Course Title: Switch Gear and Protection
Course Code: EPEG 415
Credit Hours: 3

Course Description:
The course presents information on the techniques and hardware used for power system protection.

Course Contents:

Unit 1: Introduction
Principles of power system protection; System Vs apparatus protection; Analog vs. digital protection; Protection system components: potential / current transformers, Fuses, Circuit, Breaker, Isolator; Computerized status monitoring; Zone protection, Back up schemes, coordination and effect of fault impedance.

Unit 2: Fuses
Use, performance, Selection of fuse material, Types of fuses, Main features of HRC fuses, Selection and co-ordination of fuses

Unit 3: Isolator, Contractor and Reactors
Types of isolators, contractors, Purpose and construction of various types of reactors, Location of reactors, Selection of reactors

Unit 4: Protective Relays
Concept of electromechanical, static and digital relaying, Type and classification of relay, Differential and percentage differential relay, Impedance, Admittance, Reactance relays distance protection concept, Carrier and pilot wire systems, Digital vs. analog protection systems; Significance of computerized protection systems; Microprocessor controlled relaying system.

Unit 5: Power Circuit Breakers
Arc characteristics, Arc interruption, Arc gaps, Short circuit KVA calculations, Percentage method, Types of circuit breakers: Air, Oil, vacuum, SF6, Automatic circuit, Reclosers

Unit 6: Apparatus Protection
Generator, Transformer, Transmission lines protection systems

Unit 7: Protection against Lightning and Insulation Co-ordination
Lightning wave shape of lightning stroke, Classification of direct lightning discharges, over voltage due to lightning stroke, Protection against lightning, lightning arrestors, Protection from surge waves, insulation coordination

References:
1. S. S. Rao, *Switchgear and Protection,* Khanna Publishers
2. Y.G. Paithankar and S.R. Bhinde, *Fundamentals of Power system Protection*, PHI
3. U.A. Bakshi and M.V. Bakshi, *Switchgear & Protection,* Technical Publications

4. V.K. Mehta, *Principles of Power system*, S. Chand Co.
5. B. Ram and D. N. Vishwakarma, *Power system Protection and Switchgear*, TMH,
6. B. Bhalja, R. P. Maheshwari and N. G. Chothani, *Protection and Switchgear*, Oxford University Press