

Course Syllabi: UEE501 Generalized Theory of Electrical Machines (L:T:P::3:1:0)

1. **Course number and name:** UEE501; Generalized Theory of Electrical Machines

2. **Credits and contact hours:** Credits: 3.5; Hours: 4

3. **Text book, title, author, and year**

- *Bimbhra, P.S., Generalized Theory of Electric Machines, Khanna Publishers (2006).*
- *Kraus, P.C., Analysis of Electric Machine, McGraw-Hill (2000).*

a. Other supplemental materials

- Nil

4. **Specific course information**

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

Introduction: Reference frame theory, $3-\Phi \rightarrow 2-\Phi$ transformation, Physical concept of park's transformation, Volt-ampere and torque equations, Space vector concept.

3- Φ Induction Machine: Performance equations in different rotating frames, Equivalent circuit, Different inductance, Effect of voltage and frequency on the performance, Braking, Unbalance operations.

Synchronous Machine: General machine equation in different frame, Dynamic analysis, Power angle characteristics, Phases diagram for cylindrical rotor and salient pole machine, Electromagnetic and reluctance torque, Electric braking of synchronous machine.

DC Machine: Transfer function for DC machine, (Shunt, Series and compound), Linearization technique, Analysis under motoring and generating mode, Dynamic analysis.

Advance Machines: 1- Φ synchronous motor, 2- Φ servomotor, AC tachometers, Switched reluctance motor, Brushless DC motor.

5. **Specific goals for the course**

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

- Express the revolving field and reference frame theory
- Develop mathematical model of three-phase AC machines and parameters in different reference frame.
- Simulate the transient performance of three-phase AC machines in different reference frames.
- Investigate the transient performance of different DC machines.
- Select special purpose small machines for different applications.

6. **Brief list of topics to be covered**

- 3- Φ Induction Machine
- Synchronous Machine
- DC Machine
- Advanced Machine