

SEE3433 : ELECTRICAL MACHINES

Sem 1 2010/2011

Magnetic circuit and electromechanical energy conversion Review of electromagnetism and electromechanical energy conversion: Faraday's law, Lenz law, magnetic circuit.	Chapter 1 1.1 Magnetic circuit (1.1.1 – 1.1.6) 1.2 Hysteresis (1.2.1 – 1.2.3) 1.3 Sinusoidal excitation – exciting current	Chapter 3 3.1 Energy Conversion Process 3.2 Field Energy 3.3 Mechanical force in electromagnetic system
Fundamentals of rotating machines Principles of rotating machines – cylindrical machines Motional voltage and electromagnetic force. Basic construction of rotating electric machines	Chapter 3 3.4 Rotating machine 3.5 Cylindrical Machine	Chapter 4 4.1 Electromagnetic conversion
DC machines Construction, commutator action, armature windings, effect of armature reaction, interpoles and compensating windings Analysis of steady state performance of separately excited and shunt generators, shunt and series motors Speed control of DC motors	Chapter 4 4.2 DC machines (4.2.1 – 4.2.7) 4.3 DC generators (4.3.1 –4.3.2), 4.3.5 4.4 DC motor (4.4.1 – 4.4.2)	Chapter 4 4.5 Speed control (4.5.1-4.5.3)
3-phase Induction machines Construction, principles of operation, rotating magnetic field. Derivation of equivalent circuits, no-load and blocked rotor tests Steady state performance characteristics, power flow, classes of induction machines Speed control of induction motor	Chapter 5 5.1 Constructional features 5.2 Rotating magnetic field 5.3 Induced voltages 5.7 Equivalent circuit 5.8 No load test, blocked rotor test etc	5.9 Performance characteristic 5.10 Power flow 5.12 Classes of IM 5.13 Speed control (5.13.1-5.13.3)
Synchronous machines Construction: cylindrical and salient pole, starting of synchronous motors, synchronous generators connection to infinite bus Derivation of equivalent circuit, Open-circuit and short-circuit tests Synchronous generator: Analysis of steady state performance, power and torque characteristics Synchronous motor: analysis of steady state performance, power factor control	Chapter 6 6.1 Construction of 3-phase synch machines 6.2 Synchronous generators 6.3 Synchronous motors 6.4 Equivalent circuit (6.4.1, 6.4.2)	6.5 Power and torque characteristics 6.7 Power factor control

Textbook:

P.C. Sen, Principles of Electric Machines and Power Electronics, 2nd Edition, John Wiley and Sons

References:

1. A.E. Fitzgerald, Charles Kingsly Jr., Stephen D. Umans: Electric Machinery, Sixth Edition, Mc Graw Hill, 2003
2. Stephen J. Chapman, Electric Machinery Fundamentals, 3rd Edition, Mc Graw Hill, 1999.
3. Jimmie J. Cathey, Electric Machines: Analysis and design, Mc Graw Hill, 2001