

**3/4 B.Tech. SECOND SEMESTER**

**EE6T2**

**ELECTRICAL MACHINES DESIGN**

**Credits: 3**

**Lecture: 3 periods/week**

**Internal assessment: 30 marks**

**Tutorial: 1 period /week**

**Semester end examination: 70 marks**

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**Objective:**

To develop knowledge on principles of design of static and rotating machines. Also students must be able to understand the design fundamental concepts, design main dimensions & cooling systems of transformers and main dimensions of rotating machine.

**Course outcomes:**

1. Upon completing the course, students are able to understand the design of various parts of DC machines and solve the problems of design
2. Student should be able to understand the design concepts of transformers and know about how to design the parts.
3. Student is able to understand the design concepts of synchronous machines and solve the problems related to design.
4. Student understands the importance of design of machines based on their applications.

**UNIT I**

**DESIGN OF DC MACHINES:** Basic concept of design, limitation in design, standardization, modern trends in design and Manufacturing techniques, Calculation of total mmf and magnetizing current. Specific permeance and leakage reactance - Output equation, choice of specific loading and choice of number of poles, design of Main dimensions of DC 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 II**

**DESIGN OF SINGLE PHASE 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.

**UNIT III**

**DESIGN OF THREE PHASE TRANSFORMERS:** Output equation for three phase transformers, choice of specific loadings, expression for volts/turn, determination of main dimensions of the core, types of windings and estimation of number 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 IV**

**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 V**

**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.

### **Learning Resources**

#### **Text Books:**

1. A course in Electrical Machine Design, A.K. Sawhney, Dhanpatt Rai & Sons.
2. Design of Electrical Machines, V.N. Mittle, 4<sup>th</sup> edition.

#### **Reference Books:**

1. Performance and Design of AC machines by M.G. Say, CBS publishers and Distributors pvt.Ltd.
2. Performance and Design of DC machines by Clayton and Hancock, BPB publishers
3. Design Data Handbook, A.Shanmugasundarm, G,Gangadharam, R.Palani, Wiley Eastern Ltd.