# EE 306: PROTECTION & SWITCHGEAR (3-1-2: 5)- Revised

**Introduction**
Substation equipments, fault clearing process, different types of switchgears

**Circuit Breakers**
Properties of arc, Arc interruption theories, Re-striking and Recovery voltage, Resistance switching, Current chopping, capacitive current interruption, auto reclosing, classification, construction, functioning, selection, and applications of circuit breakers, ratings, recent developments in circuit breakers

**L.T. Switchgears**
Characteristics & applications of other circuit breaking devices such as miniature air circuit breakers, moulded case circuit breakers, contactor types, re-wirable & H.R.C. fuses, earth leakage breakers

**Protective Relaying**
Basic requirements of protective relaying, classification of relays, non-directional over-current and directional over current relay, differential and distance relays, carrier current protection, negative phase sequence, harmonic restraint relays, reverse power, earth fault relays

**Protection**
Types of faults and protection schemes for alternators, transformers, bus-bars, transmission lines, feeders, lightning arrester, arcing grounds, neutral earthing

**Intelligent Protection**
Introduction to digital and numerical relays, microcontroller/microprocessor based current, voltage, frequency and distance relays

**Suggested List of experiments:**
1. Over current and under voltage protection schemes
2. Over or under frequency protection schemes
3. Directional over current protection relay characteristics
4. Power Reverse relay protection schemes
5. earth fault relay protection schemes
6. Differential relay protection schemes
7. Digital relay and design of distance protection schemes
8. Study of MCB, Characteristics of HRC fuse, Visit report on protection schemes in substation
9. Simulation exposure of switchgears and protection schemes
10. Study of industrial circuit breaker and testing

**Text Books**

1. P. M. Anderson, “Power System Protection”, JW and IEEE Press.
2. S. S. Rao, “Switchgear Protection and Power Systems”, Khanna Publishers.


**References**

1) C. R. Mason, “Art & Science of Protective Relaying”, John Wiley & Sons.
2) T. S. M. Rao, “Solid State Protective Relaying”, Tata McGraw-Hill.
3) Y. G. Paithankar and S.R. Bhide, “Fundamentals of Power Systems Protection”, PHI.