

<b>EE5T2</b>	<b>3/4 B.Tech. FIFTH SEMESTER</b>	<b>Credits: 3</b>
<b>Lecture: 3 periods/week</b>	<b>ELECTRICAL MACHINES-III</b>	<b>Internal assessment: 30 marks</b>
<b>Tutorial: 1 period /week</b>		<b>Semester end examination: 70 marks</b>

**Course Objective:**

This subject is an extension of previous machines courses. It deals with the detailed analysis of synchronous generators and motors which are the prime source of electrical power generation and its utilities. This concerns about the different types of single phase motors which are having significant applications in house hold appliances and control systems.

**Course Outcomes:**

Upon completing of the course student should be

1. Able to understand the constructional details of synchronous machines, their load characteristics, solve the problems on regulation and parallel operation of alternator.
2. Able to understand the working principle ,methods of starting and applications of synchronous motor
3. Able to understand principle operation of BLDC Motor, reluctance motor and stepper motor.

**UNIT I****Synchronous Generator**

Constructional Features of round rotor and salient pole machines, armature windings, integral slot and fractional slot windings, distributed and concentrated windings – distribution, pitch and winding factors – E.M.F Equation - harmonics in generated e.m.f. – suppression of harmonics – armature reaction - leakage reactance – synchronous reactance and impedance – phasor diagram – load characteristics – problems .All practical ratings and name plate details.

**UNIT II****Synchronous Generator Regulation**

Experimental determination of synchronous impedance - regulation by synchronous impedance method, M.M.F. method, Z.P.F. method and A.S.A. methods – salient pole alternators – two reaction analysis – experimental determination of  $X_d$  and  $X_q$  (Slip test), phasor diagrams – regulation of salient pole alternators.

**UNIT III**

**Parallel operation of alternators** :Synchronizing of alternators with infinite bus bars current practices– synchronizing power torque – parallel operation and load sharing - effect of change of excitation and mechanical power input. Analysis of short circuit current wave form – determination of sub-transient, transient and steady state reactance, capability charts.

**UNIT IV****Synchronous Motors – Principle of Operation**

Theory of operation – phasor diagram – variation of current and power factor with excitation – synchronous condenser – mathematical analysis for power developed - excitation and power circles – hunting and its suppression – methods of starting – synchronous induction motor – synchronous phase modifier and its industrial applications.

**UNIT V****Special Machines**

Construction -working principle and operation of BLDC motor, Repulsion motor Principle of operation of hysteresis and reluctance motors and its applications.

**Stepper Motor**-principle, operation of variable reluctance stepper Motor, permanent magnet stepper Motor and their applications.

Construction and principle of operation of linear induction motor and applications.

**Learning Resources****Text Books:**

1. Electrical Machines by PS Bhimbra, Khanna publishers.
2. Electrical Machines by I.J.Nagrath & D.P.Kothari, Tata Mc Graw-Hill Publishers, 7<sup>th</sup> Edition 2005.
3. Electrical Machinery by A.E. Fitzgerald, C. Kingsley and S. Umans, Tata Mc Graw Hill Companies, 5<sup>th</sup> edition 1990.
4. Electrical Machines by J.B.Gupta, Kataria publications.

**Reference Books:**

1. The Performance and Design of A.C.Machines by M.G.Say, ELBS and Pitman & Sons.
2. Theory of Alternating Current Machinery by Langsdorf, Tata Mc Graw Hill, 2<sup>nd</sup> edition.
3. Electromechanics-III (Synchronous and single phase machines) by S.Kamakashiah, Right Publishers.