EL-I EE-7311 EE-VII

BE VII SEMESTER						
COURSE CONTENTS						
EE-7201	**Generalized Theory of Machines**	**L**	**T**	**P**	**Max. Marks**	**Min. Marks**
Duration in hrs.		3	0	0	70	22

Course Objective:

UNIT – I :Single Phase Machines :

Single phase induction motor :- Review of rotating field theory. Torque in electrical machines, Optimum condition for production of motor torque. Single phase induction motor qualitative examination, double revolving field theory of single phase induction motors. Equivalent circuit starting and running performance. Determination of single phase induction motor constant from test. Principle of operation by cross field theory, analysis of machine by two axis theory development of e.m.f. and torque Equation vector diagram capacitor motor, split phase and repulsion start motors.

UNIT – II :Commutator Motors :

D.C. Series motor on AC bus, single phase series motor :- Analysis, vector diagram performance uses, commutation compensation and inter poles. Brief explanation of Poly phase operation of a single phase series motor. Repulsion motors- principle of operation, analysis, vector diagram, performance characteristics, uses, starting and running condition, Schrage motor constructional detail, principle of operation, vector diagram, power factor correction, the mechanism of energy transference, combined speed and power factor control.

UNIT – III :Generalized theory of Electrical Machines :

Basics for development of generalized approach for analysis of electrical machines. Kron's primitive machine, concept of rotational and transformer voltage, Pseudo stationery coil, voltage and flux linkages, equations of electrical machines, based on coupled circuit approach. Expression for self and mutual inductance of various windings with respect to rotor position, Park's and inverse Park's transformation. Application to DC machine steady state and transient analysis, and equation of cross field commutator machines.

UNIT – IV :Synchronous Machines:

Synchronous machines inductance, transformation to direct and quadrature axis variables. Basic machine relations in dqo variables, transient analysis three phase short circuits, steady state components of short circuit current, field current, effect of additional rotor circuit. Synchronous machine transient and sub transient reactance's and time constant. Discussion of three phase short circuit torques. Line to line short circuit torque. Voltage dip, effect of voltage regulator, minimum voltage.

UNIT – V :Induction Machine :

Basic machine relation in dq variable. Electrical transient in induction machines. Unbalanced operation of symmetrical two phase machine. The symmetrical component concept. Effect of voltage and frequency variation on the induction motor performance, slot harmonics, effect of space harmonics on 3-phase induction motor performance. Induction machine dynamics.

References-

1. Generalized Theory of Electrical Machine by Dr. P.S. Bhimbra.

BE VII SEMESTER EL-II						
COURSE CONTENTS						
EE-7203	Industrial Electronics & Drives	**L**	**T**	**P**	**Max. Marks**	**Min. Marks**
Duration in hrs.	EE-7321	3	0	2	70	22

Course Objective:

UNIT – I :Basic Concepts of Electric Drives:

Elements of drive systems, Requirement of electric drives, Rating & Selection of drives, groups and individual drives, Constant power and Constant torque drives.

Motor Mechanism dynamics: Review of Characteristics of AC & DC motors, load characteristic, load-drive speed torque characteristics, quadrant speed torque characteristics. Mechanical Systems Stability of Electric drives, referred moment of inertia and torque of motor load combination, load equalization.

UNIT – II

Concept of Electrical Drives design, synchronization, isolation, pulse amplifier circuits, converter ratings, heat sink ratings, selection of power switching devices microprocessor and microcontroller controlled drives.

UNIT – III: DC Drives:

Single phase and 3 phase converter fed dc drive, Performance parameters, Study state analysis, Energy recovery systems. Starting and braking of dc drives, converter, chopper, dual converter fed dc drives.

UNIT – IV AC drives:

Induction Motor Drives, Conventional method of Starting braking and speed control, PWM, (VSI) Voltage source Inverter and Current Sources (CSI) fed IM drives, cyclo converter fed drive, Vector control drives. V/F control, slip power recovery schemes, synchronous motor drives.

UNIT – V Special Drives:

Fundamentals of Switched reluctance motors, Stepper Motors, Permanent Magnet Motor Digital control of drives. **Case Studies** Electric traction, steel & cements plants, textile & paper mills, machine tool drive and CNC, electric cars. PMBL DC motor.

References-

1. Dubey G. K. , "Fundamentals of Electrical Drives". Narosa Publishing House.
2. Bose B. K., "Power Electronics and AC Drives", Prentice-Hall.
3. Murphy M. D., and Turnbuli F., "Power Electronic Control of AC Motors", Pergamon Press, Oxford Uni. Press.
4. P.V. Rao, "Power semiconductor Drives", BS Publications

EE-7304

BE VII SEMESTER						
COURSE CONTENTS						
EE-7205	**Power System Protection**	**L**	**T**	**P**	**Max. Marks**	**Min. Marks**
Duration in hrs.		3	0	2	70	22

Unit - I

Relay: Philosophy of protective relaying system, Characteristics of relay, zones of protection, construction realization of characteristics of different relays- Electromagnetic attraction and induction type relays, Buchholz relay, differential relay, distance relay.

Unit - II

Apparatus protection: Types and detection of faults and their effects, generator protection, power transformer protection, bus-bar protection, Feeder protection

Unit - III

Fundamentals of switchgear: Theory of current interruption, arc phenomenon, energy balance theory, arc quenching restricting voltage and recovery voltage, RRRV calculations, L.T. switchgear- basic definitions, types of fuses, HRC fuse , construction and applications.

Unit - IV

Classification of switchgear: Different types of circuit breakers, bulk oil and minimum oil circuit breakers, air break and air blast circuit breaker, SF_6 circuit breaker, vacuum circuit breaker, rating selection and testing of circuit breaker.

Unit - II

Modern trends in protection: static relays, advantages and limitations of static relays, static amplitude and phase comparators, level detector, logic and training circuits, static over current, directional, distance relay, numerical over current and distance protection, microprocessor and computer based protection schemes.

List of Experiments:

Operating Characteristics of

1) Over Voltage Relays
2) IDMT Relays
3) Percentage based differential relays
4) Determination of instantaneous relays
5) Buchholz relays
6) Solid state over current relays

References Books:

1 Van A. R & Warrington C., " Protective Relays : Their Theory and Practice", Vol 1 & 2, Chapman and Hall.
2. Paithankar Y. O.," Transmission Network Protection: Theory and Practice", Marcel Deicker, Inc.
3. GEC Measurements," Protective Relays : Application Guide", GEC Measurements.
4. Masson R.J., Art & Science of Protective Relaying.
5. J & P Switchgear handbook Ravindra Nath B., and Chandar M., Power systems protection and switchgear
6. Rao Sunil S, Switchgear and protection.
7. Crane P.H.C., Switchgear Principle.
8. The Elementary Council, "Power System Protection", Vol.1,2 &3, Peter Peregrinus Ltd.
9. Badriram & Vishwakarma, Power System Protection.

Text Books:

1. Ravindranath & Chander, Power System Protection & Switchgear.
2. C.L. Wadhwa : Electrical Power Synthesis: New Edge International Ltd.

BE VII SEMESTER						
EE 733	COURSE CONTENTS					
EE-7207	Reliability Engineering	L	T	P	Max. Marks	Min. Marks
Duration in hrs.		3	0	0	70	22

Course Objective:

UNIT – I :

Introduction to reliability and indices. Review of probability theory, density and distribution function of continuous and discrete random variable.

UNIT – II :

Component reliability, hazard function, failure laws, exponential failure law, wear in period and its importance. Safety and reliability, replacement, methods of reliability improvement.

UNIT – III :

Reliability evaluation of series, parallel, and series – parallel network. Complex network reliability evaluation using event, space, decomposition, tie-set, cut-set and Montecarlo simulation technique, convergence in Montercarlo simulation. Stand by system and load sharing system, multi state models.

UNIT – IV :

Markov process, state diagram, availability and unavailability function. Evaluation of time dependent and limiting state probabilities. MTTF calculation. Concept of frequency and durations. State enumeration method for evaluating failure frequency, MUT, MDT, frequency balance approach.

UNIT – V :

Load and capacity models, Reliability equation with various load and capacity models, safety index.

References-

1. Reliability and Maintainability Engineering, C.E. Ebeling, TMH, 2006
2. Reliability Engineering: Probability Models and Maintenance Methods – Joel A. Nochlas, Taylor and Prancis 2005.