

Course Syllabi: UEE521: Electric Machine Design (L : T : P :: 3 : 1 : 0)

1. **Course number and name:** UEE521: Electric Machine Design
2. **Credits and contact hours:** 3.5 and 4
3. **Text book, title, author, and year**

Text Books / Reference Books

- *Ramamoorthy, M., Computer Aided Design of Electrical Equipment, Eastern Press Private Limited (1989).*
 - *A.K. Sawhney, a Course in Electrical Machine Design, DhanpatRai & CO. (2013).*
 - *Say, M.G., Design and Performance of Machines, CBS Publications (1981).*
 - *Hamdi, E.S., Design of Small Electrical Machine, John Wiley and Sons (1994).*
 - *Smith, S.P. and Say, M.G., Electrical Engineering Design Manual, Chapman and Hall (1984).*
 - *Walker, J.H., Large AC Machines: Performance and Operation, BHEL (1997).*
- a. Other supplemental materials
- Nil

4. Specific course information

- a. Brief description of the content of the course (catalog description)

Introduction: Design of Machines, Factors, limitations, Modern trends. Materials: Conducting, magnetic and insulating materials.

Magnetic Circuits: Calculations of mmf for air gap and teeth, real and apparent flux densities, iron losses, field form, leakage flux, specific permanence.

Heating and Cooling: Modes of heat dissipation, Temperature gradients, types of enclosures, types of ventilation, conventional and direct cooling, amount of coolants used, Ratings.

Armature Windings: Windings for DC and AC machines and their layout.

Design of Transformers: Output equation, Types of transformer windings, design of core and windings and cooling tank, performance calculations.

Concepts and Constraints in Design of Rotating Machines: Specific loading, output equation and output co-efficient, effects of variation of linear dimension.

Skeleton Design of Rotating Machines: Calculation of D and L for DC, induction and synchronous machines, length of air gap, design of field coils for DC and synchronous machines, selection of rotor slots of squirrel cage induction motors, design of bars and ends, design of rotor for wound rotor for induction motors, design of commutator and inter poles for DC machines.

Computer Aided Design of Electrical Machines: Analysis and synthesis approaches, design algorithms, Introduction to optimization techniques, Implementing computer program for design of three phase induction motor.

5. Specific goals for the course

After the completion of the course, the students will be able to:

- Design DC machines.
- Design transformers with reduced losses.
- Calculate the losses and efficiency in the machines.
- Analyze and synthesis of computer aided design of electrical machines.

- Design three phase induction motor.

6. Brief list of topics to be covered

- Magnetic Circuits
- Heating and Cooling
- Armature Windings
- Design of Transformers
- Concepts and Constraints in Design of Rotating Machines
- Skeleton Design of Rotating Machines
- Computer Aided Design of Electrical Machines