Relays (13 Periods, 23%)

Topics: Basic relay terminology - Protective relay, Relay time, Breaker time, Fault Clearing time, Pick-up, reset value, current setting, plug setting multiplier, Time setting multiplier, burden, reach; Protective relays: Classification, principle of working, construction and operation of - Electromagnetic, Induction type relays; Block diagram and working of Static relays; Overcurrent relay - Time current characteristics, principle of operation of - Non directional Over Current relay, Induction type Directional Power Relay, Directional Induction type Over Current relay; Introduction to Microprocessor based over current relays; Distance relaying - Principle, operation and classification of distance relays; Differential relay - operation of current balance and voltage balance differential relays.

Unit - IV: Protection of Alternator, Transformer and Motors (11 Periods, 20%)

Topics: Alternator Protection: Faults, Differential protection, Over current, earth fault, overheating protection; Transformer Protection: Faults, Differential, over current, earth fault, over heating protection, Limitations of differential protection; Buchholz relay: Construction, operation; Motor Protection: Short circuit protection, Overload protection (through thermal Relay), Single phase preventer.

Unit - V: Protection of Busbar, Transmission Line and Concept of Neutral Grounding (11 Periods, 20%)

Topics: Faults on Bus bar and Transmission Lines; Bus bar protection: Differential and Fault bus protection; Transmission line protection: Over current, Distance and Pilot wire protection; Grounding (equipment and system), Ungrounded Neutral system, Need of neutral grounded, Methods of Neutral Grounding.

Reference Books (as listed in the syllabus)

- Mehta V. K; Rohit Mehta, Principles of Power System, S. Chand and Co., New Delhi., ISBN: 978-81-2192-496-2
- Rao, Sunil S., Switchgear and Protection, Khanna Publishers, New Delhi, ISBN: 978-81-7409-232-3
- Singh, R. P., Switchgear and Power System Protection, PHI Learning, New Delhi, ISBN: 978-81-203-3660-5
- Gupta. J. B., Switchgear and Protection, S. K. Kataria and Sons, New Delhi, ISBN: 978-93-5014-372-8
- Veerapan, N., Krishnamurty, S. R., Switchgear and Protection, S. Chand and Co., New Delhi. ISBN: 978-81-2193-212-7
- Ram, Badri; Vishwakarma D. N., Power System Protection and Switchgear, McGraw-Hill, New Delhi. ISBN: 978-07-107774-X
- Dr. T. D. Bisht, Ashish Sahoo, Pooja Yadav, Switch Gear & Protection, Asian Publishers, Muzaffarnagar, ISBN No. 978-93-91541-62-0

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Source: BTEUP 3rd Year curriculum (folder2627), approved in C.D.C. meeting held on 16.07.2026. Topic lists follow the official syllabus; short explanations are the author's own plain-English summaries, not syllabus text.

Please confirm with your own polytechnic for any local changes.