

# KARPAGA VINAYAGA COLLEGE OF ENGINEERING AND TECHNOLOGY

## LESSON PLAN

**Sub Code:** ME 6351

**Sub Name:** ELECTRICAL DRIVES AND CONTROL

**Branch:** Mechanical

**Semester:** III

### OBJECTIVES

- To understand the basic concepts of different types of electrical machines and their performance.
- To study the different methods of starting D.C motors and induction motors.
- To study the conventional and solid-state drives

### Unit 1: INTRODUCTION

Basic Elements – Types of Electric Drives – factors influencing the choice of electrical drives – heating and cooling curves – Loading conditions and classes of duty – Selection of power rating for drive motors with regard to thermal overloading and Load variation factors

Session No	Topics to be covered	Ref. book	No. of periods	Cu. No of periods	Teaching Method
1	Introduction	T1	1	1	BB
2	Basic Elements – Types of Electric Drives	T1	1	2	BB
3	Factors influencing the choice of electrical drives	R1	1	3	BB
4	Heating and cooling curves	T2	1	4	BB
5	Loading conditions	T1	2	6	BB
6	Classes of duty	R3	1	7	BB
7	Selection of power rating for drive motors with regard to thermal overloading (short time duty)	R2	1	8	BB
8	Selection of power rating for drive motors with regard to thermal overloading (continuous and intermittent duty) , Summary	T2	1	9	BB

### Unit II: DRIVE MOTOR CHARACTERISTICS

Mechanical characteristics – Speed-Torque characteristics of various types of load and drive motors – Braking of Electrical motors – DC motors: Shunt, series and compound - single phase and three phase induction motors.

Session No	Topics to be covered	Ref. book	No. of periods	Cu. No of periods	Teaching Method
9	Speed-Torque characteristics of various types of load	T1	1	14	BB
10	Speed – Torque Characteristics of DC motors	T2	1	15	BB
11	Braking of Electrical motors-Types	T1	1	16	BB
12	Braking of DC shunt motor	T1	1	17	BB
13	Braking of DC series motor	T1	1	18	BB
14	Braking of DC compound motor	R3	1	19	BB
15	Speed – Torque Characteristics of AC motors	R2	1	20	BB
16	Braking of three phase induction motors	R1	1	21	BB
17	Braking of single phase induction motors	R3	1	22	BB
18	Problems related to N-T characteristics and braking for DC and AC motors	R3	1	22	BB

### Unit III: STARTING METHODS

Types of D.C Motor starters – Typical control circuits for shunt and series motors  
– Three phase squirrel cage and slip ring induction motors.

Session No	Topics to be covered	Ref. book	No. of periods	Cu. No of periods	Teaching Method
20	Need for starters, Two point starters	R1	1	23	BB
21	Three Point starters,	T2	1	24	BB
22	Four Point starters	T2	1	25	BB
23	Typical control circuits for shunt motors	T1	1	26	BB
24	Typical control circuits for series motors	R2	1	27	BB
25	DOL starter, primary resistor starter, Autotransformer starter	T2	2	28	BB
26	Star-Delta starter, Rotor resistance starter	T2	1	29	BB
27	Problems and Summary	T1	1	30	BB

### Unit IV: CONVENTIONAL AND SOLID STATE SPEED CONTROL OF D.C. DRIVES

Speed control of DC series and shunt motors – Armature and field control, Ward-Leonard control system - Using controlled rectifiers and DC choppers –applications.

Session	Topics to be covered	Ref.	No. of	Cu.	Teaching
---------	----------------------	------	--------	-----	----------

No		book	periods	No of periods	Method
28	Speed control of DC series motors	T2	1	32	BB
29	Speed control of DC shunt motors	R2	1	33	BB
30	Ward-Leonard control system, Problems	R1	1	34	BB
31	Basics of controlled rectifiers, choppers	T1	1	35	BB
32	Converter fed DC motor control	T1	1	36	BB
33	Problems	T2	1	37	BB
34	Chopper fed DC motor control	R3	1	38	BB
35	Problems	R2	1	39	BB
36	Applications, Summary	R2	1	40	BB

### Unit V: CONVENTIONAL AND SOLID STATE SPEED CONTROL OF A.C. DRIVES

Speed control of three phase induction motor – Voltage control, voltage / frequency control, slip power recovery scheme – Using inverters and AC voltage regulators – applications.

Session No	Topics to be covered	Ref. book	No. of periods	Cu. No of periods	Teaching Method
38	Speed control of three phase induction motor- Stator Voltage control, V/f control	T2	1	41	BB
39	Pole changing method, Cascade control, Rotor resistance control, Problems	T1	1	42	BB
40	Slip power recovery scheme - concept	R2	1	43	BB
41	Static Scherbius and Kramer method	R3	1	44	BB
42	Basics of inverters and AC voltage regulator	R4	1	45	BB
43	VSI fed Induction motor control	T2	1	46	BB
44	CSI fed Induction motor control	T1	1	47	BB
45	Supply Voltage control using AC Voltage regulator	T1	1	48	BB
46	Tutorial	T2	1	49	BB
47	Summary of all Units, Question paper discussion	T2	1	50	BB

**Text Book:**

1. Vedam Subrahmaniam, "Electric drives (concepts and applications)",
2. Nagrath.i.j. & Kothari.d.p, "Electrical machines", tata mcgraw-hill, 1998

**References:**

1. Pillai.S.K "A first course on Electric drives", Wiley Eastern Limited, 1998
2. M.D.Singh, K.B.Khanchandani, "Power Electronics", Tata McGraw-Hill, 1998
3. Dubey G K, "Fundamentals of Electrical Drives", Narosa publishing house, Edition 2
4. Theraja, B.L; Theraja, A.K., "Textbook Of Electrical Technology Volume II: Ac And Dc Machines", S. Chand publisher

	<b>Prepared by</b>	<b>Verified by</b>	<b>Approved by</b>
<b>Signature</b>			
<b>Name</b>	<b>M.PURUSHOTHAMAN</b>	<b>Prof A. BALAMANI</b>	<b>Dr. S M. KANNAN</b>
<b>Désignation</b>	AP/EEE	HOD/EEE	PRINCIPAL
<b>Date</b>			