SRI VIDYA COLLEGE OF ENGINEERING & TECHNOLOGY

COURSE PLAN (THEORY)

ACADEMIC YEAR: 2018-19

Subject Code	EE6601	L	P	T	C
Subject Title	SOLID STATE DRIVES	3	0	0	3
Year / Dept / Sem	III / EEE/ VI	Regulation Year	2013		
Faculty Name / Desg / Dept	Ms.K.PADUKOLAI / Asso Professor / EEE				
Course Prerequisite	1.Knowledge in Basics Of Electrical And Electronics Engineering 2.Knowledge in Power Electronics				
Attach the copy of syllabus					
Course Objectives (CO)	CO1: To understand steady state operation and transient dynamics of a motor load system CO2: To study and analyze the operation of the converter/chopper fed dc drive, both qualitatively and quantitatively. CO3: To study and understand the operation and performance of induction motor drives. CO4: To study and understand the operation and performance of synchronous motor drives. CO5: To analyze and design the current and speed controllers for a closed loop solid state DC motor drive.				
Expected Course Outcomes (ECO)	At the end of the course, the students should be able to: ECO1:Understand the steady state operation and transient dynamics of a motor load system ECO2: Understand the the operation of the converter/chopper fed dc drive, both qualitatively and quantitatively. ECO3: Understand the operation and performance of induction motor drives. ECO4: Understand the operation and performance of synchronous motor drives. ECO5: Understand to design the current and speed controllers for a closed loop solid state DC motor drive.				

Mapping of CO & PO(Specify the PO's) - *(Fill the col.s with the legend given below)*

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

Bridging the Curriculum Gap	BCG1: Design Of Controllers-Implemention In Matlab

(Additional Topics beyond syllabus/Seminars/Assignments)	
Related Website URLs	W1: https://www.scribd.com/doc/274734114/255722651-Fundamentals-of-Electric-Drives-GK-Dubey-Copy-Copy-pdf W2: http://nptel.ac.in/courses/webcourse-contents/IIT W3:https://docs.google.com/file/d/0B_gTrLYkYZgzWTBvN0NSVlhDMms/edit W4: http://kaliasgoldmedal.yolasite.com/resources/SSD
Related Video Course Materials (min. 3 nos)	V1: http://nptel.ac.in/courses/108105067/ V2: http://www.learnerstv.com/Free-Engineering-Video-lectures-ltv230-Page1.htm. V3: http://nptel.ac.in/courses/108108077/12

S.No	Topic Name	Book & Page no	Mode of delivery	No of hrs	Cumulative hrs
UNIT I - DRIVE CHARACTERISTICS					
1.	Introduction	Notes	--	1	1
2.	Electric drive	R7-1.2	PPT	1	2
3.	Equations governing motor load dynamics	1.8	--	1	3
4.	steady state stability	1.19	--	1	4
5.	Typical load torque characteristics	1.10	--	1	5
6.	Multi quadrant	1.13	--	2	7
7.	Dynamics: acceleration, deceleration, starting & stopping	1.21	--	2	8
8.	Selection of motor	1.4	--	1	9
UNIT II - CONVERTER / CHOPPER FED DC MOTOR DRIVE					
9.	Introduction	Notes	--	1	10
10	DC motor,types	R7-2.1-2.4	PPT	2	11
11	Speed and Torque equation	2.5-2.7	--	1	12
12	Charactertics of DC motors	2.7-2.14	--	1	13
13	Conventional speed control of DC motor	2.15-2.28	--	2	15
14	Solid state speed control of Dc motor	2.29	--	1	16
15	single phase converter fed separately excited DC motor drive	2.30-2.57	--	2	18
16	Three phase converter fed separately excited DC motor Drive	2.80-2.84	--	2	20
17	Dual converter	2.91-2.96	--	1	21
18	Time ratio and current limit control	3.9-3.12	--	1	22
19	4 quadrant operation of chopper fed drive.	3.1-3.8	-	3	25
UNIT III - INDUCTION MOTOR DRIVES					
20	Introduction	R7-5.1-5.17	--	1	26
21	Stator voltage control	5.23-5.30	--	2	27
22	v/f control	5.63-5.70	--	2	29
23	constant airgap flux	5.75	--	2	31
24	voltage source fed inverter	5.78-5.83	--	1	32
25	Current source fed inverter	5.86-5.88	--	1	33
26	closed loop control	5.88-5.91	--	1	34
UNIT IV - SYNCHRONOUS MOTOR DRIVES					
27	Introduction	R7-6.1-6.8	--	1	35

28.	V/f control		--	1	36
29.	self control	6.11	--	2	38
30.	Margin angle control	6.13	--	2	40
31.	power factor control	6.22	--	1	41
32.	permanent magnet synchronous motor.	6.22	PPT	2	43
	UNIT V - PERMANENT MAGNET SYNCHRONOUS MOTORS				
33.	Introduction	R7-4.1	--	1	44
34.	closed loop control of electric drive	4.1-4.4	Video	1	45
35.	closed loop control with speed feedback–armature voltage control and field weakening mode	4.4	--	1	46
36.	Transfer function for converter	4.12	--	2	48
37.	speed controller	4.15	--	2	50
38.	Current controller	4.19	--	1	51
39.	converter selection and characteristics.	4.28	--	1	52

	Prepared by	*Approved by*
Signature		23/10/18
Name	Ms.K.PADUKOLAI	Mr.P.I.D.T.BALA DURAI KANNAN
Designation	Asso Professor / EEE	Assistant Professor & HOD /EEE
Signed date	23.10.18	23/10/18

LEGEND:

METHODOLOGY TO MAP OBJECTIVE WITH OUTCOME

Endorsed

Course outcomes are achieved through

a. Class room teaching.
b. Assignments.
c. Tutorials
d. Weekly, monthly and model exams.
e. Seminars

TEXT BOOKS:

1. Gopal K.Dubey, Fundamentals of Electrical Drives, Narosa Publishing House, 1992.
2. Bimal K.Bose. Modern Power Electronics and AC Drives, Pearson Education, 2002.
3. R.Krishnan, Electric Motor & Drives: Modeling, Analysis and Control, Prentice Hall of India, 2001.

REFERENCES:

1. John Hindmarsh and Alasdain Renfrew, "Electrical Machines and Drives System," Elsevier 2012.
2. Shaahin Felizadeh, "Electric Machines and Drives", CRC Press(Taylor and Francis Group), 2013.
3. S.K.Pillai, A First course on Electrical Drives, Wiley Eastern Limited, 1993.
4. S. Sivanagaraju, M. Balasubba Reddy, A. Mallikarjuna Prasad "Power semiconductor drives" PHI, 5th printing, 2013.
5. N.K.De., P.K.SEN"Electric drives" PHI, 2012.
6. Vedam Subramanyam, "Thyristor Control of Electric Drives", Tata McGraw Hill, 2007.
7.J.Gnanavadivel,Dr.J.karthikeyen,B.santhi,"solid state drives"Anuradha publications.

EE6601 SOLID STATE DRIVES L T P C
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OBJECTIVES:

- To understand steady state operation and transient dynamics of a motor load system.
- To study and analyze the operation of the converter/chopper fed dc drive, both qualitatively and quantitatively.
- To study and understand the operation and performance of AC motor drives.
- To analyze and design the current and speed controllers for a closed loop solid state DC motor drive.

UNIT I DRIVE CHARACTERISTICS 9

Electric drive – Equations governing motor load dynamics – steady state stability – multi quadrant Dynamics: acceleration, deceleration, starting & stopping – typical load torque characteristics – Selection of motor.

UNIT II CONVERTER / CHOPPER FED DC MOTOR DRIVE 9

Steady state analysis of the single and three phase converter fed separately excited DC motor drive–continuous and discontinuous conduction– Time ratio and current limit control – 4 quadrant operation of converter / chopper fed drive.

UNIT III INDUCTION MOTOR DRIVES 9

Stator voltage control–energy efficient drive–v/f control–constant airgap flux–field weakening mode – voltage / current fed inverter – closed loop control.

UNIT IV SYNCHRONOUS MOTOR DRIVES 9

V/f control and self control of synchronous motor: Margin angle control and power factor control – permanent magnet synchronous motor.

UNIT V 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 – Design of controllers; current controller and speed controller- converter selection and characteristics.

- Ability to understand and apply basic science, circuit theory, Electro-magnetic field theory control theory and apply them to electrical engineering problems.

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2. Bimal K.Bose. Modern Power Electronics and AC Drives, Pearson Education, 2002.
3. R.Krishnan, Electric Motor & Drives: Modeling, Analysis and Control, Prentice Hall of India, 2001.

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