GUJARAT TECHNOLOGICAL UNIVERSITY
ELECTRICAL ENGINEERING
B. E. SEMESTER: VII

Subject Name: **Electrical Machine Design – 1**
Subject Code: **170902**

Teaching Scheme				Evaluation Scheme			
Theory	**Tutorial**	**Practical**	**Total**	**University Exam (E)**		**Mid Sem Exam (Theory) (M)**	**Practical (Internal)**
				Theory	**Practical**		
3	0	2	5	70	30	30	20

Sr. No.	Course Contents	Total Hrs
1.	**GENERAL ASPECTS** Insulating Materials & Classifications, heating of electrical machines **,** Cooling of Transformer and rotating machines **,** Electrical and Magnetic Loading , output coefficient , factor affecting size of machines , selection of B_{av} & ac **,** Duty cycle and equivalent ratings	5
2.	**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. Optimum design Design for minimum cost. Design for minimum loss. Variation of output and losses in transformer with linear dimensions. Dry transformer, high frequency transformer	12

3.	**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 **DESIGN OF FIELD SYSTEMS** Pole design, design of field winding of shunt, series and compound machines, examples Design of interpole, effects and minimization armature reaction Design of commutator and brushes, Improvement in commutation ,Performance calculation & Design consideration for large machines, HV machines and miniature DC motors	20
4.	**DESIGN OF CURRENT TRANSORMERS** Introduction, construction Design principles OF C.T & P.T. , winding design, Behavior of transformer under normal and abnormal condition.	5

Term Work:

- Design of three phase transformer
- Drawing sheet of three phase transformer
- Design of DC machines
- Drawing Sheet of DC machine components.
- Tutorial on General aspects and C.T. , P.T.

Text Book

1. A course in electrical machine Design – A. K. Sawhney

Reference Books:

1. Electrical Machine Design – R. K. Agrawal
2. Design of Electrical Machine- V. N. Mittle