

Course Code	Course Name	Credits
MTC305	Electrical Circuits and Machines	03

Prerequisite: FEC105 Basic Electrical Engineering, FEC102 Engineering Physics-I
FEC202 Engineering Physics-II

Objectives

1. Network Synthesis of DC and AC circuits.
2. Understand characteristics of R-L-C networks in time and Frequency domain.
3. Understand constructional features and characteristics of Electrical Machines

Outcomes: Learner will be able to...

1. Analyse and Synthesis of network theorems for DC and AC circuits
2. Find two port circuits parameters
3. Analyse and Synthesis R-L-C circuits in time and Frequency domain
4. Illustrate working and performance characteristics of DC Motors
5. Illustrate working and performance characteristics of three phase Induction Motor
6. Implement systems using low power motors specially designed motors

Module	Detailed Contents	Hrs.
01	Analysis of DC and AC Circuits <p>1.1 Analysis of DC Circuits: Analysis of DC circuits with dependent sources using generalized loop, node matrix analysis (Simple numerical problems)</p> <p>1.2 Application of Network Theorems to DC Circuits: Superposition, Thevenin, Norton, Maximum Power Transfer theorem (Simple numerical problems)</p> <p>1.3 Steady State Analysis of AC circuits: Analysis of AC circuits with independent sources using generalized loop, node matrix analysis.</p>	8
02	Two Port Networks <p>2.1 Parameters: Open Circuit, Short Circuit, Transmission and Hybrid parameters, reciprocity and symmetry conditions (Simple Problems)</p> <p>2.2 T and PI representations</p>	6
03	Time and Frequency Response Analysis <p>3.1 S-domain representation of electrical networks , Transfer function.</p> <p>3.2 Solution of initial and final condition in RL, RC and RLC networks for AC and DC sources.</p> <p>3.3 Transient and steady state response to step, ramp and impulse signals</p>	7
04	DC Motors <p>4.1 Construction, principle of working, classification, EMF equation, Torque equation, characteristics of DC Motors</p> <p>4.2 Starters for shunt and series motors</p> <p>4.3 Speed Control: basic principle and working of different methods</p>	5
05	Three Phase Induction Motor <p>5.1 Construction, working principle of squirrel cage induction motor</p> <p>5.2 Torque speed characteristics, power</p>	7

	5.3 Speed control methods 5.4 Starting methods: Classification and working of different methods Single phase Induction Motors: 5.5 Construction, working, 5.6 Starting methods, 5.7 Torque-speed characteristics and applications	
06	Special Types of Motors Construction, working Principle, Types and applications of 6.1 BLDC Motor 6.2 Reluctance Motor 6.3 Universal Motor 6.4 Stepper Motor 6.5 Servo Motor	6
Self-study Topic	Introduction, Basic principle, Construction, E.M.F Equation, Losses in a transformer, Applications of Pulse, Isolation, center tapped transformer	--

Assessment:

Internal Assessment for 20 marks: Consisting Two Compulsory Class Tests First test based on approximately 40% of contents and second test based on remaining contents (approximately 40% but excluding contents covered in Test I). Duration of each test shall be one hour.

End Semester Theory Examination:

1. Question paper will comprise of total 06 questions, each carrying 20marks.
2. Total 04 questions need to be solved.
3. Question No: 01 will be compulsory and based on entire syllabus wherein sub- questions of 2 to 5 marks will be asked.
4. Remaining questions will be mixed in nature.(e.g. Suppose Q.2 has part (a) from module3 then part (b) will be from any module other than module 3)
5. In question paper weightage of each module will be proportional to number of respective lecture hrs as mentioned in the syllabus.

Text Books:

1. Bimbhra P. S., Electric Machinery, Khanna Publisher,
2. Bimbhra P. S., Generalized Machine Theory, Khanna Publisher,
3. E. G. Janardanan, Special Electrical Machines, PHI
4. W H Hayt, S M Durbin, J E Kemmerly, „Engineering Circuit Analysis“, 7th Edition Tata McGraw-Hill Education.
5. M. E. Van Valkenburg, „Network Analysis“, 3rd Edition, PHI Learning.
6. D. Roy Choudhury, „Networks and Systems“, 2nd Edition, New Age International.

References Books:

1. M. G. Say and E. O. Taylor, Direct current machines, Pitman publication
2. Ashfaq Husain, Electric Machines, Dhanpat Rai and co. publications
3. M. V. Deshpande, Electric Machines, PHI
4. N Balabanian and T.A. Bickart, Linear Network Theory: Analysis, Properties, Design and Synthesis“, Matrix Publishers, Inc.
5. C. L. Wadhwa, Network Analysis and synthesis“, New Age international.
6. B. Somanathan Nair, “Network Analysis and Synthesis”, Elsevier Publications