

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC SEMESTER : VIII

ELECTRICAL ENGINEERING

Subject Name: **ELECTRICAL MACHINE DESIGN- I & II**

Subject Code: **X80902**

Sr. No.	Course Contents	Total Hrs
1.	DESIGN OF THREE PHASE TRANSFORMER: Types of transformers, position of HV and LV windings, core and yoke cross sectional area, importance of mitered joints., Different types of transformers windings. Different methods for cooling of transformer, Different positions of tapings. Output equation for 3 phase transformers, window space factor, factors affecting window space factor. Relation between emf per turn and transformer rating, factors affecting constant K, stacking factor, examples. Selection of flux density and current density, Window dimensions, Yoke dimensions and overall core dimension calculations, examples. Design of HV and LV windings (No. of turns and area of cross section). Estimation of operating characteristics. Primary and secondary winding resistance. Leakage reactance calculation of only cylindrical coil with equal height, Leakage reactance of unequal windings and heights, only formula. No load current calculations for 3 phase transformers. Temperature rise of transformer, design of tank with tubes, calculation of dimension of tank, examples.	
2.	DC MACHINE DESIGN Introduction, output equation, mmf calculation Selection of Number of poles, core length, armature diameter, Carter's fringing curves, length of air gap, examples on above topics costing ARMATURE DESIGN Choice of armature winding, armature conductor, number of armature slots, slot dimensions, slot loading, design of armature core, Problems on above topics, costing	
3.	Induction motor design: Output equation, choice of specific scheme, separation of D & L, peripheral Stator winding design, Calculation of no. of turns per phase, conductor's area shape of the stator slots, factors to be considered while deciding no of stator slots, Area of stator slots, stator winding resistance, stator teeth design, depth of the stator core, examples related to above topics, Length of the air gap. Rotor design A. Squirrel cage rotor – selection of no. of rotor slots, harmonic induction torque. Harmonic synchronous torque, vibration and noise, voltage ripples, rules for selecting no. of rotor slots, Methods for reducing harmonic torque, design of rotor bars and slots, calculation of rotor bar current, area of rotor bars, shape of rotor slots, examples, Design of end rings, Calculation of end rings current, cross-sectional area of end rings. B. Design of wound rotor - calculation of number of rotor slots, no. of turns, crosssectional area of rotor conductors, types of rotor windings, check for rotor tooth density, design of rotor core, examples Estimation of operating characteristics- no load current calculation, short circuit current calculation, stator and rotor resistance and reactance calculation, examples, circle diagram, Dispersion coefficient – effect on maximum output power factor	

4.	Synchronous machine design Introduction, output equations, Main dimension, SCR, effect of SCR on machine performance Length of air gap and shape of pole face Armature design, Armature winding (Single layer and double layer), number of armature slots, slots dimension, length of mean turns, calculation of armature resistance and reactance Design of rotor , Design of magnetic circuit, Open circuit characteristic Determination of full load field MMF, Design of field winding Determination of direct and Quadrature axis synchronous reactance Short circuit characteristics, Performance evaluation Design of Turbo alternators, Main dimension, Length of air gap, Stator & Rotor design	
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Reference Books:

1. Electrical Machine Design – R. K. Agrawal
2. Design of Electrical Machine- V. N. Mittle
3. A Course in electrical machine design – A. K. Sawhey, Dhanpat Rai and Sons
4. Electrical machine design – R. K. Agrawal, S.K. Kataria & Sons
5. Design of Electrical machines – V. N. Mittle, Standard Publishers Distributors