GUJARAT TECHNOLOGICAL UNIVERSITY

Power Electronics

B. E. SEMESTER: VI

Subject Name: **Switch Gear and Fault Analysis**
Subject Code: **162403**

Teaching Scheme				Evaluation Scheme		
Theory	**Tutorial**	**Practical**	**Total**	**University Exam (Theory) (E)**	**Mid Sem Exam (Theory) (M)**	**Practical (I)**
4	0	2	6	70	30	50

Sr. No.	Course Contents	Total Hrs
1.	**Introduction:** • General Characteristics of Electrical Equipment • Types of Fault in Power System, Short circuit current, Harmful Effect of short Circuit fault on power system, sources of fault power • Necessity for protection system, fault clearing process, basic requirement of protection system, protection zones and types of protection	03
2.	**Circuit Breakers:** • Introduction, circuit breakers, Restriking voltage transient , duties of circuit breakers, Resistance switching • Classification of circuit breakers, Oil Circuit Breakers, Water circuit Breakers, Air Break circuit breakers, air blast circuit breakers, SF6 circuit Breakers, Vacuum circuit breakers, HVDC circuit breakers, Auto reclosures • Breakers operating mechanisms, Type of circuit breakers • Arc phenomena and Arc extinction methods	06
3.	**Isolator:** • Types of Isolator – Earth Switches – their interlocking	02
4.	**Short Circuit Calculation for Symmetrical Fault:** • Percentage Resistance and percentage reactance and base kVA and base kV , Per Unit method of representing quantities, single line diagram • Switching operation on an R-L series circuit, 3-Ø sudden short circuit of an alternator, Limitation of fault current • Analysis of symmetric faults in power system networks, Current Limiting Reactors. Location of reactors	06

5.	**Short Circuit Calculation for Unsymmetrical Fault:** • Introduction, Types of Unsymmetrical fault, Symmetrical components • Phase shift in star – delta transformer, Physical significance of sequence component, sequence impendence networks, fault analysis of unloaded synchronous generator • Faults in power systems, L-G, LL-G , L-L and open conductor faults	06
6.	**Fuse:** • Fuse Element Material, Types of fuses, HRC Fuse, and Expulsion Type HV Fuse	02
7.	**Basic Relays:** • Introduction, Basic requirement of protection and its types, Zones of protection, Operating principle of protecting relay • Classification of relay, Construction – Working -Torque Equation- advantage and disadvantage of: Electromagnetic Attraction Relay, Electro-magnetic induction relay, Permanent Magnet Moving coil relay, Thermal relay, Buchholz relay	06
8.	**Construction and Operation of Relays :** • Working -Torque Equation- advantage and disadvantage of: Over current Relay , Induction type directional power relay, induction type directional over current and earth fault relay, Universal relay torque equation • Distance protection, Type of distance protection, Classification of distance relay • Differential protection, trans relay , Negative phase sequence or phase unbalance relay	06
9.	**Static Relay:** • Introduction, Classification of static relay, Basic Component of Static Relay • Electronic circuits commonly used in static relays, microcontroller based digital relay, numerical control relay	03

Text Book:

1. Power System Protection and Switchgear - B. Ram. McGraw Hill Co.

Reference Books:

1. Power system Analysis –John Grainger and Stevenson
2. Switchgear Protection and Power System – S. S. Rao
3. Power System Protection and Switchgear – Ravindranath and Chander
4. A text book of Power System Engineering – J. B. Gupta