SARDAR RAJA COLLEGE OF ENGINEERING, ALANGULAM

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

MICRO LESSON PLAN

SUBJECT : SOLID STATE DRIVES

CODE : EE 2352

CLASS : III Year / VI SEM

STAFF: Ms. M.RATHIKA,

A.P/EEE

EE 2352 SOLID STATE DRIVES L T P C

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UNIT I DRIVE CHARACTERISTICS 9

Equations governing motor load dynamics - steady state stability - Multi quadrant dynamics - Acceleration, deceleration, starting and stopping - load torque characteristics of various drives.

UNIT II CONVERTER / CHOPPER FED DC MOTOR DRIVE 9

Steady state analysis of the single and three phase fully controlled converter fed separately excited D.C motor drive - Continuous and discontinuous conduction Time ratio and current limit control - 4 quadrant operation of converter.

UNIT III DESIGN OF CONTROLLERS FOR DRIVES 9

Transfer function for DC motor, load and converter – Closed loop control with current and speed feedback - Armature voltage control and field weakening mode control, Design of controllers: Current controller and speed controller - Converter selection and characteristics - Use of simulation software package.

UNIT IV INDUCTION MOTOR DRIVES 9

Stator voltage control – energy efficient drive - v/f control, constant air-gap flux – field weakening mode - voltage/current fed inverters - Block diagram of vector control - closed loop control.

UNIT V SYNCHRONOUS MOTOR DRIVES 9

V/f control and self-control of synchronous motor – Marginal angle control and power factor control - Permanent magnet synchronous motor Black diagram of closed loop control.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Gopal K.Dubey, “Power Semi conductor controlled drives “ Prentice Hall Inc., New Jersey 1989.
2. Bimal K. Bose. ‘Modern Power Electronics and AC Drives’, PHI / Pearson Education, 2002.

REFERENCES:

1. N.K.De and S.K.Sen Electrical Drices" PHI, 2006 9th print.
2. Murphy J.M.D. and Turnbull, " Thyristor control of AC Motor" Pergamon Press Oxford 1988.
3. R. Krishnan, 'Electric Motor & Drives Modeling, Analysis and Control', Prentice Hall of India, 2001.

SUBJECT DESCRIPTION AND OBJECTIVES

DESCRIPTION

A system which is modernized and equipped with automation only by means of drives and control. In this subject we are classifying the drives concept in to three major areas such as

- ✓ Drives and its characteristics
- ✓ Controllers

Drives and its characteristics:

Growth in power electronics and power system are highly based on AC motor applications since the AC machines are compact to work and it can be provided with a AC supply for cheaper price and simplicity. It also includes the higher end application of induction motor drives. These are the widest topic in drives system since it covers both micro and macro level controllers. DC systems are more flexible to all areas of power system and seem to be compact as a portable device with high range of accuracy.

Controllers:

A system seems to be efficient and accurate only by means of its switching response. A mathematical model of the systems is derived to analyze the accurate mechanism of drives. It enhance the switching mechanism by controlling switching components based on simulation results of a dynamic model with real time applications

OBJECTIVE:

- To understand the stable steady-state operation and transient dynamics of a motor-load system.
- To study and analyze the operation of the converter / chopper fed dc drive and to solve simple problems.
- To study and understand the operation of both classical and modern induction motor drives.
- To understand the differences between synchronous motor drive and induction motor drive and to learn the basics of permanent magnet synchronous motor drives.
- To analyze and design the current and speed controllers for a closed loop solid-state DC motor drive and simulation using a software package

MICRO LESSON PLAN

Hours	LECTURE TOPICS	READING
UNIT I DRIVE CHARACTERISTICS		
1	Equations governing motor load dynamics	T1
2	steady state stability	T1
3	Multi quadrant dynamics	T1
4,5	Acceleration, deceleration, starting and stopping	T1
6,7,8,9	load torque characteristics of various drives	T1
UNIT II CONVERTER / CHOPPER FED DC MOTOR DRIVE		
10,11,12	Steady state analysis of the single and three phase fully controlled converter fed separately excited D.C motor drive	T1
13,14	Continuous and discontinuous conduction Time ratio and current limit control	T1
15,16,17	4 quadrant operation of converter	T1
18,19,20	Problem Solving	T1
UNIT III DESIGN OF CONTROLLERS FOR DRIVES		
21,22	Transfer function for DC motor, load and converter	T1
23,24	Closed loop control with current and speed feedback	T1
25	Armature voltage control and field weakening mode control	T1
26,27	Design of controllers: Current controller and speed controller	T1
28	Converter selection and characteristics	T1
29	Use of simulation software package	T1

UNIT IV INDUCTION MOTOR DRIVES		
30	Stator voltage control	T1,T2
31	Energy efficient drive	T1
32	V/f control	T1
33	Constant air-gap flux	T1,T2
34	Field weakening mode	T1
35,36	Voltage/current fed inverters	T1
37	Block diagram of vector control, Closed loop control	T1,T2
38,39,40	Problem Solving	T1
UNIT V SYNCHRONOUS MOTOR DRIVES		
41,42	V/f control	T1
43	self-control of synchronous motor	T1
44	Marginal angle control	T1
45,46	power factor control	T1
47,48,49	Permanent magnet synchronous motor Black diagram of closed loop control.	T1

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