

ERODE SENGUNTHAR ENGINEERING COLLEGE



(An Autonomous Institution, Affiliated to Anna University) PERUNDURAI, ERODE - 638 057

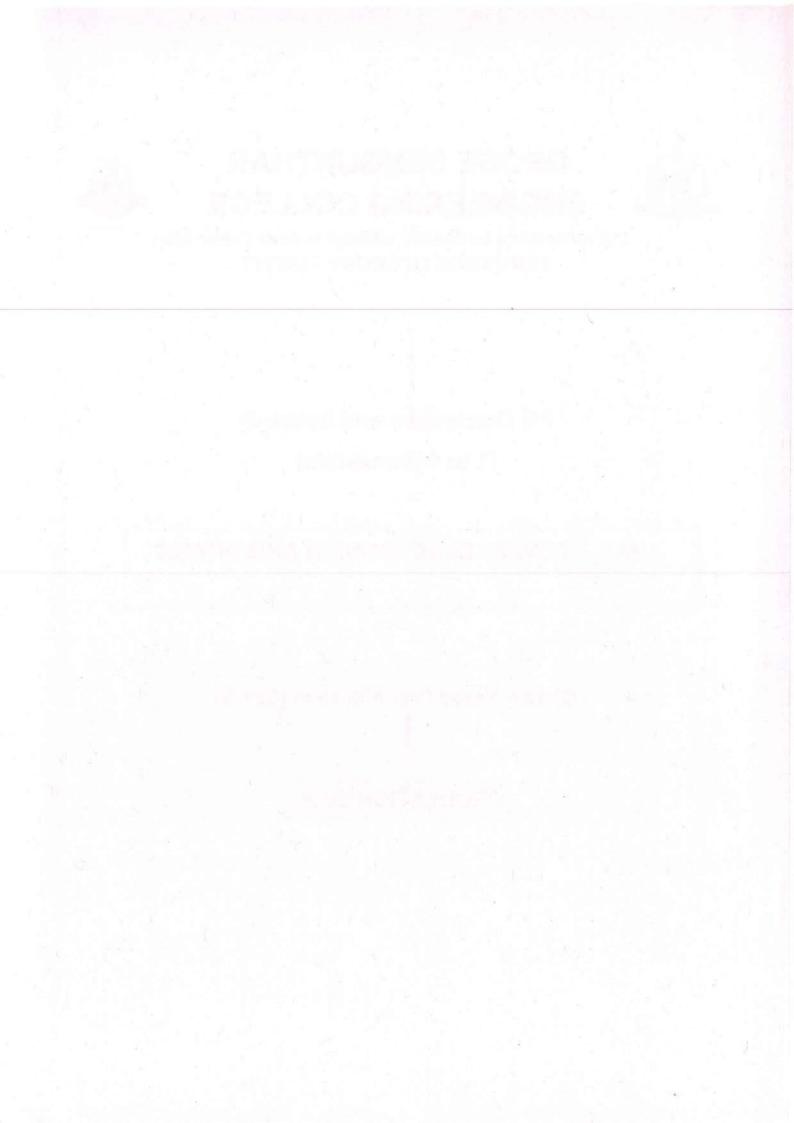
PG Curriculum and Syllabus

(1 to 4 Semesters)

M.E – POWER ELECTRONICS AND DRIVES

Choice Based Credit System (CBCS)

REGULATION 2019



ERODE SENGUNTHAR ENGINEERING COLLEGE, ERODE

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING REGULATION – 2019

CHOICE BASED CREDIT SYSTEM

I TO IV SEMESTERS CURRICULUM

		FIR	ST S	EME	STER				
Code No.	Course	L	Т	Р	С	Maximum Marks			Catagor
Code No.	Course	L	1	P	C	CA	ES	Total	Category
19PE101	Calculus of Variations and Optimization Techniques	3	1	0	4	40	60	100	FC
19PE102	Power Quality Problems and Solutions	3	0	0	3	40	60	100	PC
19PE103	Design and Analysis of Converters	3	0	0	3	40	60	100	PC
19PE104	Design and Analysis of Inverters	3	0	0	3	40	60	100	PC
19PE105	System Theory	3	0	0	3	40	60	100	PC
	Professional Elective I	3	0	0	3	40	60	100	PE
	A lot in the second second	Pl	RAC	TICAI	S				
19PE106	Power Electronic Circuits Laboratory	0	0	2	1	60	40	100	PC
19PE107	Technical Seminar-I	0	0	2	0	100	0	100	EEC
	Total	18	1	4	20	400	400	800	-

				SEMI	STER	1			1
Code No.	Course	L	Т	Р	с	Ma	Category		
coue mo.	course	L	1	-	C	CA	ES	Total	Category
19PE201	Research Methodology	3	0	0	3	40	60	100	PC
19PE202	Solid State Drives	3	0	0	3	40	60	100	PC
19PE203	Power Converters for Renewable Energy Systems	3	0	0	3	40	60	100	PC
19PE204	Modeling and Analysis of Electrical Machines	3	0	0	3	40	60	100	PC
	Professional Elective II	3	0	0	3	40	60	100	PE
	Professional Elective III	3	0	0	3	40	60	100	PE

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19PE205	Electrical Drives Laboratory	0	0	2	1	60	40	100	PC
19PE206	Mini Project	0	0	2	1	60	40	100	EEC
19PE207	Technical Seminar-II	0	0	2	0	100	0	100	EEC
1. C	Total	18	0	6	20	460	440	900	-

	Υ	THI	RD SI	EMES	TER			. In the second		
C. I. N.	0	L	T	Р	C	Ma	ximum	Marks	Catagom	
Code No	Course	L	T	r	С	CA	ES	Total	Category	
-	Professional Elective IV	3	0	0	3	40	60	100	PE	
	Professional Elective V	3	0	0	3	40	60	100	PE	
	Professional Elective VI	3	0	0	3	40	60	100	PE	
		P	RAC	ΓICAL	S			1	1.12	
19PE301	Project Work - Phase I	0	0	12	6	60	40	100	EEC	
1.	Total	0	0	12	15	180	220	400		

		FOUR	TH	SEME	STER				
Code No	0	L	т	Р	С	Ma	Catagory		
	Course		1			CA	ES	Total	Category
19PE401	Project Work-Phase II	0	0	24	12	60	40	100	EEC
		0	0	24	12	60	40	100	-

	PROFESSIONAL ELECTIVES				
Code No	Course	L	Т	Р	С
	PROFESSIONAL ELECTIVES I				
19PEX01	Embedded Control of Electric Drives	3	0	0	3
19PEX02	Virtual Instrumentation Systems	3	0	0	3
19PEX03	Digital Signal Processors for Modern Industrial Drives	3	0	0	3
19PEX04	Advanced Control of Electric Drives	3	0	0	3
	PROFESSIONAL ELECTIVES II				
19PEX05	FACTS Controllers	3	0	0	3
19PEX06	Smart Grid	3	0	0	3

19PEX07	Harmonics Filter Design	3	0	0	3
19PEX08	Special Machines and their Controllers	3	0	0	3
	PROFESSIONAL ELECTIVES	ш			. de
19PEX09	Modern Industrial Drives	3	0	0	3
19PEX10	Advanced Digital Signal Processing	3	0	0	3
19PEX11	FPGA Controller for Power Electronic Systems	3	0	0	3
	PROFESSIONAL ELECTIVES	IV			
19PEX12	Switched Mode and Resonant Converters	3	0	0	3
19PEX13	Modeling and Control of Power Electronic Systems	3	0	0	3
19PEX14	Power Electronics Applications to Power System	3	0	0	3
	PROFESSIONAL ELECTIVES	V			-
19PEX15	Finite Element Analysis of Electrical Machines	3	0	0	3
19PEX16	Sensors and Instrumentation systems	3	0	0	3
19PEX17	Automotive Electronics	3	0	0	3
	PROFESSIONAL ELECTIVES	VI			
19PEX18	HVDC Systems	3	0	0	3
19PEX19	Optimization Techniques	3	0	0	3
19PEX20	Hybrid Electric Vehicles	3	0	0	3

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Programme	ME - POWER ELECTRONICS	S AND	DRIV	VES		R 2019	Semester I	FC
Course	Course Name	Ho	urs / V	Veek	Credit	Total	Maximu	m
Code	Course Name	L	T	Р	C	Hours	Marks	
19PE101	CALCULUS OF VARIATIONS AND OPTIMIZATION TECHNIQUES	3	1	0	4	60	100	
Study abouStudy abouStudy the v	ve (s): The purpose of learning this course is to at the matrix theory used in electrical engineering at the variations and its applications. Various optimization techniques. Fourier series analyses and Fourier Transform.							
	simultaneous linear and non-linear equations.							
Integrate urGet the ideaUse Fourier	es: At the end of this course, learners will be al ndergraduate fundamentals with advanced know a of optimization and the applications. r series analyses and Fourier Transform to form optimization ideas to solve the functional in rea	wledge nulate	and so					
	ematical problems using numerical methods.	ar time.			<u> </u>			
1700.20	LCULUS OF VARIATIONS							12
dependent on fur methods Unit II COM	properties–Euler's equation–Functional dep nctions of several independent variables–So NSTRAINED OPTIMIZATION TECHNIQ prithms: Classifications – optimality criteria –	ome aj	oplicat	ions–l	Direct met	hods: Ritz	and Kantoro	12
multivariable opti	imization: Newton's method - constrained opti							
	EAR PROGRAMMING PROBLEMS				12			12
Graphical Metho	d - Simplex Method - Two phase Method-Rev	vised S	implex	(Meth	od			1
Unit IV DYNA	AMIC PROGRAMMING	4						12
Dynamic Program Problem of dimen	nming – Recursive nature of computation-F asionality	orward	and	Backv	vard Recur	sion-work	force size mo	del-
Unit V DEC	ISION ANALYSIS and GAME THEORY		14	14				12
	ls – Decision making under risk – Decisi Two person zero sum games – Graphical s						ncertainty(AH	(P)-
REFERENCE(S)	Chaiman Ros		1			L.		
1. Lev Elsgolts,	Differential equations and Calculus of Variati	ons, U	niversi	ity Pre	ss of the Pa	acific, 2003		
	Numerical methods for scientists and Engineer	rs, Thir	d editi	on, Pr	entice Hall	of India lea	rning	21
Pvt. Ltd, New	v Delhi, 2009							
Eleanor Chu,	v Delhi, 2009 Discrete and continuous Fourier transforms. Ancis Group, 2008	Analysi	s, App	licatio	ons and Fas	t Algorithm	s,	

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Chairman - BoS Dept. of Maths - ESEC

P3L Chairman - BoS Dept. of EEE - ESEC

Programme	ME - POWER ELECTRONICS	SAN	D DR	IVES		R 2019	Semester I PC
Course Code	Course Name Hours / Week Credi t Total Max					Maximum	
Code	and the state of the second	L	T	P	C	Hours	Marks
19PE102	POWER QUALITY PROBLEMS AND SOLUTIONS	3	0	0	3	45	100
 Obtain th Determin Understan Analyze t Determin Course Outcon Understan Classify p Mitigate p Recognize 	tive (s): The purpose of learning this course the characteristic of different types of power of the causes and effects of power quality pro- nd various power quality problems, their mi- the supply system with linear and non-linear the effects of harmonics on various equipar- mes: At the end of this course, learners will ad the various Power quality problems and the ower quality events according to IEEE, ITIC power quality parameter like harmonics, vol- e symptoms of power quality problems in s, transients, electrical noise (EMI/RFI/E	qualit oblen tigati r load ment. be ab heir e C (CE tage s acludi	ins in c on an and s le to: ffects EBNA ag, tra ag, tra	d mea source) and ansien gs, sv	suring tec public uti its etc vells, und	hniques. lity standa	voltage,
 Understan 	d power quality monitoring and classification	on tec	hniqu	ies.		÷	
	RODUCTION definitions -Power quality issues: Short						9
Unit II AN Single phase line nonlinear load –	ALYSIS OF SINGLE PHASE AND THR ear and non linear loads – single phase sinu- three phase Balance system – three phase supplying non linear loads – concept of po	REE F usoida e un	PHAS al, nor balan	E SY n sinu ced sy	STEM soidal sou /stem – tł	ree phase	unbalanced and
and the second distance in the second distanc	NVENTIONAL LOAD COMPENSATIO	N M	ETH	ODS		1	9
- Closed loop b	d compensation and Voltage regulation – Cl balancing, Current balancing – Harmonic antaneous real and reactive powers – Extrac	redu	ction	and v	voltage sa	ng reduction	on – Analysis o
	D COMPENSATION USING DSTATCO						9
currents using in currents when the control mode.	single phase loads – Ideal three phase sh astantaneous PQ theory – Instantaneous syn he source is unbalanced – Realization and	nmetr contr	ical c ol of	ompo DST A	nents the ATCOM -	ory - Gene	erating reference COM in Voltage
	IES COMPENSATION OF POWER DIS	-	A.S. 18538 - 10	2452340A0A04045		DUD C	9
	rted Dynamic Voltage Restorer – DC Cap eries Active Filter – Unified Power Quality				DVK -	DVK SIN	icture – voltage
TEXT BOOK(S		2 ond			1	1	7.8.1.
ArindamGho 2002	osh "Power Quality Enhancement Using Cu	istom	Powe	er Dev	vices", Klu	uwer Acad	emic Publishers,
" Quality", Mo	n, Mark.F.McGranaghan,SuryaSantoas and cGraw-Hill, 2004.					l Power S	ystem
	'Electric Power Quality", Stars in a Circle F						
Bhim Singh,	Ambrish Chandra, Kamal Al-Haddad, "Po	ower (Qualit	y: Pro	blems an	d Mitigatio	on

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	Techniques", John Wiley & Sons,2015.
RF	CFERENCE(S):
1.	Jos Arrillaga and Neville R. Watson," Power system harmonics", Wiley, 2003.
2.	Derek A. Paice, "Power Electronics Converter Harmonics :Multipulse Methods for Clean Power", Wiley, 1999.
3.	Ewald Fuchs, Mohammad A. S. Masoum Power Quality in Power Systems and Electrical Machines, Elseveir academic press publications, 2011.

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Program	me ME - POWER ELECTRONIC	CS AN	D DR	IVES	6	R 2019	Semester I	PC
Course Code	Course Name	Hou	irs / V	Veek	Credi t	Total	Maximur Marks	n
Coue		L	T	P	C	Hours	Marks	
19PE103	DESIGN AND ANALYSIS OF CONVERTERS	3	0	0	3	60	100	
 Obta Deter Appl Deter Deter Course Ou Analy Deter Deter Deter Deter Deter Deter Deter Deter Construction GTOs - Gat snubber circ 	jective (s): The purpose of learning this course in the switching characteristic of Power diodes rmine the operation, characteristics and perform y switching techniques and basic topologies of rmine the operation, characteristics and perform teomes: At the end of this course, learners will yze the characteristics of Power electronics dev rmine the various parameters of single phase an onstrate the response of chopper for a DC load gn a PWM converter and an AC voltage regular yze the performance of Matrix converter. POWER DIODES AND THYRISTORS h, operation, types, switching and steady state the circuit requirements – Protection – Series uits – Commutation.	s and T mance f DC-D mance mance l be ab vices. nd thre tor.	paran DC sw paran paran de to: e phas	neters itchin neters neters se rect	g regulat of AC of Mat tifier.	-AC conver rix conver	rters. ter.	n of
Unit II	AC-DC CONVERTER							12
impedance a converter cir	and Three phase half controlled and fully con and overlap- Performance parameters: harm cuits – power factor correction rectifiers – Fou DC-DC CONVERTERS	nonics,	rippl	le, dis	stortion,	converters power fac	- Effect of sou ctor - Design	of
	step-down and step-up converters – Control step-down and step-up converters – High frequency isolated DC ·						ck- Boost, CU	К,
	AC – AC CONVERTERS					mopperor		12
configuration	phase control and ON-OFF control – Single pl ns – PWM schemes – Single phase and three p	hase ar bhase C	nd thre Cyclo	ee pha	nse AC vo erters - SM	oltage cont MPS – type	rollers – Vario es and design.	
	MATRIX CONVERTER				-			12
input curren	e and three phase Matrix Converters – types – t, input and output power factors – PWM sche							ge,
TEXT BOO		1.10		1		Starley Law		
Ned Mo	ashid, Power Electronics: Circuits, Devices and han, Tore M. Undeland and William P.Robbin							
	New Jersey, John Wiley and Sons, 2007.		er En	cetton	nes. con	verters, rip	prications and	
REFEREN	CE(S):							
	, Chris Mi, Transients of Modern Power Electr						1.1.1.515	
2. M.H. Ra of India,	shid, Hand Book of Power Electronics: Circui 2007.	its, De	vices	and	Applicat	ion, New I	Delhi, Prentice	Hall
3. Marty B	rown, Power sources and supplies Newnes, Els	sevier,	Secor	nd edi	tion,2010).		

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Programme	ME - POWER ELECTRONI	1			1	R 2019	Semester I	-
Course	Course Name	Hours / Week Credit Total L T P C Hours 3 0 0 3 6					Maximur	n
Code	course nume	L	Т	Р	С	Hours	Marks	
19PE104	DESIGN AND ANALYSIS OF INVERTERS	3	0	0	3	60	100	
Course Objectiv	e (s): The purpose of learning this cour	se is to				10.00		
	le the electrical circuit concepts behind	the diffe	erent	workir	ng modes	of inverter	s so as to enal	ble
	erstanding of their operation.							
	with required skills to derive the criteria							etc.,
 Ability to converter 	analyze and comprehend the various of	perating	mode	es or d	merent c	onnguratio	ons of power	
	s. design different single phase and three	phase in	nverte	ers				
	working of advanced types of inverters				inverters	and resona	nt inverters.	
	es: At the end of this course, learners wi					w ^a	2	
• Understar	nd the characteristics of power diodes an	nd powe	r han	dling o	capability	of switchi	ng devices	
 Understar 	nd the static and dynamic characteristics	of curr	ent co	ontroll	ed power	semicondu	ictor devices	
 Understar 	nd the static and dynamic characteristics	of volta	age co	ontroll	ed power	semicond	actor devices	
	e students for the selection of firing and	protect	ion ci	rcuit f	or differe	nt power s	emiconductor	
switches								
the second s	nd the methods of thermal protection for							
	ER DEVICES AND PROTECTION							12
	eration, Circuit model and switching	characte	eristic	s of-	MOSFE	r, IGBT a	nd IGCT- O	pto
	circuits- Design of heat sinks.	-						10
	TAGE SOURCE INVERTERS							12
	d parallel inverter. Single phase and T						nce parameter	rs –
	with Fourier series analysis - Various h			ninatio	n techniq	ues.		10
	RENT SOURCE AND Z-SOURCE IN			_				12
	d current source inverter- Single phase							
	ble of operation of Z- source inverter-							
inverter.	eners – comparison of current source i	inverter,	von	age se	funce mive	and i	inpedance so	ince
	TILEVEL INVERTERS		1.1	-				12
Multilevel concer	ot - Diode clamped - Flying capacitor -	Cascad	le tvp	e mult	ilevel inv	verters - H	vbrid multi le	vel
	lysis- Comparison of multilevel inverter							
	NANT INVERTERS				J			12
Concept of Zero	Voltage Switching and Zero Current	Switch	ning -	Serie	es and pa	arallel reso	nant inverter	s -
	f resonant inverters – Class E resonant		-					
TEXT BOOK(S)	:	1. 10	11.1		1. 1. 1		util al pr	
1. M.H. Rashid	"Hand Book of Power Electronics: C	ircuits,	Devi	ces an	d Applic	ation", Ne	w Delhi, Prer	
								ntice
Hall of India,								ntice
Ned Mohan,	Fore M.Undeland and William P.Robbi		ver E	lectro	nics: Cor	nverters, A	pplications	ntico
2. Ned Mohan, and Design",	Fore M.Undeland and William P.Robbi 3rd Edition, John Wiley and Sons, 2007		ver E	lectro	nics: Cor	nverters, A	pplications	ntice
2. Ned Mohan, and Design", REFERENCE(S Vinu V. D	Fore M.Undeland and William P.Robbi 3rd Edition, John Wiley and Sons, 2007	7. ternation	nal (Confer	ence on	Trends	in Informat	
REFERENCE(S 1. Vinu V. D Telecommuni	Fore M.Undeland and William P.Robbi 3rd Edition, John Wiley and Sons, 2007): as, "Proceedings of the Third Info cation and Computing Engineering", Sp se, "Modern Power Electronics and Mo	ternation	nal (Scien	Confer ce & E	ence on Business M	Trends Media, 201	in Informat 2.	ion,
Hall of India, Ned Mohan, ' and Design'', REFERENCE(S) I. Vinu V. D Telecommuni 2. Bimal K. Bos Education, 20	Fore M.Undeland and William P.Robbi 3rd Edition, John Wiley and Sons, 2007): as, "Proceedings of the Third Int cation and Computing Engineering", Sp se, "Modern Power Electronics and Mo 06. , Power sources and supplies Newnes, E	7. ternation pringer S tor Driv	nal (Sciend ve- Ad	Confer ce & E Ivance	rence on Business M es and Tro	Trends Media, 201 ends", 2nd	in Informat 2.	ion,
Hall of India, Ned Mohan, ' and Design", REFERENCE(S) 1. Vinu V. D Telecommuni 2. Bimal K. Bos Education, 20	Fore M.Undeland and William P.Robbi 3rd Edition, John Wiley and Sons, 2007): as, "Proceedings of the Third Int cation and Computing Engineering", Sp se, "Modern Power Electronics and Mo 06.	7. ternation pringer S tor Driv	nal (Sciend ve- Ad	Confer ce & E Ivance	rence on Business M es and Tro	Trends Media, 201 ends", 2nd	in Informat 2.	ion,

Chairman - BoS Dept. of EEE - ESEC

Programme	ME - POWER ELECTRON	NICS AN	D DR	IVES		R 2019	Semester I	PC
Course Code	Course Name	Hou	irs / V	Week	Credi t	Total	Maximu Marks	
coue		L	Τ	Р	C	Hours	Marks	
19PE105	SYSTEM THEORY	3	0	0	3	60	100	
 To understa 	(s): urning this course is and the basic concepts of state variab and the concepts of state equation.	ole represe	entatio	on.				
To acquireTo analyzeTo understa	the knowledge about controllability the stability of non linear systems. and the concepts of stability analysis							
	: At the end of this course, learners							
	nderstood the basic concepts of state		repres	sentati	on.			
	nderstood the concepts of state equat equired the knowledge in controllabi		h	-1-:1:4-				
	ble to analyze the stability of non line			aomty				
	derstood the concepts of stability ar		15.					
Unit I STATI	E VARIABLE REPRESENTATIO	DN					· · · · · · · · · · · · · · · · · · ·	12
Introduction-Conce	pt of State-State equation for D	Dynamic	Syste	ms-Ti	me invar	iance and	linearity- 1	Von
	model-State Diagrams-Physical Sys	stem and S	State /	Assign	ment.			110
	FION OF STATE EQUATION	6 10 IN						12
	ueness of solutions to Continuous-ti ations-State transition matrix and							
	en values and Eigenvectors.	it's prope	crues.	-Lvaiu		maura caj	ponentiai-sys	tem
	ROLLABILITY AND OBSERVA	BILITY	-					12
General concept o	f Controllability - General concept	of Observ	vabili	ty & (Controllal	bility tests	for Continuo	us –
	stems - Observability tests for Co							
Observability of st State model.	tate model in Jordan Canonical for	m - Conti	rollab	ility a	nd Obser	vability Ca	anonical form	is of
	ontrollers and Observers: State Feed	lback Co	ntrolle	er desi	ion throug	oh Pole As	signment - S	State
	er and reduced order.	action con	in one	er desi	ign throug		Significant .	June
Unit IV NON-L	INEAR SYSTEMS							12
Phenomenon etc;-	Linear Systems - Types of Non-L Singular Points – Introduction to hase Plane analysis - Describing fund	Linearizat	tion c	of non	linear sy	stems, Pro	operties of N	on-
The second se	LITY ANALYSIS							12
instability theorem	Equilibrium Points-Stability in the s s-Stability Analysis of the Linear C of Lyapunov's functions-Krasovsk	Continuous	s time	e invar	iant syste	ems by Lya		
TEXT BOOK(S):		ii diid y di	laore	oradi	ant meth		1.000	-
1. Digital Cont &	State Var Met, Tata McGraw-Hill E	Education,	2012	2		1.1	10.00	
2. K. Ogatta, "Mo	dern Control Engineering, New Del	hi", Prent	ice H	all of	India, 200)9.		
REFERENCE(S):								
	ital Control and State Variable Meth Hill Education, 2003	hods: Con	venti	onal a	nd Neural	l-fuzzy Cor	ntrol Systems	",

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	Seyed Kamaleddin Yadavar Nikravesh,"Nonlinear Systems Stability Analysis: Lyapunov- Based Approach", CRC Press, 2013.
3	Richard L. Dorf and Robert H. Bishop, "Modern control Systems", New Delhi, Prentice Hall of India, 2010.

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Programme	ME - POWER ELECTRO	ONIC	S AN	D DR	IVES	R 2019	Semester I P
Course	Course Name	Hou	irs / V	Veek	Credit	Total	Maximum
Code	coursertune	L	T	Р	С	Hours	Marks
19PE106	E106 POWER ELECTRONIC CIRCUITS LABORATORY	0	0	2	1	30	100
 To make the closed-loop To make the implementing 	(s): The purpose of learning this e students capable of implementin control for power electronic syste e students acquire knowledge on r ing the same using simulation tools the students to design and fabrica	ig anal m nather	og int natica	l mod	eling of p	ower electro	onic circuits and
levels	the students to design and fabrica	ate a p	ower	conve	ner circui	is at apprec	lable voltage / powe
	skills on PCB design and fabricat				dents		
	: At the end of this course, learne				vitabas		
	on the switching behaviour of Po ng on mathematical modeling of					l ability to i	mplement
the same usi	ng simulation tools						
	ontroller and its associated IDE fo implement analog circuits for Pow						
	fabricate a power converter circui						
Ū	LIST						
1. Study of swite MOSFET	ching characteristics of Power ele	ctroni	c swit	ches v	vith and v	vithout Snu	bber (i) IGBT (ii)
2. Modeling and	system simulation of basic electr	ric circ	uits u	sing N	ATLAB-	SIMULIN	K/SCILAB
3. AC Source wi	th Single Diode fed Resistive and	Resis	stive-l	nduct	ive Load		
4. AC source with	th Single SCR fed Resistive and I	Resisti	ve-In	ductiv	e Load		
5. Full Converte	r Fed R, RL and DC Motor Load	at Dif	ferent	Firing	g Angles		
6. Single Phase I	PWM Inverter					Η.Η.	
7. Three Phase P	WM Inverter			2	· · ·		
8. Modeling and	System Simulation of SCR based	l full c	onvei	ter wi	th differen	nt types of l	oad using MATLAE
9. Circuit Simula	tion of Voltage Source Inverter u	ising N	MATI	AB			
10. Circuit Simula	tion of basic electric circuits usin	ig MA	TLAI	3	-		
11. Circuit Simula	tion of basic power electronics ci	rcuits	using	MAT	LAB		
12. Measurement	of Efficiency at different duty cyc	cle wit	h R a	nd RL	Load		
13. Interface the H	Iall effect current sensor and disp	lay the	e curr	ent wa	veform		
	all effect voltage sensor and disp	lay th	e curr	ent wa	veform		
15. Design of Driv	ver circuit using IR 2110						

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Programme	ME - POWER ELECTRO	NICS	AND	DRI	VES	R 2019	Semester I	EEC
Course Code	Course Name		ours Week		Credit	Total Hours	Maximur Marks	n
19PE107	TECHNICAL SEMINAR - I	0	0	2	-	- 30	100	

Course Objective: In this course, students will develop their scientific and technical reading and writing skills that they need to understand and construct research articles. A term paper requires a student to obtain information from a variety of sources (i.e., Journals, dictionaries, reference books) and then place it in logically developed ideas.

TECHNICAL SEMINAR

The work involves the following steps:

- Selecting a subject, narrowing the subject into a topic
- Stating an objective.
- Collecting the relevant bibliography (atleast 15 journal papers)
- Preparing a working outline.
- Studying the papers and understanding the authors contributions and critically analyzing each paper.
- Preparing a working outline
- Linking the papers and preparing a draft of the paper.
- Preparing conclusions based on the reading of all the papers.
- Writing the Final Paper and giving final Presentation

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Programme	ME - POWER ELECTRONIC	CSAN	D DR	IVES		R 2019	Semester I	I P
Course Code	Course Name		urs / V		Credi t	Total Hours	Maximu Marks	
19PE201	RESEARCH METHODOLOGY	L 3	T 0	P 0	C 3	45	100	
	earning this course is stand the basics of Research formulation.	and De	esign					
• To learn S	Soft Computing Algorithms tand Ethics and IPR							
 Understar Collect an Implemen Understan Prepare re 								
	EARCH FORMULATION AND DES							9
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Chairman - BoS Dept. of EEE - ESEC

RE	FERENCE(S):
1.	Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, Ess Ess Publications. 2 volumes
2.	Trochim, W.M.K., 2005. Research Methods: the concise knowledge base, Atomic Dog Publishing.

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Programme	ME - POWER ELECTRO	NICS AN	D DF	RIVES		R 2019	SemesterII	P
Course	Course Name	Hou	irs / V	Week	Credit	Total	Maximu	
Code	e our se riume	L	Τ	Р	C	Hours	Marks	
19PE202	SOLID STATE DRIVES	3	0	0	3	45	100	
 To learn co To learn th To study th To underst 	e (s): The purpose of learning this co- onverter and choppercontrol of DC the concept of closed loop control of the control & estimation of induction r and the control of synchronous mot pout the digital control of drives.	drives. AC drive. notor drive	es.					
 Understar Know abo Able to un Understar 	s: At the end of this course, learners ad the converter and choppercontrol out the control of induction motor du aderstand the speed control of induc ad the control of synchronous motor out the digital control drive.	of DC dri ives. tion motor	ves.					
	ERTER AND CHOPPER CONT	ROL OF	DCI	RIVE	S			9
CONT Unit II CONT DRIVE DRIVE Steady state analys phase induction model – Torque slip chara Contract	is – speed control techniques of ind otors – constant flux operation – dyr acteristics of wound rotor induction	AND WO	UND tor – regen	ROT variab	OR IND	UCTION I ncy operat of CSI and	MOTOR ion of three VSI fed driv	9 /es
	nd super synchronous operation.	DUCTIO		omon				
	ROL AND ESTIMATION OF IN trol of induction machines – DC driv						El	9
estimation - Direct	Torque control strategy of induction	n machine	- Di	orque	expressio	n with state	- Flux vector	luv
Unit IV SYNCE	IRONOUS MOTOR DRIVES	ii maemin	.5 1	orque	capiessio	ii witti stat		9
margin angle contro commutated inverte	r types, open loop VSI fed drive and ol – power factor control – brushless er fed synchronous motor drive.	its charac s excitatio	cterist n syst	ics – s ems –	elf contro closed lo	l model – t op control	orque angle a of load	and 9
	troller characteristics - simulation o	f converte	r and	chopp	er fed de	drive Dh	ase looked h	
	er control of dc drives - selection of							
Bimal K. Bose,	, Power Electronics And Motor Driv	es: Advar	nces a	nd Tre	ends, Aca	demic Pres	s, 2006	
2. Sundareswaran	, K., "Elementary Concepts of Powe	er Electron	nic dr	ives",	CRC Pres	s, 2009, 1 ^s	^t Edition.	
. Vedam Subrar Education, 201	nanyam, Electric Drives: Concep 1	ts & Ap	pl, 2	/E, No	ew Delhi	, Tata Mo	cGraw- Hill	
REFERENCE(S):								
	ower Semiconductor Controlled Dri			· · · · · · · · · · · · · · · · · · ·				
	and Turnbull, Thyristor Control of	AC Moto	rs, Pe	-	n Press, C	Oxford, 197	73.	
P.C. Sen, Thyri								
	stor DC Drives, New York, John W	iely and S	Sons,	1981				

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Course Code 19PE203	Course Nome		30.12	IVES		R 2019	Semester I	_
19PE203	Course Name	Hou L	rs / V	Veek P	Credit C	Total Hours	Maximu Marks	
Commo Ohion	POWER CONVERTERS FOR RENEWABLE ENERGY SYSTEMS	3	0	0	3	45	100	
Course Objec	tive (s): The purpose of learning this course	is	1					
	ose the students to the applications of power		ronics	s in rei	newable e	nergy syst	ems	
	erstand & design the PV systems					0		
	erstand & design the wind energy systems			1.1				
	erstand the concepts of grid connected syste	ems						
	ly about the distributed power systems.							
	mes: At the end of this course, learners will	be ab	le to:	1		e rijetan	a series by	
• Deal w	ith energy sources and energy development	agenc	ies.					
	tand the photovoltaic energy conversion.							
	tand the wind energy conversion systems.							
	te the grid connected system.							
	te the distributed power systems.			-				0
76.1	y consumption - World energy scenario - E	norm/	COURO	a and	thair avai	lability (Conventional	1
	ce - Need to develop new energy technolog							
	India and World.	5103- 1	- I VICI	2 Ituit	s and ree	Sulations	i Ebri wind	and
	OTOVOLTAIC ENERGY CONVERSIO	N		-				1
Solar radiation	and measurements - Solar Panels and its	classif	ficatio	ons –	PV arrays	and their	· characteristi	cs -
	nsulation, temperature-Importance of bypa							
	ct-Maximum power point tracking Algorith							
	esign of Solar PV systems.				-			
Unit III WI	ND ENERGY SYSTEMS		÷		1	12.4		9
Basic principl	e of Wind Energy Conversion System -	Natur	e of	Wind	- Wind	farm and	its accessor	
	f Wind Energy Conversion System -Gen					ifications	of WECS -	ies
	on generator - synchronous generator - Pow	er con	ditio	ning so	chemes.			
	ID CONNECTED WECS AND SECS	1						Se
	l systems — Grid related problems - Grid				tegrated	color DV		Se.
				A 14:1.				Se 9 Grid
Jrid connected	CS -Matrix converters -Line commutated i			viuittie				Se 9 Grid
	WECS - Concept of mini/micro grids and s			viuitiie				Se 9 Grid for
Unit V DIS	WECS - Concept of mini/micro grids and s TRIBUTED POWER SYSTEMS	mart g	grids.		evel inver	ters- Powe	er converters	Se 9 Grid for
Unit V DIS Need for Distri	WECS - Concept of mini/micro grids and s TRIBUTED POWER SYSTEMS buted Systems - Types of Distributed system	mart g ms - H	grids. lybrid	l Syste	evel inver	ters- Powe	er converters	Se 9 Grid for
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Course	ME - POWER ELECTRONIC	CS A	ND I	DRIVI	ES	R 2019	Semester II	PC
Code	Course Name		-	Week	crean	Total	Maximu Marks	
Coue		L	T	P	C	Hours	Warks	
19PE204	MODELING AND ANALYSIS OF ELECTRICAL MACHINES	3	0	0	3	45	100	
	(s): The purpose of learning this course is	s to						
	and the concepts of rotating machines.							
	ference frame theory on Induction machin							
	ference frame theory on Synchronous ma							
the second se	about the equivalent circuit and its param					s.		
	out the construction and operating princip			cial ma	chines.	- Gala		
	: At the end of this course, learners will be	e able	e to:					
	t the concepts of rotating machines.							
	the concept of Reference frame theory.							
	out Synchronous machines with dynamic							
	out the equivalent circuit and its paramete							
	t the construction and operating principle	of sp	ecial	machi	nes.			
Unit I CO	DNCEPTS OF ROTATING MACHINE	S						9
	ap mmf of a single turn full pitch distrib							
short pitched armat	ure coils (AC machines) - Calculation of	air g	ap m	mf of a	a DC mac	hine - Intr	oduction to d	irect
	axis theory in salient pole machines -	Calc	ulatio	on of a	ir gap ind	luctances	of a synchron	nous
machine.							S.	
Unit II INI	DUCTION MACHINE MODELING							
	o o riori initorini in noonen to							9
Static and rotating		tions	hips	- Stati	onary circ	uit variab	les transforme	
Static and rotating the arbitrary Refere	Reference(s): frames, transformation rela	tions	hips / - Aj	- Stati pplicat	onary circ	uit variable erence fra	les transforme me theory to t	ed to
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the arbitrary Refere phase symmetrical Voltage and torque	Reference(s): frames, transformation rela nce frame treating R, L, C elements separ induction machine - Direct and quadratu equations	rately re ax	- Aj	pplicat	ion of Ref	erence fran	me theory to t	ed to three
the arbitrary Refere phase symmetrical Voltage and torque	Reference(s): frames, transformation rela nce frame treating R, L, C elements separ induction machine - Direct and quadratu	rately re ax	- Aj	pplicat	ion of Ref	erence fran	me theory to t	ed to three
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the arbitrary Refere phase symmetrical Voltage and torque Unit III SY Application of ref	Reference(s): frames, transformation rela nce frame treating R, L, C elements separ induction machine - Direct and quadratu equations	rately re ax IG ynchi	ronou	odel in	ion of Ref arbitrarily	erence fran y rotating amic mod	me theory to r Reference fra el analysis-P	ed to three me - 9 ark's
the arbitrary Refere phase symmetrical Voltage and torque Unit III SY Application of ref equation - Voltage	Reference(s): frames, transformation rela nce frame treating R, L, C elements separ induction machine - Direct and quadratu equations NCHRONOUS MACHINE MODELIN Ference frame theory to three phase s	rately re ax IG ynchi eady	ronou state	pplicat odel in us mac e phase	ion of Ref arbitrarily chine-dyna or relation	erence fran y rotating amic mod	me theory to r Reference fra el analysis-P	ed to three me - 9 ark's
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Bly Chairman - Bos Dept. of EEE - ESEC

2.	J. R. Hendershot, James R. Hendershot, Timothy John Eastham Miller, "Design of Brushless Permanent- magnet Machines", Motor Design Books, 2010.	
3.	K.T Chau, ,"Electric Vehicle Machines and Drives: Design, Analysis and Application", John Wiley & Sons, 2015.	

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Chairman - BoS Dept. of EEE - ESEC

Program	me ME - POWER ELECT	RONICS AN	D DI	RIVES	5	R 2019	Semester II	PC
Course	Course Name	Ho	Hours / Week			Total	Maximum	
Code	course maine	L	T	P	С	Hours	Marks	
19PE20	5 ELECTRICAL DRIVES LABORATORY	0	0	2	1	30	100	
• (• E • In Course On • T • T	Design and analyse the various DC and A Generating firing pulses for converters an Design of controllers for linear and nonli mplementation of closed loop system us utcomes : At the end of this course, learn To simulate different types of machines, To analyze the performance of various el To perform both hardware and software s	nd inverters u near systems sing hardware ners will be al converters in ectric drive systems	simul ble : a syst	lation em.	processors			
	LIS	T OF EXPE	RIMI	ENTS				
1: Sp	peed control of Converter fed DC motor		5					
2. Sp	beed control of Chopper fed DC motor				2.12			
3. V/	f control of three-phase induction motor		1					
4. Mi	icrocontroller based speed control of ste	pper motor						
55 Sp	eed control of BLDC motor							
6. DS	SP based speed control of SRM motor							
7. Vo	oltage regulation of three phase synchron	nous generato	r					
8. Cy	clo convertor fed Induction motor drive	,	200			4		V
9. Sin	gle phase Multi Level Inverter based ind	duction motor	· drive	2				
10. Stu	dy of power quality analyzer	/						

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Programme	ME - POWER ELECTRO	DNICS AN	D DR	IVES		R 2019	Semester II EEC	
Course	Course Name	Нот	Hours / Week Cre			Total	Maximum	
Code		L	Т	P	С	Hours	Marks	
19PE206	MINI PROJECT	0	0	2	1	30	100	

Course Objective (s): To impart the theoretical and practical knowledge

- To solve a specific problem right from its identification and literature review till the successful solution of the same.
- To train the students in preparing project reports and to face reviews and viva voce examination

Course Outcomes: At the end of this course, learners will be able to:

- Acquire practical knowledge within the chosen area of technology for project development
- Identify, analyze, formulate and handle programming projects with a comprehensive and systematic approach
- · Contribute as an individual or in a team in development of technical projects
- · Develop effective communication skills for presentation of project related activities

PROCEDURE

A project to be developed based on one or more of the following concepts.

Rectifiers, DC-DC Converters, Inverters, Cyclo Converters, DC drives, AC drives, Special Electrical Machines, Renewable Energy Systems, Linear and non-linear control systems, Power supply design for industrial and other applications, AC-DC power factor circuits, micro grid, smart grid and robotics.

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Programme	ME - POWER ELECTRO	NICS	AND	DRI	VES	R 2019	Semester II	EEC
Course Code	Course Name		ours Week		Credit	Total	Maximum	
in the second		L	Т	Р	C	Hours	Marks	
19PE207	TECHNICAL SEMINAR - II	0	0	2	0	30	100	-

Course Objective: In this course, students will develop their scientific and technical reading and writing skills that they need to understand and construct research articles. A term paper requires a student to obtain information from a variety of sources (i.e., Journals, dictionaries, reference books) and then place it in logically developed ideas.

TECHNICAL SEMINAR

30

The work involves the following steps:

- Selecting a subject, narrowing the subject into a topic
- Stating an objective.
- Collecting the relevant bibliography (atleast 15 journal papers)
- Preparing a working outline.
- Studying the papers and understanding the authors contributions and critically analyzing each paper.
- Preparing a working outline
- Linking the papers and preparing a draft of the paper.
- Preparing conclusions based on the reading of all the papers.
- Writing the Final Paper and giving final Presentation

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Programme	ME - POWER ELECTRO	NICS	AND	DRI	VES	R 2019 S	Semester III	EEC
Course Code	Course Name		ours Weel		Credit	Total	Maximur	n
		L	T	Р	С	Hours	Marks	
19PE301	PROJECT WORK - PHASE I	0	0	12	6	180	100	
beginning stage Methodology	for their final presentation		-					180
faculty member area of construc	ividually works on a specific topic approved who is familiar in this area of interest. It is an approved and management. The detailed report on the work done show the state of the state o	The stu e topic uld be	udent may subm	can s be th nitted	elect any eoretical of which co	topic whi- or case stu ontains cle	ch is relevant idies. At the ar definition	to the end of of the

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Chairman - BoS Dept. of EEE - ESEC

Chairman - 303 Dupt. of ERE - 5950

Programme	ME - POWER ELECTRO	NICS	AND	DRI	VES	R 2019	Semester IV	EEC
Course Code	Course Name		ours Week		Credit	Total	Maximu	m
		L	T	P	С	Hours	Marks	
19PE401	PROJECT WORK - PHASE II	0	0	24	12	360	100	
Methodology	thodologies and stating it to global.			-				360
guidance which is or case s contains and met	dent individually works on a specific e of a faculty member who is familiar is relevant to the area of construction eng tudies. At the end of the semester, a deta clear definition of the identified proble hodology for carrying out the work. tion by a panel of examiners including o	n this ineerin ailed re m, deta The s	area o g and port o ailed tuden	of int d man on the literat ts wi	erest. The nagement. work dor ture review ill be eva	student ca The topic in the should b w related to	n select any may be theo e submitted o the area of	topic retical which work

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Programme	ME - POWER ELECTRON	ICS AN	D DI	RIVES	5	R 2019	Semester I	PE
Course	Course Name	Hou	ars / V	Week	Credit	Total	Maximun	n
Code	A second and a second and a second and	L	Т	P	С	Hours	Marks	
19PEX01	EMBEDDED CONTROL OF ELECTRIC DRIVES	3	0	0	3	45	100	
Course Objectiv	e (s): The purpose of learning this cour	se is						
	and analyze the various electric drives				1.12.00			
	ce between processors & peripheral dev					cessing.		
	and formulate efficient programs on an							
	the basic concepts of systems programm					ssembler	compliers	
	the management task needed for develo							
	about the applications of embedded con				es.			_
	es: At the end of this course, learners will gain knowledge about hardware units of				n into a S	vetem		
	apply microcontroller and PIC controlle				n nito a S	ystem		
	gain knowledge about architecture unit							
	know about the peripherals interfacing							
	design Embedded System Design Using							
	ARCHITECTURE	1.2			-			9
	n - 8051 CPU structure - Memory (Organiz	ation	– Ad	dressing	modes -	Instruction se	:t -
-	ming diagram – Memory expansion.		_	1				0
	PHERALS AND VERSIONS OF 805							9
	imers and Counters - Interrupts - Seri				 Simple 	Program	s ADC, DAC	and
and the second se	or – PWM and Watch dog timer option	s in PIC	C 16F	877A.	_	_		0
	HITECTURE OF DSPIC		1	-		_		9
DSPIC30F4011-	Architecture – Timer- I/O ports-PWM r	nodule-	ADC	-Case	study.			
Unit IV PERI	PHERALS INTERFACING OF DSP	IC						9
	s / Counters – Capture / Compare / PW - A / D Converter module – Comparat			– Mas	ter Synch	ronous S	erial Port (MS	SP)
Unit V APPL	CATIONS USING 8051 AND PIC16	F87XA						9
	x - DC motor speed control - Generation							
	rement - Temperature control - Speed	d contro	ol of i	nduction	on motors	s – Imple	mentation of F	PID
controller.						_		
TEXT BOOK(S)	: Ali Mazidi, JaniceGillispie Mazidi,	Polin	DN	Kink	av "Th	a 8051N	licrocontroller	00
	stems- Using Assembly and C", Prenti						nerocontroner	an
2 Muhammad A	Ali Mazidi, JaniceGillispie Mazidi, Roli ng Assembly and C for PIC18", Prentic	n D. M	cKinl	ay, "Pl	IC Microc	controller	and Embedded	d
REFERENCE(S				,				
1. Dogan Ibrahin	n, Designing Embedded Systems with	32-Bit I	PIC M	licroco	ontrollers	and Mikr	oC Newnes, 20	013
2 Kenneth Ayls	, "The 8051 Microcontroller", Cengage izadeh, "8051 Microcontrollers - An Aj	Learnin	ng 3rd	l Editio	on,2007. I	David Cal	cutt, Fred Cow	
2 Subrata Ghos	shal,"Embedded Systems & Robots: Production, 2009	ojects U	Jsing	The 80	051 Micro	controlle	r", Cengage	

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Programme	ME - POWER ELECTRONIC	CS AN	D DF	RIVE	S	R 2019	Semester I	PE
Course	Course Name	Hou	rs / V	Veek	Credit	Total	Maximu	
Code	1-1-1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	L	T	P	С	Hours	Mark	S
19PEX02	VIRTUAL INSTRUMENTATION SYSTEMS	3	0	0	3	45	100	
To provideTo bring	ive (s): The purpose of learning this cours de an overview of Virtual instruments out the overview of the software (LabVIE	EW).						
 To know 	about the programming structure of the se about the hardware structure configuratio iarize the student with the Applications.		e.				;	
 Ability t Ability t Ability t Ability t Ability t 	nes: At the end of this course, learners will o understand the concept of virtual instru- o understand the programs with LABVIEV o understand the programming structure o o understand the hardware structure config o understand the machine vision technique	nentati W. of the so guratic	ion sy oftwa	stem	5			
	RODUCTION	es.	-	-				9
	nal description of a digital instrument -	Bloc	k dia	oram	of a Vir	tual Instru	iment – Phy	1
quantities and an	alog interface- Hardware and software- U	ser int	erfac	es - A	dvantage	s of virtua	l instruments	over
conventional inst	ruments - Architecture of a virtual instrum	ment a	nd its	relat	ion to the	operating	system.	0.0.
	TWARE OVERVIEW					1 0	-	9
Editing – Debug Controls, indicat	aphical user interfaces- Controls and indu- ging and running a virtual instrument – Cors, object properties and their configuration	Graphi	cal pr	ogran	nming pa	; – Data fl llets - Fro	ow programmer ow programmer ow programmer ow programmer of the pro	ning- ects -
Unit III PRO	GRAMMING STRUCTURES						111- AR 9	9
operations – Bu file I/Os - Attrib	HILE loops - CASE structure - Formula n ndle - Bundle/unbundled by name - Grapl ute modes local and global variables.							
Unit IV HAR	DWARE ASPECTS				Real Providence		The second	9
	are - Installing drives - Configuring the og I/O function – Data acquisition – Buffer						e in Lab VIE	EW -
Unit V LAB	VIEW APPLICATIONS					L.		9
vision - Machin serial communic	General applications - Feedback devices e vision techniques – Configuration of I cation – General, GPIB hardware an ration and installation.	IMAQ	DAG	2 car	d – Instru	iment con	nectivity - G	PIB,
		" Tata	Ma	· · · · · · · ·	TTH bash	C. New I	D-11-: 2000	-
-	nson, "Lab view Graphical Programming"					10	Jeini, 2006	
	EW : Basics I & II Manual ", National In:	strume	ents, E	Banga	lore, 201	1	and the first	
REFERENCE(S		ICDIC	TAT					
Jeffrey Travi	ne, "VIRTUAL INSTRUMENTATION U s and Jim Kring ," LabVIEW for Everyon l book Co, New Delhi, 2006.							
Sale Sale Sales	ruments Technical Staff," Lab VIEW: Ba	sice L	P. 11 N	lanu	Notio	nol Instance	aanta 2006	
prational mst	ruments reeninear stan, Lab view: Ba	510510	x II N	ranua	, ivatio	nai mstrun	ients, 2000	

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Programme	ME - POWER ELECTRONIC	S AN	D DR	IVES		R 2019	Semester	I PE
Course	Course Name	Hou	irs / V	Veek	Credit	Total	Maxim	
Code	Course Maine	L	T	P	С	Hours	Marl	KS
19PEX03	DIGITAL SIGNAL PROCESSORS FOR MODERN INDUSTRIAL DRIVES	3	0	0	3	45	100)
Course Object	ive (s): The purpose of learning this course	e is	1				1.1.1.1	
	y the programmable digital signal processo		itectu	e and	program	ming tech	niques.	
To know	w the application of modern DSP controller	rs for i	mode	n driv	e applica	ations.		
 To apply 	y DSP for engineering application program	nmable	e digit	al sig	nal proce	essor.		
 To acqu 	ire knowledge on DSP based electric drive	es.						
	in knowledge on DSP based electric system							
	nes: At the end of this course, learners will		ole to:					
	and and remember the concept DSP Control						. 31	
	to understand the filter concept as well as t				s fordigi	tal implem	nentation	
	to determine the harmonics and its elimination			S				
	to design DSP based controller for industri							
	to design DSP based controller for electrica							9
	NDAMENTALS OF PROGRAMMABI			nd M		aaaaa in D	DCDa M	
	Multiplier accumulator – Modified Bus S – Multi-port memory – VLIW architecture							
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Blo Chairman - BoS Dept. of EEE - ESEC

Programme	ME - POWER ELECTRONIC				1	R 2019	Semester I	
Course Code	Course Name	Hou	irs / V	Week	Credit	Total	Maxim	
Coue		L	T	Р	C	Hours	Mark	S
19PEX04	ADVANCED CONTROL OF ELECTRIC DRIVES	3	0	0	3	45	100	
	ve (s): The purpose of learning this cours						10.00	
	the industrial advanced control methods			DC driv	ves			
	stand the control techniques of Induction							
	stand the theory and control techniques							
	n the model techniques of BLDC and rel							
	ze the operation of advanced Artificial-In			ased I	Drives.	1.1.1.1	1 X.	
	es: At the end of this course, learners wi							
	understand the principle of direct and in		vecto	r conti	rol of dri	ves.		
	analyze the vector control of Induction							
	model the control techniques of PMSM model the PMSM and synchronous relu							
	apply artificial intelligence to electrical				205			
	RODUCTION TO ADVANCED CON				es.			9
	d controls, advanced control strategies for			Inivor	Saalar	antral and	an loon and a	
	tor control, direct and indirect vector co							
ising State-Space	Averaged Models - Sliding-Mode Cont	rol of P	ower	Conv	erters	SI, I OWEI V	conventer co	JIIIOI
Unit II INDU	CTION MOTOR DRIVES		oner	Contra	crters.			9
	Principle of vector or field oriented con	trol T	liract	and I	ndiract	vector con	trol Dorivoti	
	ontrol scheme-Direct torque control of							
motor drive - Sen	sor less control and flux observers.	mauer	ion n	10101	- wuutu	ever conve	inter red mat	uction
	MANENT MAGNET SYNCHRONOU	IS MO	TOR	DRIV	VES			9
	ent magnet synchronous machines – V					ronous m	achine mo	2
MSM – Vector	control – control strategies – constant to	roue-ar	ondo	ontrol	unity n	ower facto	actime – mo	nstant
	ges control, optimum torque per ampere							instant
	HLESS DC AND SYNCHRONOUS I							9
	motor - Modeling - Drive scheme- Syn						vector contro	olof
Synchronous Relu	actance Drives- Switched Reluctance Dr	ives.	us Re	fuctar		ls-Current	vector contro	51 01
	FICIAL-INTELLIGENCE BASED D		-					9
	iques - Applications in Electrical Mad			Drives	- Neur	al-Networl	k-Based Driv	
commercial AI b	based Drives. The Fuzzy Logic Conce	pt- Apr	olicati	ons o	f Fuzzy	Logic to	Electric Driv	ves -
Fuzzy Logic Con	trol of Power Converters- Hardware Sys	tem De	scrip	tion.	unity	Dogie to	Dicetite Dir	res
TEXT BOOK(S)								-
Control", Pub	ker, Duco W.J. Pulle, André Veltma lished on 2011.							
2. Ned Mohan, Wiley Publica	"Advanced Electric Drives: Analysis, ations, 2014	Contro	l, and	l Moc	leling U	sing MAT	LAB / Simu	ulink"
REFERENCE(S):	A. S. S. S.				10-12		
. Malcolm Barı	nes, "Practical Variable Speed Drives an	d Powe	r Elec	ctronic	cs ". New	vness, 200	3	
, Grafame Ho	lmes D and Thomas A Lipo, "Pulse EE Press, 2003							es and
N.P.Quang an	d J.A. Dittrich, "Vector Control of Thre	e-Phase	AC	Machi	ines", pu	blished on	2008.	-
Tze-Fun Char	, Keli Shi, "Applied Intelligent Control	of Indu	ction	Moto	r Drives'	, John Wil	ley & Sons, 2	2011.
	Channan Bus Danial 656 - 531		-	P	31	5		1

Common		1		IVES	1	R 2019	Semester	II PE
Course	Course Name	Hou	irs / V	Week	Credit	Total	Maxin	
Code		L	Τ	Р	C	Hours	Mar	ks
19PEX05	FACTS CONTROLLERS	3	0	0	3	45	10	0
To underst To learn sl To learn al To learn al To learn al To learn al To learn th To learn th Course Outcome Ability to g Ability	(s): The purpose of learning this cou and the need for FACTS nunt and series compensation technique oout the different types of series compout controlled voltage and phase ang e concept of unified power flow control s: At the end of this course, learners we gain the knowledge of necessity of FA understand the operation of the compe- understand the operation of different to understand the operation of static volt inderstand the operation of static volt inderstand the various emerging Facts ODUCTION TO FACTS ssion Network - Necessity - Power Funities for FACTS - possible benefits C VAR COMPENSATION	les pensation coller vill be ab ACTS in ensator ar types of s age and j s controll low in A for FAC	tor powe nd its series phase ers. AC Sy TS.	r syste applic comp angle /stem	eations. ensator. regulato - relative	importan		9
compensation - co	sation - introduction to shunt & onfiguration & operating characteris							
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Unit III SERIE	r (TSC) -Comparison of TCR & TSC S COMPENSATION)	1		9
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Course			D DR			R 2019	Semester II Maximu	
Code	Course Name				Credit	Total Hours	Marks	
19PEX06	SMART GRID	L 3	T 0	P 0	C 3	45	100	
Course Objectiv	e (s): The purpose of learning this c	ourse is				45	100	
	about Smart Grid technologies, diffe		mete	rs and	advance	ed meterin	ng infrastructu	ire
	arize the high performance computir					a metern	ig initiastructi	ne.
	arize the power quality management							
	es: At the end of this course, learners				1			
	will develop more understanding on			Smart	Grid and	d its prese	ent developme	nts.
	will study about different Smart Grid							
	will acquire knowledge about differe						infrastructure	
	will have knowledge on power quality	•						
	will develop more understanding on	LAN, WA	N and	l Clou	id Comp	uting for	Smart Grid	
applicatio					_			
	RODUCTION TO SMART GRID	1.21 1.0			a 11 a		1	9
	ctric Grid, Concept, Definitions an allenges and benefits, Difference							
	tives in Smart Grid.	between	conv	entio	nai &	Smart G	rid, National	an
and the second se	RT GRID TECHNOLOGIES	12212						
								9
Cechnology Driv	ars Smart anarou recourses Smart	aubstation	- C.	hatat	ion Auto		Faadan Auton	
	ers, Smart energy resources, Smart							natio
Transmission sys	tems: EMS, FACTS and HVDC, V	Vide area i	monit	oring,	Protect	ion and c	ontrol, Distril	natio
Transmission sys systems: DMS, V	tems: EMS, FACTS and HVDC, Volt/Var control, Fault Detection, Isc	Vide area in lation and	monit servi	oring, ce res	Protect storation,	ion and c Outage 1	ontrol, Distril management,	natio outio Higł
Transmission sys systems: DMS, V Efficiency Distrib	tems: EMS, FACTS and HVDC, V olt/Var control, Fault Detection, Isc ution Transformers, Phase Shifting	Vide area in Iation and Fransforme	monit servi ers, Pl	oring, ce res ug in	Protect storation, Hybrid I	ion and c Outage 1 Electric V	ontrol, Distril management,	natio outio Higł V).
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Course	Course Name	Hou	rs / V	Veek	Credit	Total	Maximur	n
Code	course nume	L	Т	P	С	Hours	Marks	
19PEX07	HARMONICS FILTER DESIGN	3	0	0	3	45	100	
 To lease To uncomposition To dese 	tive (s): The purpose of learning this course rn source and effects of harmonics. lerstand the concept of harmonic measuren ign & analyze the passive filter. ign & analyze the active filter.							
To kno	w about the harmonic elimination technique			2				
• Unders	mes: At the end of this course, learners wil stand the source of harmonics.							
	e of various methods of harmonics measur						× – п	
	& analyze active filter for particular appli							
-	a & analyze passive filter for particular app stand about the the various harmonic elimin			iquas				
	URCE AND EFFECTS OF HARMONIC		teenn	iques.				9
	harmonics-linear and non linear loads-pow		ality	indice	es-Source	e of harmo	onics: transform	ners
rotating machin	e, power convertersharmonics standard sformer-Rotating machines- Effects on co	s. Effe	ects o	f Har	monics:	Thermal e	effects on elect	trica
	RMONIC MEASUREMENT AND ANA	LYSI	S					9
analysis. Unit III DES	nts- Interrelation between AC system an SIGN OF PASSIVE FILTER mination Techniques: Selective harmonic			_				9
	mal PWM technique - Types of Passive ned harmonic filter.	filters	Desi			A Contraction of the local distribution of t	and the second second	
Pass Filter- Tur		filters	Desi					9
Pass Filter- Tur Unit IV DES Types of active methods- Single	ned harmonic filter.	sing ac	tive p ts cor	ntrol-7	Three pha	ase three-w	vire and four-v	trol vire
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 UniversityPress, 2010. T.J.E.Miller", Reluctance Motor and their Controls", USA, Oxford University Press, 2001. REFERENCE(S): Paul Acarnley, Stepping Motors, UK, IET, 2002 Chang-liang Xia, "Permanent Magnet and Brush less DC motors", John Wiley & Sons, 2012 	Programme	ME - POWER ELECTRONIC	S ANI	D DR	IVES	1.1	R 2019	Semester II	PE
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	ME - POWER ELECTRONICS AND DRIVES						Semester II PE
Course Code 19PEX10	Course Name ADVANCED DIGITAL SIGNAL PROCESSING	Hours / Week			Credit	Total	Maximum
		L	LT		С	Hours	Marks
		3	0	0	3	45	100
	ve (s): The purpose of learning this course						
	dy about the discrete random process tech		s.				
	dy about the spectral estimation techniqu						
	derstand the algorithm used in linear estin		and p	redicti	ion.		
	dy about the various types of adaptive fil						
	dy about the multi rate signal processing.		1				the second second
	es: At the end of this course, learners wil						
	stand the basics of discrete random signal ate the spectrum estimation techniques.	proces	ssing.				
	stand the algorithm used in linear estimat	ion and	d pred	liction			
	ze the filters for noise cancellation and ec						
	stand the wavelet transforms.						
Init I DISC	CRETE RANDOM SIGNAL PROCESS	SING					9
Discrete Random	n Processes - Ensemble averages, statio	nary p	roces	ses, A	uto corre	elation and	d Auto covarianc
natrices - Parse	val's Theorem - Wiener-Khintchine Rela	ation -	Powe	er Spee	ctral Den	sity - Per	iodogram Spectra
	Filtering random processes - Low Pass I	Filterin	ng of	White	Noise -	Paramete	r estimation: Bia
nd consistency.		_	_				
nit II SPEC	CTRUM ESTIMATION						
eriodogram Esti eriodogram – Ba	bectra from finite duration signals M imator – Performance Analysis of Estin artlett and Welch methods – Blackman – ased spectral estimation – Parameter F	nators – Tuke	– Ur y met	biased	l, Consis Paramet	stent Estir ric Metho	nators – Modifie ds – AR, MA, an
eriodogram Esti eriodogram – Ba RMA model ba Durbin's algorithm Init III LINE Linear prediction	imator – Performance Analysis of Estimate artlett and Welch methods – Blackman – ased spectral estimation – Parameter E m. CAR ESTIMATION AND PREDICTIO n – Forward and backward predictions –	nators - Tuke Stimati DN - Solut	– Ur y met ion – tions	biased hod - Yule-' of the	d, Consis Paramet Walker e Normal	stent Estir ric Method equations equations	elation Method nators – Modifie ds – AR, MA, an – Solutions usin 9 s Levinson-Durb
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Chairman - BoS Dept. of EEE - ESEC

1.	Steven M. Kay, "Fundamentals of Statistical Signal Processing": Practical algorithm development Prentice- Hall PTR, 2013	
2.	J.S.Chitode, "Digital Signal Processing, Technical Publications", 2008	

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Programme	ME - POWER ELECTRONICS	ME - POWER ELECTRONICS AND DRIVES						
Course	Course Name	Hou	rs / V	Veek	Credit	Total	Maxim	
Code		L	T	P	C	Hours	Mark	s
19PEX11	FPGA CONTROLLER FOR POWER ELECTRONIC SYSTEMS	3	0	0	3	45	100	10
	tive (s): The purpose of learning this course							
	erstand the concept of a Field Programmable	e Gate	e arra	y and	be able to	o use itin i	real world	
applicat								
	erstand the programme of VHDL in the FPC		1		1203	is NOR 1		
	erstand the basics of simulation and implem-			state 1	nachine	model.		
	erstand the concept of Spartan 3E & FPGA							
	erstand how a hardware description language	e can :	simpl	ify des	sign of ve	ery large a	and complex	
	ions in electronics.			_		2		
	mes : At the end of this course, learners will							
	and the basic architecture and features of FI	PGA.	ike S	partan	3E and V	virtex III p	pro.	
	and the programming of FPGA. entation of FPGA in simulation.							
			Г	1 17:				
	and the basic architecture of FPGA like Spa ze the applications of FPGA in power elect					•		
	'RODUCTION	romes	base	appi	ications.	211111		9
	construction of FPGA. Architecting an FP	GA	Dorfo	rmana	a dancit	v and aan	agity of an I	
Programmabilit	y issues. A study of the XC4000 configura	ble lo	reno oric h	lock 1	ntroduct	ion to ma	ior EPGA fai	nilie
Xilinx, Altera a			gie o	IUCK. I	miouuci	ion to ma	joi i i OA iai	mile
	OGRAMMING OF FPGA	1				Call State		9
Introduction to	VHDL hardware description language. Pr	ooran	mino	r elem	ents cor	netructe au	nd evotax Er	
and architecture	e, Creating combinational and synchronous	logic	Det	ails of	function	and proc	redures Toni	cs or
	objects, data types and attributes. Synthesis					r and proc	coures. Topi	C5 01
	ULATION AND VERIFICATION OF T							9
	of area, speed and device resource utili					ony Cres	ting test has	
Systematic stud	y of implementing state machines using VF	IDI	i mi j	ITUA	teennon	ogy. crea	ung test bei	iches
	CR VIEW OF SPARTAN 3E AND VIRTI		I PR	O FPO	GA BOA	RDS		9
	representation & features of Spartan 3E						Pipe lining	
esource sharing	concepts of Virtex III pro and FPGA board	is Fut	ture a	dvanc	es in FP(GA techno	logy	anu
	LICATIONS OF FPGA BOARDS IN PO					orr teenine	ло _Б у.	9
section of protection and	ontrolled Rectifier, Switched Mode Powe					erters D	C motor cor	
	r Control using Virtex III pro FPGA board.	1 00	invert	15, 1	wivi miv	criters, D	e motor cor	iuoi,
EXT BOOK(S			-	-				
1		11						
Rahul Duber								
	eld,"FPGA'S Instant Access", Newness, 20		ing E	ald Dr	ogramm	abla Gata	A mayor? Con	Ingo
Science & B	eld,"FPGA'S Instant Access", Newness, 20 y.,"Introduction to Embedded System Desig		ing Fi	ield Pr	ogramma	able Gate	Arrays", Spr	inger
Science & B	eld,"FPGA'S Instant Access", Newness, 20 y.,"Introduction to Embedded System Designusiness Media, 2008		ing Fi	ield Pr	ogramm	able Gate	Arrays", Spr	inger
REFERENCE(eld,"FPGA'S Instant Access", Newness, 20 y.,"Introduction to Embedded System Designusiness Media, 2008 S):	gn Usi			ogramm	able Gate	Arrays", Spr	ingei
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Programme	ME - POWER ELECTRONICS	SAN	D DR	IVES	;	R 2019	Semester III	PE
Course	Course Name			Week	Credit	Total	Maximu	m
Code		L	T	P	C	Hours	Marks	
19PEX12	SWITCHED MODE AND RESONANT CONVERTERS	3	0	0	3	45	100	
	tive (s): The purpose of learning this course							
	rstand the basic topologies of switched mod			rs.				
	rstand the different types of modulation sche							
	rstand the current control techniques of the c							
	rstand the concepts of various closed loop co							
	nate the switching and conduction losses tak				ched mod	le converte	ers.	
	mes: At the end of this course, learners will	be at	ole to:					
	ct Buck, Boost, Buck-Boost converter.							
	et Half Bridge and Full Bridge Inverters.							
	he current control converters.							
	ne the various control techniques.		1	ah in a				
	e the cause of switching and conduction losse	es and	1 SWI	ching	stresses.			9
14.000 C 10.000 C 10.000	NVERTER TOPOLOGIES		War	form	a moda	of anora	tion switchi	
	ick – Boost SMPS Topologies. Basic Operation ning and conduction losses – optimum switted in the second secon							
	relations – voltage mode control principles	10000000	, nequ	uency	- practic	ai vonage,	current and p	Jowe
	RRIER MODULATION.	•						9
	lc-ac Inverters - Basic Concepts - Single Pha	T		D	1.0.11	ILICD 11		
pulse modulation carrier frequence	rs - Blanking Time - Single Pulse Modulatio on - PWM Principles - Sinusoidal Pulse Wic cy in SPWM - Bipolar and Unipolar Switchi RRENT CONTROL SCHEMES.	ith M	odula	tion in	n Single I	Phase Inve	erters - Choice	e of
		14	C	. T		Arthada a	6 Company Cas	-
Hysteresis Cor	ated Inverter - Current Regulated PWM Vo htrol - Variable Band Hysteresis Control - F quency Vs accuracy of Current Regulation -	Fixed	Swite	ching	Frequenc	y Current	Control Meth	nods
	OSED LOOP CONTROL	Alca	3 01 4	ppnea		unent reg	sulded vol.	9
	e Rectifier - Operation of Single/Three Phase	Dric	lass in	n Dect	ifier Mo	de Contre	ol Principles	188
	DC Side Voltage - Voltage Control Loop - T						or r meiples-	
	VER FACTOR CONTROL	ine in						9
	Power Compensators - Switched Capacitor	s - St	atic R	eacto	r Compe	nsators bas	sed on thyriste	or-
Static Reactive Compensation	e VAR Generators using PWM Current Reg by PWM-VSI based Voltage Injection Sche	gulate	d VS	SIs - I	Principles	s - Control	Strategies -Se	eries
TEXT BOOK				D	C 1	D	N. N. 1	-
¹ . McGraw-H						Ň		
Simon Ang	, Alejandro Oliva,"Power-Switching Conve	erters'	', Sec	ond E	dition CI	RC Press, 2	2005	
	(6).							_
REFERENCE				Lloot	onics. Co			
REFERENCE 1.NedMohaDesign", 1	n, Tore M. Undeland and WilliamP .Robbir NewJersey, JohnWileyandSons,2007.	Ê		-	C. Spirit	and a second		1.00
REFERENCE 1. NedMoha Design", 1 2. Luca Corr Switched-	n, Tore M. Undeland and WilliamP .Robbin	li, Re ons, 2	gan Z 015	ane, "	Digital C	Control of I	High-Frequen	icy

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Programme	ME - POWER ELECTRONIC	S ANI	D DR	IVES	5	R 2019	Semester III	PE
Course	Course Name	Hou	rs / V	Week	Credit	Total	Maximu	00000
Code		L	Τ	Р	С	Hours	Marks	
19PEX13	MODELING AND CONTROL OF	3	0	0	2	1.1		4
19FEAI3	POWER ELECTRONIC SYSTEMS	3	0	0	3	45	100	
	ive (s): The purpose of learning this course							
	erstand the steady state analysis of convert		~					
	erstand the dynamics control of Power Elec							
	del and analyze the transfer function of diff gn the various controller for power electro			erters.				
 To desi 	gn and model the AC & DC equivalent circ	cuit	cuits.					
	nes : At the end of this course, learners will		le to:					_
	a controller for steady state analysis of cor							
	a dynamic control for power converters.							
• Derive	the transfer functions of power electronic c	onver	ters.					
 Design 	a controller for power switching circuits.							
	ine the equivalent circuit modeling of disco	ontinu	ous c	onduc	ction mod	le.		
	VERTERS IN EQUILIBRIUM				1	Distant In	Market Street	9
Principles of ste	eady state converter analysis - Steady-stat	e equi	valer	nt circ	uit mode	ling, Los	ses, and Effici	ency
Contract of the second se	ation - The discontinuous conduction mode							
and the second se	VERTER DYNAMICS AND CONTRO				- N -	1		9
AC equivalent	circuit modeling - The basic AC modelin	g app	roach	, Stat	e-Space	averaging	g, circuit avera	iging
	vitch modeling, the canonical circuit model	l, Moc	leling	, the p	ulse- wic	ith modu	lator.	
	VERTER TRANSFER FUNCTIONS							9
Review of Bode	Plots - Pole zero response, frequency inv	ersion	, qua	dratic	pole resp	ponse: re	sonance, the lo	w-Q
approximation,	approximate roots of an arbitrary-degree	polyn	omia	I. Ana	lysis of	converte	r transfer func	tion,
	truction of impedance and transfer func allel resonant, voltage divider transfer fun							
functions.	and resonant, voltage divider transfer fu	iction	s. 01	aprica	ar consu	uction of	converter trai	Ister
The second se	TROLLER DESIGN		-					9
	ve feedback on the network transfer function	ns – c	onstr	uction	ofimne	ortant qua	intities $1/(1+T)$	
T/(1+T) and the	closed-loop transfer functions – stability –	regu	lator	design	i – measi	urement o	of loop gains	and
	ND DC EQUIVALENT CIRCUIT MOI						or reop game.	9
	ivalent Circuit Modeling of the Discontinu			iction	Mode D	CM aver	aged switch m	1011
	AC modeling of the DCM switch network -							
FEXT BOOK(S		mgi	11100	lacite,	gaynann	01 001	iventers in Der	
	undamentals of Power Electronics", Spring	oer Sc	ience	& Bi	siness M	ledia 20	13	
" Power ele	ctronics", WILEY edition, 2009.G.K Dub							
edition, Alt	bha Science	icy, 1	unua	unente	ii oi cice	uie uiive	, second	
REFERENCE(S					1577			
and the second se	CHA,"Power Electronic Converters Model	ing an	d Co	ntrol".	, Springe	er Scienc	e & Business	
2. S.KBhatta	acharya, "Fundamental of power electronic	cs", U	BS P	ublish	ers, Seco	ond editio	on 2009.	

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Programme	ME - POWER ELECTRONIC	CS AN	D DR	IVES		R 2019	Semester III PE
Course	Course Name	Hou	irs / V	Veek	Credit	Total	Maximum
Code	course mane	L	Τ	P	С	Hours	Marks
19PEX14	POWER ELECTRONICS APPLICATIONS TO POWER SYSTEM	3	0	0	3	. 45	100
Course Obje	ctive (s): The purpose of learning this cours	se is					
 To impa 	rt knowledge on HVDC system.						
	ze the different types of converter configur						
	the different types of compensator for load					C	
	n and analyze the different types of reactive rt the knowledge of series and shunt compe			pensa	tion sche	emes for co	onverters.
	omes: At the end of this course, learners wi			_	1.541		
	the characteristics of different types of HV			er con	figuratio	ons.	
	ne the different control functions required for						
• Understa	and the load balancing in AC and DC system	n.					
	s the reactive power compensation methods					1640 (H40	
	the engineering problems and identify suit	table sh	unt o	r Serie	es Comp	ensation de	evices for
	plications. VDC SYSTEM						9
	urations, components of HVDC system:	Conve	rtor 1	ranefe	rmor s	moothing	
	power support, operation of 6-pulse control						
	converter. Control of HVDC system, Rec						
	, voltage dependent current order limit, con						
and by - pass	ing, limitations HVDC system using line co	ommuta	ated c	onver	ters, mod	dern HVD	C system - HVDC
light.						- die	-
Unit II AM	ALYSIS OF CONVERTERS AND THE	EIR CO	DNTE	ROL			9
Principal of I	analysis of Graetz circuit-characteristics of OC Link Control – Converters Control (le control – Effect of source inductance of	Charact	eristi	cs – 1	Firing a	ngle contr	ol - Current and
	DAD BALANCING					and all	9
Limitations of	load balancing using passive elements, Us	se of V	SI as	a Var	generate	or, Indirect	t current controlled
synchronous li	nk converter Var Compensator (SLCVC).	Bi-dire	ction	al pow	er flow	in VSI, U	se of VSI as active
	generator, Current controlled SLCVC, St						current, Strategy-2:
	urce current, Use of two VSIs, one as Var	generat	or and	1 anotl	her as ac	tive filter.	9
	CACTIVE POWER COMPENSATION						
	reactive power theory, expression for act						
	er compensator using instantaneous re Reference wave generation (hardware n						
	n one cycle control, discussion on one cycle						
	UNT AND SERIES COMPENSATION						9
	methods of Var generation, analysis o	of unco	mper	isated	AC li	ne, Passiv	e reactive power
	Compensation by a series capacitor con						
	ity, Compensation by STATCOM and SS						
	or-switched capacitor- Thyristor controlled	reactor	(TSC	-TCR), static v	var compe	nsators.
1. K.R. Padi	(S): yar, "HVDC Power Transmission System -	- Techn	مامع	and	System I	nteraction	". New Delhi New
1. p	COM · HONDING .	reem		und t	-joteni i		, reen benn, reen
	Dapt of EEE - ESEC			PU	sl	r	

	Age International, 2002.
2.	Jos Arrillaga, Y. H. Liu, Neville R. Watson," Flexible Power Transmission: The HVDC Option's, John Wiley &Sons, 2007
RI	EFERENCE(S):
1.	Ewald Fuchs, Mohammad A. S. Masoum, "Power Quality in Power Systems and Electrical Machines", Academic Press, 2011.
2.	Ned Mohan, Power Electronics Converters Applications and Design, New York, John Wiley Sons, 2002.
3	R. Mohan Mathur, Rajiv K. Varma, "Thyristor-Based FACTS Controllers for Electrical Transmission Systems", John Wiley & Sons, 2002

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Programme	ME - POWER ELECTRONIC	SAN	D DR	IVES	5	R 2019	Semester III P
Course Code	Course Name		-	-	Credit	Total	Maximum Marks
Coue		L	T	P	C	Hours	Marks
19PEX15	FINITE ELEMENT ANALYSIS OF ELECTRICAL MACHINES	3	0	0	3	45	100
Course Object	ive (s): The purpose of learning this course	e is					
	ign electrical apparatus using finite elemen		nod.				
	gn and analyze the eddy current method.						
To ana	lyze the manipulation of machines.						
To anal	lyze the steady state condition of IM.						
	ly the finite element method to study the bel				onous Ma	achines.	
	nes: At the end of this course, learners will						
	e and design the electrical machines by inte	~	-			ations	
	ine the various electrical quantities require	ed for	mach	ine de	sign		
	he non linear problems of machines.						
	ine the model of steady state Induction Ma						
	ine the model of steady state Synchronous RODUCTION TO FINITE ELEMENTS		iine.				
	alerkin Finite element method-Boundary c		one r	on lir	aar prob	lame Dorr	
iodeling	alerkin Finite element method-Boundary c	onun	10115-1	ion m	iear prou	iems- ren	nanent wiagnet
	Y CURRENT ANALYSIS						
	nd skin effect- Elliptical description of flu	v den	sity -	eddy	currents	in non lin	
	lity models-coupling finite elements to exte						
	IPUTATION OF PARAMETERS	ernar	enear	10 1110	dening et	moraeratio	
	f eddy current loss, losses in a series win	ding_	resist	ance	inductan	ce- calcula	ation of force and
	's force law, Maxwell stress method, us						
computation.	o force fan, mainen oneoo memou, a						
	JCTION MOTOR IN STEADY STATE						9
and the second se	arameters- frequency response- reactance		culati	on- ti	me dom	ain mode	ling of induction
	kin formulation-global system of equations						Ũ
	CHRONOUS MACHINES IN STEADY		ГЕ				9
Basic configur	ation of synchronous machine-steady s	state	opera	tion-N	Aodeling	consider	ations- excitation
calculation-com	putation of steady state reactance-Poynting	g Vect	tor m	ethod	2.14		
TEXT BOOK(S			<u>.</u>	_			
1. Sheppard S 2012	alon, "Finite Element Analysis of Electrica	al Mac	chines	s", Spi	ringer Sc	ience & B	usiness Media,
	use, Oleg Wasynczuk and Scott D. Sudh o New Jersey, Wiley Student Edition, 2013	off, "A	nalys	sis of I	Electric N	Aachinery	and Drive
REFERENCE(S):				N. 1.		
· · · · · · · · · · · · · · · · · · ·	uie, "Advanced Lighting Controls: Energess, Inc., 2006	gy Sa	ving	Produ	ctivity",	Technolo	gy & Application
2. Zhangxin Cl	hen, "Finite element methods and their app	licatio	ons",	Spring	ger, 2013		-
3 Sheppard J.S	Salon, "Finite element analysis of electrical	mach	nine".	Sprin	ger. 200'	7.	

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Programme	ME - POWER ELECTRONIC	SAN	D DR	IVES		R 2019	Semester III
Course	Course Name	Hou	irs / V	Week	Credit	Total	Maximum
Code	course reame	L	T	P	C	Hours	Marks
19PEX16	SENSORS AND	3	0	0	3	45	100
	INSTRUMENTATION SYSTEMS					45	100
 To unde To unde To bring To study To desig Course Outcom Understation Analyze Understation Understation 	ve (s): The purpose of learning this course rstand the concept of sensors. rstand about mechanical and electromech g out the overview of thermal and magnet to the concept of smart sensors and their te gn signal conditioning circuits for sensors. es: At the end of this course, learners will and the principle and characteristics of ser the mechanical and electromechanical ty the thermal and magnetic types of sensors and the concept of smart sensors Technolo nterfacing and signal conditioning circuit	anical ic sens chnolo l be ab isors. pes of s. ogy	ors. ogies. le to: senso	ors.			*
	ODUCTION TO SENSORS	s for se	ensor	S.			
	im of measurement, Roll of sensors	s in	engi	peering	-Sensor	s_princip	
parameters: stat	ic & dynamic characteristics-Environ	nental	para	ameter	s Elect	rical m	echanical therm
	election of sensors.	nemai	par	ameter	J. Licer	ineui, in	containeai, therm
Unit II MECI	HANICAL AND ELECTROMECHAN	ICAL	SEN	SOR	5		
Resistive potent	iometers, strain gauge, LVDT, Inducti	ve an	d Ca	pacitiv	ve senso	ors, Force	e &stress sensor
ultrasonic senso	rsElectrostatic transducers-RVDT, DO	C tach	nome	ter, A	C tacho	meter, o	ptical tachomete
Rotary encoder,	eddy current, drag cup type tachometer, n	nagnet	ic, str	obosc	ope, gyr	oscope.	
Unit III THER	MAL & MAGNETIC SENSORS				1. 5		
constant and refi magnetic sensors Unit IV SMAR	thermometric sensors-thermal expans ractive index sensors-nuclear thermomet -yoke coil & coaxial type sensors-magnet CT SENSORS	terth to resis	erma stive	l EMI sensor	F and ra s- magne	diation so	ensors-principle on the second s
Introduction, pri semiconductor IC	mary sensors, converters, compensation C technology, MEMS, Nano-sensors.	. Rec	ent ti	ends	in senso	or techno	logy film sensor
	GN OF SIGNAL CONDITIONING CIP						9
microcontroller a	Sensors and Signal conditioning-wirel and communicating device-Zigbee and co plar and wind energy.	less s ommu	ensor nicati	• Netv on de	work: W vice-Pov	Vireless ver suppl	sensor based o y to sensors: fror
	• s and Instrumentation", by D.V.S. Murthy	(DLIT	200	e and	adition		The state of the
							-
EZZAT G. Bak	houm, "Micro- and Nano-Scale Sensors a	and Ir	ansdi	icers",	CRC Pr	ess, 201	5
	Robot sensors and transducers", Springer	Scien	ce &	Rusin	ess Medi	ia 2013	
	ster, HalitEren.," Measurement, Instrume						2014
	actuator :control system instrumentation"		0.6.4			Second second second second	A REAL PROPERTY AND A REAL
Sensor and a	actuator reonator system instrumentation	byCl	archi	C W. (ac Silva,	ere press.	,2007

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Programme	ME - POWER ELECTRONIC	CS AN	D DR	IVES		R 2019	Semester III	PI
Course	Course Name	Hou	irs / V	Week	Credit	Total	Maxim	um
Code	Course Name	L	T	P	С	Hours	Marl	ks
19PEX17	AUTOMOTIVE ELECTRONICS	3	0	0	3	45	100	
To study the T Know the To understa To study the To s	e (s): The purpose of learning this cours e concept of automobiles in electronics internal structure and the switching ch and the working concept of sensors and e concept of engine Control Systems. e advanced power devices and its workin s: At the end of this course, learners will the suitable device for the application. gnition & injection systems and its parar ensors and actuator of switching system the engine control systems. he reliability of the system. ODUCTION ronics in automobiles – emission laws – valent Bharat Standards, Charging syste rements of starting system - Starter mot TION AND INJECTION SYSTEMS gnition fundamentals - Electronic igniti	naracter actuato ng prin l be ab meters. n - introd ems: W tors and	ors ole to: luctio orkin d star	n to En g and ter circ	uro I, Eur design of cuits	o II, Euro f charging c	ircuit diagr	am -
gnition -Direct ign xhaust emissions	nition – Spark Plugs. Electronic fuel Co –Electronic control of carburetion – Pet	ntrol: I	Basics	s of co	mbustion	n – Engine f	fuelling and	1
	OR AND ACTUATORS e and characteristics of Airflow rate, Ex		1	1.0				9
angle, temperature stepper motor actu Unit IV ENGIN Control modes for used in the engine	e, exhaust gas oxygen sensors – study nator, vacuum operated actuator. E CONTROL SYSTEMS fuel control- engine control subsystems management – block diagram of the eng	y of fu - igni gine m	tion c	jector, control	exhaust methodo system. In	gas recirc	ulation act	uator 9 s
	f CAN standard – diagnostics systems in	n mode	ern au	tomob	iles.			0
Traction control sy system –electronic	SIS AND SAFETY SYSTEMS ystem – Cruise control system – electron e suspension system – working of airbag m –climate control of cars.							
	'Automobile electrical and electronic sy						Edition, 20	012
	bens, "Understanding Automotive Elec	tronics	s", Ne	wness	7th Editi	ion2012.		
Al Sontini "Au		ngaga	Loom	ing 2	012		10 to 10	011
	tomotive Electricity & Electronics" Cer				012	1		-
	ashid,"Power Electronics Hand booke, I				nanarar	otivo Ela-	vier 2014	
William B.Rib	bens, Understanding automotive electro	mics, a	in eng	gineeri	ng perspe	cuve, Else	vier 2014	
				P	31	-		

Programme	ME - POWER ELECTRO	NICS AN	D DR	IVES		R 2019	Semester III	F F
Course	Course Name	Hou	urs / V	Veek	Credit	Total	Maximun	n
Code	Course Name	L	Т	P	С	Hours	Marks	
19PEX18	HVDC SYSTEMS	3	0	0	3	45	100	
 To unders To analysi To unders To study t To deal wit To deal wit Course Outcomes Understant transmission Analyze H Understant Analyze th Investigate Jnit I INTRO 	VDC Converters. d the control of converters. e faults in converters. harmonics and filters. DUCTION	C transmis ction em. will be ab er transmi	ble to: ssion					9
DC transmission considerations – M Init II ANALY	 Power transmission technology – Structure of HVDC transmission. SIS OF HVDC CONVERTERS 	nission sy	/stem	- F	Reactive	power	demand-Econo	mio
Three phase conve	verters – Choice of converter cor	figuration	- Pr	operti	es of Th	yristor c	onverter circui	ts -
Three phase conve welve pulse conve	verters – Choice of converter converters - Simplified analysis of Graverter – Transformer connections. OL OF CONVERTERS	figuration etz circuit	- Pr with	operti and v	es of Th vithout o	iyristor c verlaps (onverter circui Characteristics	ts -
Three phase conve twelve pulse conve Unit III CONTR Principal of DC L versus constant vo angle control- Freq Power Control.	erters - Simplified analysis of Graverter - Transformer connections. OL OF CONVERTERS ink Control - Basic means of cordinate ltage- Converters Control Characci uency control - Effect of source in	etz circuit ntrol – Ga teristics – ductance c	with te Co Firin on the	and v ntrol g ang	- Power le contro	verlaps (reversal ol – Curr	- Constant cur rent and extinc	ts - of a 9 rent tion
Three phase conve welve pulse conve Jnit III CONTR Principal of DC L versus constant vo angle control- Freq Power Control. Jnit IV FAULTS	erters - Simplified analysis of Graater - Transformer connections. OL OF CONVERTERS ink Control – Basic means of corr ltage- Converters Control Charace uency control – Effect of source in S IN CONVERTERS AND ITS P	etz circuit ntrol – Ga teristics – ductance c	with te Co Firin on the	and v ntrol g ang syster	- Power le contro m- Startin	verlaps (reversal bl – Curr ng and sto	- Constant cur ent and extinc opping of DC li	ts - of a 9 rent tior ink- 9
Three phase conve twelve pulse conve Unit III CONTR Principal of DC L versus constant vo angle control- Freq Power Control. Unit IV FAULTS Converter disturban protection - DC re	erters - Simplified analysis of Graa rter – Transformer connections. OL OF CONVERTERS ink Control – Basic means of cor ltage- Converters Control Charac uency control – Effect of source in S IN CONVERTERS AND ITS P nce – By pass action in bridge – Sh actors - Voltage and current oscil	etz circuit ntrol – Ga teristics – ductance c PROTECT nort circuit	with te Co Firin on the FION on a	and v ntrol g ang syster rectifi	- Power le contro m- Startin er – Con	verlaps (reversal bl – Curr ng and ste	- Constant cur rent and extinc opping of DC li	9 rent ink- 9 s of
Three phase conve twelve pulse conve Unit III CONTR Principal of DC L versus constant vo angle control- Freq Power Control. Unit IV FAULTS Converter disturbar protection - DC re breakers - Overvolt Unit V HARMO	erters - Simplified analysis of Graater - Transformer connections. OL OF CONVERTERS ink Control – Basic means of correlating - Converters Control Charace uency control – Effect of source in S IN CONVERTERS AND ITS P ince – By pass action in bridge – Shactors - Voltage and current oscil age protection. DNICS AND FILTERS	etz circuit ntrol – Ga teristics – ductance c PROTEC1 nort circuit lations – 0	with te Co Firin on the FION On a Clearin	and v ntrol g ang syster rectifi ng lin	- Power le contro m- Startin er – Con e faults	verlaps (reversal ol – Curr ng and sto nmutation and re-en	- Constant cur ent and extinc opping of DC li failure- Basic nergizing - Cir	9 rent ink- 9 s of 2 9
Three phase converting of the pulse converting of DC L Imit III CONTR Principal of DC L Converter local Principal control- Freq Prover Control. Init IV FAULTS Converter disturban Protection - DC representers - Overvolt Init V HARMO Init V Converter local	erters - Simplified analysis of Graa rter – Transformer connections. OL OF CONVERTERS ink Control – Basic means of cor ltage- Converters Control Charac uency control – Effect of source in S IN CONVERTERS AND ITS P nce – By pass action in bridge – Sh actors - Voltage and current oscil age protection.	etz circuit ntrol – Ga teristics – ductance c ROTECT nort circuit lations - (armonics	with te Co Firin on the FION on a Clearin	and v ntrol g ang syster rectifi ng lin s miti	- Power le contro m- Startin er – Con e faults gation-D	verlaps (reversal ol – Curr ng and sto nmutation and re-en esign of	- Constant cur rent and extinc opping of DC li n failure- Basic nergizing - Cir AC filters and	9 ren tior nk- 9 s of cuit
Three phase converting of the pulse converting of DC L Init III CONTR Principal of DC L Versus constant voltage control- Freq Power Control. Init IV FAULTS Converter disturbar protection - DC representers - Overvolt Init V HARMO Introduction - Gen ilters - Corona loss EXT BOOK(S):	erters - Simplified analysis of Graater - Transformer connections. OL OF CONVERTERS ink Control – Basic means of cordinater - Converters Control Charace uency control – Effect of source in S IN CONVERTERS AND ITS P ince – By pass action in bridge – Shactors - Voltage and current oscillage age protection. DNICS AND FILTERS eration of harmonics –Effects of has in HVDC lines - Radio interferenters	etz circuit ntrol – Ga teristics – ductance c PROTEC1 nort circuit lations – C armonics ce due to c	with te Co Firin on the Clearin and it: corona	and v ntrol g ang syster rectifi ng lin s miti a- Gro	- Power le contro m- Startin er – Con e faults gation-D unding –	verlaps (reversal ol – Curr ng and sto nmutation and re-en esign of advantag	- Constant cur ent and extinc opping of DC lin failure- Basic nergizing - Cir AC filters and ges and problem	9 rentition ink- 9 s of cuit
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To understand the basics of electric and hybrid vehicles. To understand the configuration of energy storage. To understand the working configuration of electric propulsion To analyze various electric drives used in hybrid and electric vehicles To learn about IC Engine Components Course Outcomes: At the end of this course, learners will be able to: Determine the mathematical model for electric vehicle. Identify suitable electric storage devices for a particular application. Analyze various power converters for electric vehicles Learn the different types of IC engine and their controls. Init I INTRODUCTION 9 History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles Basics of vehicle propulsion and mechanics, hybrid traction, electric vehicle architecture, Power trair components, Mathematical models to describe vehicle performance Unit II ENERGY STORAGE 9 Introduction to Energy Storage Requirements, Battery Fundamentals, Parameters and Modeling, Types, Battery based energy storage and its analysis: Types, Parameters and Modeling, Fuel Cell based energy storage and its analysis. Hybridization of different energy storage devices. Unit II ELECTRIC PROPULSION 9 Introduction to electric components used in hybrid and electric vehicles, Configuration and control of Switch Reluctance Motor drives, Configuration and control of Switch Reluctance Motor drives, Configuration and control of Switch Reluctance Motor drives, Setter Storage FOR ELECTRIC DRIVES 10 IV POWER CONVERTERS FOR ELECTRIC DRIVES 10 IV POWER CONVERTERS FOR ELECTRIC DRIVES 10 IV CENGINES COMPONENTS, CONTROL & COMMUNICATION 9 Iternal Combustion Engines-Economy and Emission control, Power train Components, Cooling System, Vehicle Control strategy, Vehicle communication IEXT BOOK(S): Ideal Hussain, "Electric Vehicle Technology Explained", John Wiley & Sons, 2003. IEXT BOOK(S): Ideal Hu	19PEX20	HYBRID ELECTRIC VEHICLES	3	0	0	3	45	100	
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