**20EE32E1-ELECTRICAL MACHINE DESIGN**

 **(EEE)**

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| **Course Category:** | Professional Elective | **Credits:** | 3 |
| **Course Type:** | Theory | **Lecture-Tutorial-Practical:** | 3-0-0 |
| **Pre-requisite:** | Electrical Machines | **Sessional Evaluation:****External Exam Evaluation:****Total Marks:** | 4060100 |

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| **Course Objectives:** | Students undergoing this course are expected to learn: |
| 1. The principles of design of static and rotating machines.2. To design armature and field systems for D.C machines3. To design stator and rotor of induction machines.4.To design stator and rotor of synchronous machines and study their thermal behavior.5. To design core, yoke, windings and cooling systems of transformers.6. The modes of heat dissipation and cooling methods. |
| **Course Outcomes:** | After completing the course the student will be able to |
| **CO1** | Understand the importance of design of machines based on their applications. |
| **CO2** | Demonstrate the design of various parts of D.C machines and solve the problems of design. |
| **CO3** | Enumerate the design concepts of induction motors. |
| **CO4** | Design the concepts of synchronous machines and solve the problems related to design |
| **CO5** | Gain knowledge on the concepts of three phase transformer. |
| **CO6** | Analyse the modes of heat dissipation and cooling methods |
| **Course Content:** | **UNIT I****Basic considerations:** Basic concept of design, limitation in design, standardization, modern trends in design and manufacturing techniques, classification of insulating materials, general concepts in designing rotating machines.**UNIT II****Design of DC machines:** Output equation, choice of specific loading and choice of number of poles, design of main dimensions of D.C machines, design of armature slot dimensions, commutator and brushes, magnetic circuit, estimation of ampere turns, design of yoke and poles, main and inter poles, field windings, shunt, series and inter poles**UNIT III****Design of induction motors:** Output equation, choice of specific loadings, main dimensions of three phase induction motor, stator winding design, choice of length of the air gap, estimation of number of slots for the squirrel cage rotor, design of rotor bars and end ring, design of slip ring induction motor, estimation of no load current and leakage reactance and circle diagram.**UNIT IV****Design of synchronous machines:** Output equation, choice of specific loadings-short circuit ratio, design of main dimensions, armature slots and windings, slot details for the stator of salient and non- salient pole synchronous machines, design of rotor of salient pole synchronous machines, magnetic circuits, dimensions of the pole body, design of the field winding, and design of rotor of non- salient pole machine, introduction to computer aided design.**UNIT V****Design of transformers:** Output equation for single phase, choice of specific loadings, expression for volts/turn, determination of main dimensions of the core, types of windings and estimation of number of turns and conductor cross sectional area of primary and secondary windings, estimation of no load current, expression for leakage reactance and voltage regulation, design of tank and cooling tubes (round and rectangular).**UNIT VI****Heating and cooling**: Modes of heat dissipation & temperature rise time curves, methods of cooling ventilation (induced & forced, radial & axial), direct cooling& quantity of cooling medium calculation of total MMF and magnetizing current, specific permeance and leakage reactance. |
| **Text books** **&****Reference books:** | **Text books:**1.“A course in electrical machine design”, by A.K. Sawhney, DhanpatRai& Sons.2.“Design of electrical machines”, by V.N. Mittle, 4t h Edition.**Reference books:**1.“Performance and design of A.C machines”, by M.G. Say, CBS publishers and Distributors Pvt Ltd.2.“Design data handbook”, by A.Shanmugasundarm, G,Gangadharam & R.Palani, Wiley Eastern Ltd. |
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