

GUJARAT TECHNOLOGICAL UNIVERSITY

B. E. SEMESTER: V

Electrical & Electronics Engineering

Subject Name: **Electrical Machines**

Subject Code: **150802**

Teaching Scheme				Evaluation Scheme		
Theory	Tutorial	Practical	Total	University Exam (Theory) (E)	Mid Sem Exam (Theory) (M)	Internal Assessment (I)
4	0	2	6	70	30	50

Sr. No	Course Content
1.	The Performance of DC Machine: Armature Winding: Introduction, Drum winding, Two layer windings, Coil span, Windings pitches, Commutator pitch, Numbering Armature conductors, Simplex lap winding, Simplex wave winding, Dummy coils, Armature Reaction: Magnetizing action of armature currents, Flux distribution due to armature currents, Armature reaction and flux distribution curve, Armature reaction and iron losses, Compensating windings. Commutation. Testing: Brake test, Swinburne's method of computing efficiency, Differential tests, Hopkinson tests, and Temperature tests, Separation of iron and friction loss, Retardation test, Commutation tests.
2.	Three phase Transformer: Introduction , Construction, The vector groups of transformer connection nomenclature, General remarks on 3-phase connection, tertiary winding, Scott connection, parallel operation, transients and harmonics in transformer.
3.	The Performance of Poly Phase Induction Motor: Equivalent Circuit, Blocked Rotor Test, No load Test, Dynamic Performance, Circle Diagram , Performance Calculation, Testing of induction motor as per IS-325, Unbalanced Operation of Poly phase Induction Motor, Positive negative and zero sequence response, single phasing operation on non sinusoidal voltage, methods of starting, double squirrel cage motors, equivalent circuit of double squirrel cage motor , speed control of induction motors, advantage, disadvantage, and application of induction motors.
4.	Single Phase Induction motor: Types of single phase motor, revolving field theory, starting and running performance of single phase IM, Split Phase Motors, Capacitor Type Motor, Shaded Pole Induction Motor, Self Starting Synchronous Reluctance Motor, Hysteresis Motor, AC series Motor, Universal Motor, Speed Control of Universal Motors, Equivalent circuit of single phase Induction Motor.

5.	Synchronous Motor: Construction, Principle of Operation, Starting of synchronous motors, Motor on load with constant excitation and different excitation, Equivalent circuit, Power developed by a synchronous motor, Effect of Excitation on Armature Current and Power Factor, Construction of V curves, Speed Control of Synchronous Motor, Synchronous motor application.
6.	Advanced Electrical Machine: Permanent Magnet Brushless DC Machine: Construction, Operation, Performance, Control and applications, Permanent Magnet Brushless AC Motor, Stepper Motors, Switched Reluctance Motor: Construction, operating performance, control and applications, Linear Induction Machines and Linear Synchronous Machines, AC Commutator Motors, Synchronous Induction Motor, Induction Generator.

Reference Books:

1. Thereja B.L, Theraja A.K., "A Textbook of Electrical Technology - Vol 2," S.Chand & Company Ltd, New Delhi.
2. Kothari D, Nagrath I, "Electric Machines," Third Edition, 2004, Tata McGraw Hill Company, New Delhi.
3. Ghosh Smarajit, "Electrical Machines," First Edition, 2007, Pearson Education, New Delhi.
4. Say, M.G., "Performance and Design of Alternating Current Machines," Third Edition, 1965.
5. Clayton, A.E., "The Performance and Design of Direct Current Machines," Third Edition, 1966.
6. Bhattacharya S.K., "Electrical Machines," Third Edition, 2009, Tata McGraw Hill Company, New Delhi.
7. Curriculum based video and web courses @ <http://nptel.iitm.ac.in/index.php>
<http://nptel.iitm.ac.in/courses.php?branch=Electrical>
http://nptel.iitm.ac.in/courses/IITMADRAS/Electrical_Machines_I/index.php
http://nptel.iitm.ac.in/courses/IITMADRAS/Electrical_Machines_II/index.php