Power switching devices overview – Attributes of an ideal switch, application requirements, circuit symbols; Power handling capability – (SOA); Device selection strategy – On-state and switching losses – EMI due to switching - Power diodes - Types, forward and reverse characteristics, switching characteristics – rating.

Phase Controlled Converters: Performance measures of single and three-phase converters with discontinuous load current for R, RL and RLE loads. Effect of source inductance for single and three-phase converters.

Fundamental of Electrical Drives: Introduction, Choice of Electrical Drives, Dynamics of Electrical Drives, Concept of Multi-quadrant operation, Components of load torques, Selection of motor power rating, Speed torque, speed control, Starting, Braking.

State Space Analysis: Concept of state, state space representation of systems, phase variable form, canonical variable form, physical variable form, Diagonalization, relationship between state equation and transfer function, solution of state equation, concept of controllability and observability, eigen values and eigen vector.

Non-Linear system: characteristic of nonlinear system, type of non-linearity, jump resonance, limit cycle, describing function method of analysis.

Stabilized Power Supplies: Uninterrupted power supplies, online UPS, offline UPS, high frequency online UPS, programmable logic controllers, Voltage stabilizers-servo mechanism, single phase & three phase servo voltage stabilizers.

Controller Design: Review of frequency-domain analysis of linear time-invariant systems, concept of bode plot, phase and gain margins, bandwidth, controller specifications, proportional (P), proportional plus integral (PI), proportional plus integral plus integral controller (PID), selection of controller parameters.

DC Motor Drives: Starting, Braking and Speed Control, Transient analysis of separately excited motor with armature and field control, Energy losses during transient operation, Phase controlled converter fed DC drives, Dual-converter control of DC drive, Supply harmonics, Power factor and ripple in motor current, Chopper Control DC drives, Source current harmonic in Choppers.

Power Quality Monitoring: Monitoring Considerations-Historical perspective of power quality measuring instruments-Power quality measurement equipment-

Assessment of power quality measurement data-Application of intelligent systems-Power quality monitoring standards Problems of AC transmission systems, power flow in parallel paths and meshed system, factors limiting loading capability, stability consideration. Power flow control of ac transmission line. Basic types of facts controllers. Advantages of FACTS technology

Converter Circuits: Rectification and inversion, effect of reactance, six pulse and twelve pulse converter circuits.

Signal Processing: Review of Laplace Transform, Z Transform, Fourier Transform, Discrete Fourier Transform, Fast Fourier Transform, Algorithms and complexity, Introduction to linear optimal filtering.

Neural Network: Biological neurons and their Artificial models, learning adaptation and neural network's learning rules, types of neural networks, single layer, multi-layer, feed forward and feedback networks, backpropagation learning and training, Hopfield network.