



Content:

Sr. No.	Content/Topics	Total Hrs	Module Weightage %
1	DC Motors Principle of operation of DC motors, types of DC motors and construction, separately excited and self-excited motors, shunt and series motors, universal motors, PMDC motors, torque speed characteristics for various motors, calculations of speed and torque, examples, nameplate specifications, back emf, losses and efficiency, speed control of DC motor, use of starter, numerical examples.	10	22
2	Transformers Single Phase Transformer: Working principle, Construction, types, EMF equation, Transformer on no load and on load, vector diagram, exact and approximate equivalent circuit, O.C & S.C. test on transformer, regulation of transformer, losses & efficiency, condition for maximum efficiency, Auto transformer, Current transformers and potential transformers.	10	22
3	Induction Motors 3 Phase induction motor: Construction, types, rotating magnetic field, principle of operation, slip, frequency of rotor current, rotor emf, rotor current, expression for torque, conditions for maximum torque, torque speed characteristics, starting torque in squirrel cage and slip ring motors, effect of change in supply voltage on torque, slip and speed, relation between full load torque and maximum torque, Power stages in induction motor, vector diagram and equivalent circuit, speed control of 3 phase motor, starting methods for 3	10	22



	phase induction motor.		
4	Synchronous Machine Alternator, Basic principle, construction, pitches factor, distribution factor, emf equation, and alternator on load, voltage regulation. Synchronous motor: Basic principle, methods of starting, application.	09	20
5	Introduction to stepper motors. Principle of operation, types and applications. Stepper motor drivers, torque and speed characteristics.	6	14

Suggested Specification table with Marks (Theory): (For B. Tech.)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	30	15	30	10	5

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom’s Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

BSC: basic science course /ESC: Engineering Science Course /HSM: Humanities and management /PCC: Professional Core course /PEC: professional Elective course /OEC: Open Elective course/ MD: mandatory noncredit course

Reference Books:

Sr no	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1	A textbook of electrical technology	B L Theraja and A K Theraja (Vol. 2) AC DC machines	S Chand ISBN-10 : 8121924375	1959	23 rd
2.	Electrical machines	Ashfaq Hussain	Dhanpatrai and Co. ISBN-10 : 8177001663	2016	3 rd
3.	Electric Machinery	E. Fitzgerald and C. Kingsley	McGraw Hill Education ISBN-13 : 978-0070662865	2013	2 nd
4.	Electric Machines	I J Nagrath and D. P. Kothari	McGraw Hill Education ISBN-13 : 978-9352606405	2010	5 th

Course Outcomes: After successfully completing this course, the student will be able to,

Sr. No.	CO statement	Marks % weightage
CO-1	select proper type of dc motor	30
CO-2	carry out analysis of ac, dc machines and transformer	30

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CO-3	diagnose and Troubleshoot for various faults in machines.	20
CO-4	work with stepper motor	10
CO-5	work with synchronous machines	10

Mapping CO-POs-PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1				2	3								1		
CO2	2	2	1			1	1							3	
CO3								1	2	2	1	1			2
CO4					2				2	2	1	1	1	1	1
CO5					2				2	2	2	2	1	1	1

List of Open learning website:

<https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-685-electric-machines-fall-2013>

NPTEL/SWAYAM lectures on signals and systems

https://onlinecourses.nptel.ac.in/noc20_ee60/preview

https://onlinecourses.nptel.ac.in/noc22_ee06/preview

Electrical Machines – I, Electrical Machines – II,

By Prof. Tapas Kumar Bhattacharya | IIT Kharagpur

List of Open Source Software:

Scilab/xcos/virtual lab,simulation software,

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FOR LAB SESSIONS:

List of Experiments:

1. To study the different parts of DC motor.
2. To study the different parts of Transformer.
3. To study the different parts of Induction motor.
4. To study the different parts of Synchronous machine.
5. Speed control of DC Shunt Motor using a) Armature control and b) field control methods.
6. To perform Open Circuit and Short circuit Test on a transformer and find its efficient and regulation.
7. To study different starters of D. C. motor.
8. To study different starters of three phase induction motor.
9. To perform No load and Block rotor test on induction motor and plot equivalent circuit.
10. To draw the V curves for synchronous machine.
11. To find the voltage regulation of synchronous machine.
12. To study the working of stepper motor.

Major Equipment Needed:

Various electrical machines

MATLAB interfacing and control of electrical machines, PSIM

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w.e.f. AY 2021-22