Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)



Course Content of

Final Year B. Tech. (Electrical Engineering) Sem- VII (ODD)

2021-22

Professional Core (Theory) Courses

	Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)										
	AY 2021-22										
	Course Information										
Progra	Programme B.Tech. (Electrical Engineering)										
Class.	Semes	ster	Final Year B Tech	Sem VII							
Cours	e Code										
Cours	Course Name HVDC Transmission										
Doging	Course Name HVDC Transmission Desired Description Dever Electronics, Dever System Engineering										
Desire	u neq	uisites:	Fower Electronics,	, FOWEI System Ei	ignicering						
	Traching Schome (Mayles)										
Test		2 Urs/meals		Examination	Scheme (Iviarks)	T-4-1					
Lectur	re	3 Hrs/week	<u>T1</u>	<u>T2</u>	ESE	lotal					
Tutor		-	20	20	60	100					
Practi	cal	-									
Intera	ction	-		Cre	edits: 3						
			Cou	rse Objectives							
1	This	course intends	the students to analy	ze concept of HV	DC transmission syste	m.					
2	It pro	vides the know	ledge of appropriate	e control and prote	ction systems in HVE	C transmission					
	² systems.										
3	3 It gives the overview of recent trends in HVDC transmission systems.										
		Cou	irse Outcomes (CO) with Bloom's T	axonomy Level						
At the	At the end of the course, the students will be able to,										
<u>CO1</u>	Anal	yze HVDC sys	tems			Analyse					
CO2	Justi	fy various cont	rol and protection so	chemes for HVDC	transmission system.	Evaluate					
<u>CO3</u>	Expl	ain recent trend	ds in HVDC transmi	ssion system.		Understand					
	•					TT					
Modu			Modul	e Contents		Hours					
I	C tr	omparison of ansmission sys	EHVAC and H tems, components of	OD Technology VDC Transmission f HVDC transmiss	on, types of HVD ion system.	C 6					
П	A D in	nalysis of HV ifferent modes rectification,	DC converter of valve operation, and inverter operation	o/p voltage wave ion, valve voltage	forms and D C voltag s, equivalent electrica	e 6					
	H	VDCTS contr	ol features								
III	C	ontrol modes,	control schemes and	l their comparison	s, energization and de	- 6					
	eı	nergization of b	oridges, starting and	stopping of D C li	nk.						
	Faults and over-voltages W Convertor mel operations, commutation failure, over voltages in HVDCTS 6										
protection of converters, D C reactor and damper circuits.											
	H	armonics and	their suppression i	n HVDCTS							
v	H	armonic analy	sis, filter design, m	inimum cost tune	d A C filters, reactiv	e 6					
		Jwei iequireine	HVDCTS								
VI	Se re	eries and para	HVDCIS llel MTDCTS, thei HVDCTS.	r control, introdu	ction to HVDC ligh	6					
	Text Books										

1 K.R. Padiyar, "H.V.D.C. Power Transmission", Wiley Eastern, New Delhi.

2 E.W. Kimbark, "Direct Current Transmission", Win publisher.

References

- 1 J. Arrillaga, "H.V.D.C. Transmission", Peter limited
- 2 S.Rao, "*E.H.V.A.C. & H.V.D.C. Transmission*", Khanna Publishers.

CO-PO Mapping														
		Programme Outcomes (PO) PSO												
	1 2 3 4 5 6 7 8 9 10 11 12 1 2 3													
CO1		3												
CO2		3												
CO3													3	
The strength of mapping is to be written as 1,2,3; Where, 1: Low, 2: Medium, 3: High														
Each CO	Each CO of the course must map to at least one PO.													

	Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course										
E	Bloom's Taxonomy Level T1 T2 ESE Total										
1	Remember										
2	Understand	10		10	20						
3	Apply										
4	Analyse	10	10	10	30						
5	Evaluate		10	40	50						
6	Create										
	Total 20 20 60 100										

		Walchand Col	llege of Engineeri	ng, Sangli						
		(Oovernment 2	AV 2021-22							
		Cor	rse Information							
Program	ne	B.Tech. (Elect	rical Engineering)							
Class. Sen	nester	Final Year B	Tech Sem VII							
Course Co	ode	Tinur Tour Di								
Course Na	ame	Power System	Harmonics							
Desired R	eauisites:	Power systems	s. Power Electronic	cs						
			-,							
Teac	hing Scheme		Examinati	on Scheme (Marks)						
Lecture	3 Hrs/week	T1	T2	ESE		Total				
Tutorial	-	20	20	60		100				
Practical										
Interactio	1 - Credits: 3									
		1								
		Co	urse Objectives							
1	To introduce terms	and definitions	of power quality of	disturbances, and their	cause	es, detrimental				
	effects and solutions.									
2	It also aims to provide a theoretical background to correctly approach the problem of reactive,									
4		uance compensa	uton, in the contex	a of the applicable pov	ver the	eory.				
	Cours	e Outcomes (C	O) with Bloom's	Taxonomy Level						
At the end	of the course, the st	udents will be a	ble to,							
CO1	Explain the basic	concepts of Por	wer Quality distur	bances, power definiti	ions	Understandin				
	and other figures o	f merit under di	storted operation.			g				
CO2	To Study and Sele	ct appropriate h	armonic filters for	particular applications	s.	Analyzing, Evaluation				
	To Design and Ap	plv harmonic fi	lters to mitigate po	ower quality problems.		Applying.				
CO3	r ag ar	I J	01	1 91		Creating				
Module		Mod	lule Contents			Hours				
	Introduction to P	ower Quality								
	What is Power Q	uality?,Power	Quality Voltage	e Quality, Why Are	We					
I	Power Quality P	roblems Trans	ients Long-Dura	tion Voltage Variation	S OI	6				
	Short-Duration Vo	ltage Variations	s. Voltage Imbalar	nce. Waveform Distor	tion					
	Voltage Fluctuatio	n, Power Freque	ency Variations, P	ower Quality Terms						
	Fundamentals of	Harmonics		·						
	Harmonic Distorti	on, Voltage ve	rsus Current Dist	ortion, Harmonics ver	rsus					
II	Transients, Harmo	onic Indexes, H	armonic Sources	trom Commercial Loa	ads,	6				
	System Response Characteristics Effects of Harmonic Distortion									
	Interharmonics, P	arallel resonance	e, case study on pa	rallel resonance.						
	Harmonic Mitiga	tion Technique	s- Passive Filters							
Ш	Shunt passive filters, types, Design considerations of single tuned filters,									
	Detuned filters, D	esign considera	tions of Detuned	filters, High pass filt	ers,	0				
	Design considerati	ons of HP filters	s, Case studies and	i numerical examples						
T T 7	Introduction State	of the Art on St	s-onunt Active Po	Filters Classification	of	C I				
IV	Shunt Active Deve	or Hiltors Drives	inle of Operation	and Control of Shurt		O				
	Shunt Active POW	a rincis, Princi	ipie or, Operation	and Control of Shuffl						

	Active Power Filters, Analysis and Design of Shunt Active Power Filters,	
	Numerical Examples	
	Power Definitions in Single Phase Circuits	
V	Definitions of various powers, power factor and other figures of merit under sinusoidal and non-sinusoidal conditions applicable to single phase circuits.	6
	Power Definitions in Three Phase Circuits	
VI	Definitions of various powers, power factor and other figures of merit under balanced, unbalanced and non-sinusoidal conditions. IEEE 1459 power definitions applicable to three phase circuits	6
	Text Books	
1	Roger C. Dugan, Mark F. McGranton and H. Wayne Beety, " <i>Electrical I Quality</i> " McGraw Hill.	Power Systems
2	Dr. Mahesh Kumar, IIT Chennai, "Power Quality in Distribution Systems".	
	References	
1	George J. Wakileh, "Power System Harmonics - Fundamentals, Analysis &	Filter Design"
	Springer. Bhim Singh Ambrich Chandra Kamal Al Haddad "Power Quality Problems	and Mitigation
2	Techniques", Wiley, 2015.	
	Useful Links	
1	https://nptel.ac.in/courses/108/107/108107114/	

	CO-PO Mapping														
	Programme Outcomes (PO)											PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	1													
CO2		2			2										
CO3			3												

The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High Each CO of the course must map to at least one PO.

Assessment

	Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course										
Bloom's Taxonomy Level T1 T2 ESE Total											
1	Remember										
2	Understand	5		10	15						
3	Apply	5	5	10	20						
4	Analyse	5	5	10	20						
5	Evaluate	5	5	10	20						
6	Create		5	20	25						
	Total 20 20 60 100										

Professional Core (Lab) Courses

	Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)									
				2021-22						
Due and			D Tash (Electric	e Information						
Progra	Same		B. Tech. (Electric	cal Engineering)						
Class,	Semester		Final Tear D. It							
Cours	e Coue		Dower System L	Iarmoniae Lab						
Desire	d Requisi	tog•	Power systems	Power Electronics						
Desire	u Kequisi			I Ower Electronics						
Teaching Scheme Examination Scheme (Marks)										
Lectur	re	-	LA1	LA2	ESE	Total				
Tutori	ial	_	30	30	40	100				
Practi	Practical 2 Hrs									
Intera	nteraction - Credits: 1									
			1							
			Cours	e Objectives						
1	To demo	nstrate Power (Quality issues and	their solutions.						
2	It also in	nparts skills to	design harmonic f	iltering systems su	itable for particular appl	ication in				
2 power systems.										
		Course	Outcomes (CO)	with Bloom's Tax	konomy Level					
CO1Identify power quality problems and its solutions.Applying										
CO2	Calculat	e power compl	ement definitions	in single phase and	d three phase circuits.	Applying				
CO3	Design s	suitable harmoi	nic filtering system	ms for particular	applications and analyz	e Creating				
	the result	S.								
			List of Free original	nonta / Toh Astin	:4:00					
List of	Fynorim	onte	List of Experin	nents / Lad Activ	lues					
	Experime	ents:								
1	Classific	ation of Power	Quality Disturban	ices						
2.	Determin	the K rating	of the load							
3.	Predict th	ne parallel reso	nance frequency a	nd solve for the m	agnified currents and vo	ltages in the				
	circuit.	1	1 5		8	0				
4.	Design o	f Single Tuned	Harmonic Filter f	for mitigation of H	armonics.					
5.	Simulation	on of Shunt act	ive power filter us	ing p-q theory.						
6.	Simulation	on of Shunt act	ive power filter us	ing d-q theory.						
7.	Analysis	of Power Com	ponent definitions	s in single phase ci	rcuits with Nonlinear loa	ıd.				
8.	Analysis	of Power Com	ponent definitions	s in single phase ci	rcuits with non-Sinusoid	al supply and				
	Nonlinea	r load.		• .1 1 •		. 1 1				
9.	Analysis	of Power Com	ponent definitions	s in three phase cir	cuits with a balanced Sir	lusoidal				
	supply a	id Nonlinear lo	ad.							
Toyt Books										
	Roge	r C. Dugan M	Mark F. McGrant	ton and H. Wavr	ne Beety, "Electrical P	ower Systems				
1 Roger C. Dugan, Mark F. McGranton and H. wayne Beety, <i>Electrical Power Systems</i> <i>Ouglity</i> McGraw Hill										
2 Dr. Mahesh Kumar, IIT Chennai, " <i>Power Quality in Distribution Systems</i> ".										
, , , , , , , , , , , , , , , , ,										
			Re	eferences						
1	Georg	ge J. Wakileh,	"Power System	Harmonics - Fund	damentals, Analysis & I	Filter Design"				
	Sprin	ger.			· ·	5				
2	Bhim	Singh, Ambris	sh Chandra, Kama	al Al-Haddad, "Pa	ower Quality Problems a	nd Mitigation				
2	Techr	<i>iques</i> ", Wiley,	, 2015.		-	-				

Useful Links

1

https://nptel.ac.in/courses/108/107/108107114/

CO-PO Mapping															
		Programme Outcomes (PO)											PSO		
	1	1 2 3 4 5 6 7 8 9 10 11 12 1 2 3													
CO1															
CO2				3											
CO3			2												
The strength of mapping is to be written as 1,2,3; Where, 1: Low, 2: Medium, 3: High															
Each CO	Each CO of the course must map to at least one PO.														

	Assessment										
There are three	There are three components of lab assessment, LA1, LA2 and Lab ESE.										
IMP: Lab ES	E is a separate head of	passing. LA1, LA	A2 together is treated as In-Semester Evaluat	ion.							
Assessment	Based on	Conducted by	Typical Schedule (for 26-week Sem)	Marks							
TA1	Lab activities,	Lab Course	During Week 1 to Week 6	20							
LAI	attendance, journal	Faculty	Marks Submission at the end of Week 6	50							
I A 2	Lab activities,	Lab Course	During Week 7 to Week 12	20							
LAZ	attendance, journal	Faculty	Marks Submission at the end of Week 12	50							
Lob ESE	Lab activities,	Lab Course	During Week 15 to Week 18	40							
	attendance, journal	Faculty	Marks Submission at the end of Week 18	40							

Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments.

Assessment Plan based	on Bloom's Ta	xonomy Level	(Marks) (For la	ab Courses)
Bloom's Taxonomy Level	LA1	LA2	Lab ESE	Total
Remember				
Understand				
Apply	20	10	20	50
Analyse				
Evaluate				
Create	10	20	20	50
Total Marks	30	30	40	100

	Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)										
			A	Y 2021-22							
			Cour	se Information							
Progra	amme		B.Tech. (Electrica	ll Engineering)							
Class,	Semes	ter	Final Year B. Tec	h., Sem VII							
Cours	e Code										
Cours	e Nam	e	Project 1 and Sem	inar							
Desire	d Req	uisites:									
T	Teaching Scheme Examination Scheme (Marks)										
Lectur	re	-	LA1	LA2	ESE	Total					
Tutori	ial	-	30	30	40	100					
Practi	cal	6 Hrs/Week									
Intera	teraction - Credits: 3										
			Cou	rse Objectives							
1	This of topic.	course is intend	ed to review and de	monstrate their under	standing of the select	ed specific					
2	It is a they a	imed to enable are written critic	students to interpre- cally and efficiently	t, analyze and infer re	search papers and un	derstand how					
3	It provides the ability to review the research papers and present the understanding of a new field.										
4	It is expected to identify new directions in Electrical Engineering and illustrate its importance.										
		Cou	rse Outcomes (CO) with Bloom's Taxo	nomy Level	•					
At the	end of	the course, the	students will be abl	e to,	v						
CO1	Expla	ain the concept	ual idea behind the	project.		Understand					
CO2	Analy econd	yze the resear	ch papers/ magaz ental and societal is	ine articles and the sues.	ir impact on glob	al, Analyse					
CO3	Evalu impor	ate and present rtant points in the	ent the research p he papers/articles.	papers/ magazine art	icles and outline t	ne Evaluate					
CO4	Inter identi	pret and community promising di	nunicate different of the same	contributions in Elec	trical Engineering a	nd Apply					
	100110	i j promong u				I					
			List of Exper	iments / Lab Activit	ies						
List of	f Expei	riments:	p								
Semin	ar shall	be delivered or	n one of the advance	ed topics chosen for p	roject in consultation	with the guide					
after co	ompilir	ng the informati	on from the latest li	iterature and also inter	met. The concepts m	ust be clearly					
unders	tood ar	nd presented by	the student. Studen	t should work on his	project. He/She shou	d complete the					
literatu	ire surv	vey and develop	the design of the p	roject. All modern me	thods of presentation	should be used					
by the	studen	t. A hard copy of	of the report on sele	cted project topic(25	to 30 pages A4 size,	12 fonts, Times					
New R	loman,	single spacing	both side printed as	per the format specif	ied by the departmen	t) should be					
submit	ted to t	he department.	A PDF copy of the	report in soft form m	ust be submitted to tl	e guide along					
with of	ther det	tails if any.									
	1]	Fext Books							
1	As pe	er topic Selected	and Journal papers	s, Conference papers,	Handbooks.						
			I	References							
1	As pe	er topic Selected	and Journal papers	s, Conference papers,	Handbooks.						
			U	seful Links							
1	-										

CO-PO Mapping															
		Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1							2			3					
CO2								3							
CO3									3						
CO4 2 3 2															
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															
CO1 CO2 CO3 CO4 The stren	gth of 1	mappir	ng is to	be wri	2 itten as	1,2,3;	2 3 Where	3 2, 1:Lo	3 w, 2:N	10 3 Iedium	, 3:Hig	sh			

Each CO of the course must map to at least one PO.

Assessment

	Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course										
B	loom's Taxonomy Level	T1	T2	ESE	Total						
1	Remember										
2	Understand	5	5	15	25						
3	Apply	5	5	15	25						
4	Analyse	5	5	15	25						
5	Evaluate	5	5	15	25						
6	Create										
	Total	20	20	60	100						

Professional Elective (Theory) Courses

Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)									
			(Government)	AY 2021-22					
Course Information									
Program	mme		B.Tech. (Elect	trical Engineering)					
Class, S	Semest	er	Final Year B.	Tech., Sem. VII					
Course	Code								
Course	Name		Professional E	Elective 4: Intelligen	t Systems and Its Appl	ications			
Desired	Requ	isites:	NIL	NIL					
Те	aching	g Scheme		Examinatio	n Scheme (Marks)				
Lecture)	Total							
Tutoria	l	-	20	20	60	100			
Practica	al								
Interac	tion	-		C	redits: 3				
	-			ourse Objectives					
1	To er	hance basic kno	owledge of intel	ligence system.	10 1 1				
2	lo in	npart knowledge	e about Artificia	l neural network an	d fuzzy logic programi	ning for electrical			
	engir	leering applicati	ons.	(O)	ГI				
At the e	ndoft	Cours	se Outcomes (C	U) WITH BIOOM'S I	axonomy Level				
CO1	Com	ne course, me su	talligant System			Understanding			
C01	Impl	Applying							
CO2 Implement algorithms for interligent Systems tools. Appl CO3 Study Intelligent Systems tools for Applications in electrical engineering Anal									
	Biuu	y intelligent Sys		Applications in clear	theat engineering.	Anaryzing			
Modul	e		Mod	ule Contents		Hours			
Modul	le Ir	troduction to	Mod Artificial Neura	ule Contents al Network: Organ	ization of the Brain,	Hours			
Modul	le Ir B	ntroduction to a iological Neuro	Mod Artificial Neura on, Biological a	al Network: Organ	ization of the Brain, on Models, Historical	Hours			
Modul I	le Ir B D	troduction to a iological Neuro evelopments. E	Mod Artificial Neura on, Biological a ssentials of Arti	ule Contents al Network: Organ and Artificial Neuro ficial Neural Netwo	ization of the Brain, on Models, Historical orks: Artificial Neuron	Hours 6			
<u>Modul</u> I	le Ir B D N	ntroduction to iological Neuro evelopments. E lodel, operation	Mod Artificial Neura on, Biological a ssentials of Arti ns of Artificial	al Network: Organ and Artificial Neuro ficial Neural Netwo Neuron, Types o	ization of the Brain, on Models, Historical orks: Artificial Neuron of Neuron Activation	Hours 6			
I	e Ir B D M F	ntroduction to a iological Neuro evelopments. E lodel, operation unction, ANN A	Mod Artificial Neura on, Biological a ssentials of Arti ns of Artificial Architectures.	al Network: Organ and Artificial Neuro ficial Neural Netwo Neuron, Types o	ization of the Brain, on Models, Historical orks: Artificial Neuron of Neuron Activation	Hours 6			
I	le Ir B D M F L	ntroduction to iological Neuro evelopments. E lodel, operation unction, ANN A earning Strateg	Mod Artificial Neura on, Biological a ssentials of Arti as of Artificial Architectures. y (Supervised,	ule Contents al Network: Organ and Artificial Neuro ficial Neural Netwo Neuron, Types o Unsupervised, Rein	ization of the Brain, on Models, Historical orks: Artificial Neuron of Neuron Activation nforcement), Learning	Hours 6			
I	le Ir B D M F L R	atroduction to iological Neuro evelopments. E lodel, operation unction, ANN A earning Strateg ules.	Mod Artificial Neura on, Biological a ssentials of Arti ns of Artificial Architectures. y (Supervised,	ule Contents al Network: Organ and Artificial Neuro ficial Neural Netwo Neuron, Types o Unsupervised, Rein	ization of the Brain, on Models, Historical orks: Artificial Neuron of Neuron Activation nforcement), Learning	Hours 6			
I I II	le Ir B D W F L R P	atroduction to z iological Neuro evelopments. E lodel, operation unction, ANN A earning Strategy ules. erceptron Mod	Mod Artificial Neura on, Biological a ssentials of Arti ns of Artificial Architectures. y (Supervised, lels: Training	ule Contents al Network: Organ and Artificial Neural ficial Neural Netwo Neuron, Types o Unsupervised, Rein Algorithms: Discr	ization of the Brain, on Models, Historical orks: Artificial Neuron of Neuron Activation nforcement), Learning rete and Continuous	Hours 6 6			
I	le Ir B D M F L R P P	atroduction to a iological Neuro evelopments. E lodel, operation unction, ANN A earning Strateg ules. erceptron Mod erceptron Netwo	Mod Artificial Neura on, Biological a ssentials of Arti ns of Artificial Architectures. y (Supervised, lels: Training orks, Perceptron	ule Contents al Network: Organ and Artificial Neuro ficial Neural Netwo Neuron, Types o Unsupervised, Rein Algorithms: Discr n Convergence the	ization of the Brain, on Models, Historical orks: Artificial Neuron of Neuron Activation nforcement), Learning rete and Continuous orem. Multilayer feed	Hours 6 6			
I I II	le Ir B D M F L R P P fc	atroduction to a iological Neuro evelopments. E lodel, operation unction, ANN A earning Strategy ules. erceptron Mod erceptron Netwo orward Neural N ssociative Me	Mod Artificial Neura on, Biological a ssentials of Arti ns of Artificial Architectures. y (Supervised, lels: Training orks, Perceptron letworks	al Network: Organ and Artificial Neuro ficial Neural Netwo Neuron, Types of Unsupervised, Rein Algorithms: Discr n Convergence the ctional Associativ	ization of the Brain, on Models, Historical orks: Artificial Neuron of Neuron Activation nforcement), Learning rete and Continuous orem. Multilayer feed	Hours 6 6			
I	le Ir B D W F L R P P fc A A	atroduction to z iological Neuro evelopments. E lodel, operation unction, ANN A earning Strategy ules. erceptron Mod erceptron Netwo orward Neural N ssociative Me rchitecture BA	Mod Artificial Neura on, Biological a ssentials of Arti ns of Artificial Architectures. y (Supervised, lels: Training orks, Perceptron letworks emory, Bi-dire M Training	al Network: Organ and Artificial Neural ficial Neural Network Neuron, Types of Unsupervised, Rein Algorithms: Discr n Convergence the ctional Associativ	ization of the Brain, on Models, Historical orks: Artificial Neuron of Neuron Activation nforcement), Learning rete and Continuous orem. Multilayer feed we Memory (BAM)	Hours 6 6			
I I II III	le Ir B D M F L R P P f c C A A A	atroduction to iological Neuro evelopments. E lodel, operation unction, ANN A earning Strateg ules. erceptron Mod erceptron Netwo orward Neural N ssociative Me rchitecture, BA lgorithms: Stor	Mod Artificial Neura on, Biological a ssentials of Arti ns of Artificial Architectures. y (Supervised, lels: Training orks, Perceptron letworks mory, Bi-dire M Training age and Recall	al Network: Organ and Artificial Neuro ficial Neural Network Neuron, Types of Unsupervised, Rein Algorithms: Discr n Convergence the ctional Associativ Algorithm, BAM E	ization of the Brain, on Models, Historical orks: Artificial Neuron of Neuron Activation nforcement), Learning rete and Continuous orem. Multilayer feed we Memory (BAM) Energy Function, Self-	Hours 6 6 6 6			
I I II III	le Ir Ir B D M F I L R P P P fc A A A A A O	atroduction to iological Neuro evelopments. E lodel, operation unction, ANN A earning Strategy ules. erceptron Mod erceptron Netwo orward Neural N ssociative Me rchitecture, BA lgorithms: Stora	Mod Artificial Neura on, Biological a ssentials of Arti ns of Artificial Architectures. y (Supervised, lels: Training orks, Perceptron letworks mory, Bi-dire M Training age and Recall (SOM) and Ad	ule Contents al Network: Organ and Artificial Neuro ficial Neural Netwo Neuron, Types of Unsupervised, Rein Algorithms: Discr n Convergence the ctional Associativ Algorithm, BAM E aptive Resonance T	ization of the Brain, on Models, Historical orks: Artificial Neuron of Neuron Activation nforcement), Learning rete and Continuous orem. Multilayer feed ve Memory (BAM) Energy Function, Self- 'heory (ART).	Hours 6 6 6 6			
I I II III	le Ir B D M F L R P P f c A A A A A A F	atroduction to a iological Neuro evelopments. E lodel, operation unction, ANN A earning Strateg ules. erceptron Mod erceptron Netwo orward Neural N ssociative Me rchitecture, BA lgorithms: Stora rganizing Maps uzzy versus crit	Mod Artificial Neura on, Biological a ssentials of Arti ns of Artificial Architectures. y (Supervised, lels: Training orks, Perceptron letworks emory, Bi-dire M Training age and Recall (SOM) and Ad isp, fuzzy sets:	ule Contents al Network: Organ and Artificial Neural ficial Neural Network Neuron, Types of Unsupervised, Rein Algorithms: Discr n Convergence the ctional Associativ Algorithm, BAM E aptive Resonance T membership func	ization of the Brain, on Models, Historical orks: Artificial Neuron of Neuron Activation nforcement), Learning rete and Continuous orem. Multilayer feed we Memory (BAM) Energy Function, Self- heory (ART). ttion, Basic fuzzy set	Hours 6 6 6 6			
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Modul I II III IV V	le Ir Ir B D M F L R P P fc A A A A A O O O I F O I Q I m M A et E	attroduction to iological Neuro evelopments. E Iodel, operation unction, ANN A earning Strateg ules. erceptron Mod erceptron Netwo orward Neural N ssociative Me rchitecture, BA Igorithms: Stora organizing Maps uzzy versus cri perations, prope uantifiers, fuzzy ethods pplication of In c. Study diffe	Mod Artificial Neura on, Biological a ssentials of Arti ns of Artificial Architectures. y (Supervised, lels: Training orks, Perceptron letworks emory, Bi-dire M Training age and Recall (SOM) and Ad isp, fuzzy sets: erties of fuzzy s y Inference), fu telligent System rent flow char ering.	al Network: Organ and Artificial Neural ficial Neural Network ficial Neural Network Neuron, Types of Unsupervised, Rein Algorithms: Discr n Convergence the ctional Associativ Algorithm, BAM E aptive Resonance T membership func sets, fuzzy relation uzzy rule based sy as in Voltage Contro rt of Intelligent s	ization of the Brain, on Models, Historical orks: Artificial Neuron of Neuron Activation nforcement), Learning rete and Continuous orem. Multilayer feed we Memory (BAM) Energy Function, Self- heory (ART). tion, Basic fuzzy set is. fuzzy logic (Fuzzy ystem, defuzzification ol, security assessment system application in	Hours 6 6 6 6 6 6 6 6			
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1	Kosko B, "Neural Networks and Fuzzy Systems: A dynamical system approach to machine intelligence", Prentice Hall of India, 2009.
2	Crina Grosan, Ajith Abraham, "Intelligent Systems: A Modern Approach", Springer Verlag, 2011
3	Timothy S.Ross, "Fuzzy Logic with engineering applications", Weily India Pvt. Ltd., 2011
4	S. N. Sivanandam, S. Sumathi, S. N. Deepa, " <i>Introduction to Neural Network Using MATLAB</i> 6.0", Tata McGraw-Hill, New Delhi, 2006
	References
1	Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", 1st Edition, Pearson Education, 2015
2	Abraham-Kandel, Gideon-Langholz, "Hybrid-Architectures for Intelligent Systems", CRC-Press, 1992.
3	Adrian A. Hopgood, "Intelligent systems for engineers and scientists", Second Edition, CRC press, 2001
	Useful Links
1	http://nptel.ac.in/downloads
2	http://www.nptelvideos.in
3	https://ocw.mit.edu/courses

CO-PO Mapping														
	Programme Outcomes (PO) PSO													
1	2	3	4	5	6	7	8	9	10	11	12	1	2	
3														
	2													
CO3 3 3 3														
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High														
	$\frac{1}{3}$	1 2 3 2 gth of mappin	1 2 3 3 2 2 3 3 3 2 3 3 3	P 1 2 3 4 3	Program1234532222322gth of mapping is to be written as	CO-JProgramme O1234563222223222gth of mapping is to be written as 1,2,3;	Image: CO-PO Mage Image: Programme Outcom 1 2 3 4 5 6 7 3 Image: Im	CO-PO Mapping Programme Outcomes (PC 1 2 3 4 5 6 7 8 3 2	CO-PO Mapping Programme Outcomes (PO) 1 2 3 4 5 6 7 8 9 3 2	CO-PO Mapping Programme Outcomes (PO) 1 2 3 4 5 6 7 8 9 10 3 2	CO-PO Mapping Programme Outcomes (PO) 1 2 3 4 5 6 7 8 9 10 11 3 2	CO-PO Mapping Programme Outcomes (PO) 1 2 3 4 5 6 7 8 9 10 11 12 3 - <td>CO-PO Mapping Programme Outcomes (PO) 1 2 3 4 5 6 7 8 9 10 11 12 1 3 2 2 2 2 2 2 2 2 3<td>CO-PO Mapping Programme Outcomes (PO) PSO 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 - - - - - - - - - - 2 -</td></td>	CO-PO Mapping Programme Outcomes (PO) 1 2 3 4 5 6 7 8 9 10 11 12 1 3 2 2 2 2 2 2 2 2 3 <td>CO-PO Mapping Programme Outcomes (PO) PSO 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 - - - - - - - - - - 2 -</td>	CO-PO Mapping Programme Outcomes (PO) PSO 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 - - - - - - - - - - 2 -

Each CO of the course must map to at least one PO.

Assessment

	Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course											
E	Bloom's Taxonomy Level	T1	T2	ESE	Total							
1	Remember											
2	Understand	5		10	15							
3	Apply	5	10	20	35							
4	Analyse	10	10	30	50							
5	Evaluate											
6	Create											
	Total	20	20	60	100							

	Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)										
			(Government At	V 2021-22	пше)						
			Cour	se Information							
Program	nme		B.Tech. (Electric	al Engineering)							
Class. S	lemest	er	Final Year B. Te	ch., Sem VII							
Course	Code										
Course	Name		Professional Elec	tive 4. Process Contr	ol						
Desired	Reau	isites:	Control System	Engineering							
			~ <i>~ j</i>	8							
Te	aching	Scheme	Examination Scheme (Marks)								
Lecture		3 Hrs/week	T1	T2	ESE	Total					
Tutoria	1	-	20	20	60	100					
Practica	al	-									
Interact	tion	-		Cred	its: 3						
			Cou	rse Objectives							
1	This	course intends	to provide basics for	or mathematical mode	el of the process.						
2	It imposed system	parts the knowl m.	edge of various typ	bes of controllers for s	single loop and multi lo	op control					
3	It pro	vides over view	w of advanced cont	rollers used in proces	s control and multivari	able					
	preur	Cour	se Outcomes (CO) with Bloom's Tax	nomy Level						
At the e	nd of t	he course the s	students will be abl	e to							
CO1	Prod	uce the models	of industrial proce	esses.		Apply					
	Anal	vse the proble	ms associated wit	h open loop and clo	ose loop process contr	ol Analyze					
CO2	syste	m.		1 1	1 1						
CO3	Eval	uate the perform	rmance of process	ses with various cor	ventional and advance	ed Evaluate					
CO4	Desig	n the processes	s with various conv	ventional and advance	ed controllers.	Create					
Modul	e		Мо	dule Contents		Hours					
	Ir	ntroduction to	Process Control								
	In	troduction, De	sign aspects of a p	rocess control system	, Hardware for a proce	ss					
I	c	ontrol system. I	Mathematical mod	elling and analysis of	f processes, developme	nt 6					
	of	f a mathematic	cal model, Modell	ing considerations f	or control purposes, the	ne					
	in	put-output mod	tel, degree of freed	lom.							
		lodelling of Pr	ocess								
П	C	omputer Simul	ation and lineariza	tion of nonlinear sys	stems, Transfer function	$\begin{bmatrix} 1S \\ 1 \end{bmatrix} = 6$					
	ar	id the input-ou	lput models. Dyna	mic denaviour of first	st-order systems, secon	1-					
		adback Cont	rol of Process								
	F	lements of fee	dback control sys	tem types of feedb	ack controllers sensor	s					
		ransmission li	nes final control	elements Dynamic	behavior of feedbac	s, <-					
III	c	ontrolled proce	ss. Effect of prop	portional (p) control.	Integral (I) control at	d 6					
	de	derivative (D) control on the response of controlled process, effect of composite									
	co	ontrol actions.	×.	201 on the response of controlled process, effect of composite							
	N	Iulti Loop Cor	ntrol								
	F	eedback contro	l of system with la	arge dead time or inv	verse response, process	es					
	W	ith large Dead	l time, Dead time	compensation, and	control of systems wi	th					
IV	in	verse response	e. Control systems	Control systems with multiple loops, cascade control, split- 6							
	ra	inge control, fe	eed forward contr	ol, Ratio-control, pro	oblem in designing fe	ed					
		orward controll	ers, practical aspect	cts on the design of	teed forward controller	s,					
	F∕	$(\mathbf{F} - \mathbf{F})\mathbf{B}$ contro	l.								

V	MIMO Process Multi-input, multi-output processes, degree of freedom and number of controlled and Manipulated variables, interaction and decoupling of control loops, relative gain array and selection of loops, design of non-interacting control loops. Overview of modern control methodologies: PLC, SCADA, DCS, Adaptive control, variable structure control.	6				
VI	VICentralized Multivariable Control Multivariable model predictive control, single-variable dynamic matrix control (DMC) algorithm, multivariable dynamic matrix control, internal model control, smith predictive, model predictive control, process model based control, implementation guidelines. Process control design: sequence of design steps, statistical process control.					
	Text Books					
1	George Stephanopoulos, "Chemical Process Control - An introduction to Theory and Prentice-Hall of India, 1st Edition 1984.	Practice",				
	References					
1	Thomas E. Marlin, "Process Control - Design Processes and Control System for Performance", 2nd Edition, Mc Graw Hill publication.	r Dynamic				
2	F.G. Shinskey, "Process Control System – Application, Design and Tuning", Mc Publication, 3rd Edition, 1988.	cGraw-Hill				
3	Curtis D. Johnson, "Process Control Instrumentation Technology", 7th Edition Education, 7th Edition. 2003.	n, Pearson				
	Useful Links					
1	http://nptel.ac.in/downloads/117105077					
2	http://www.nptelvideos.in/2012/12/digital-communication.html					
3	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-450-princip digital-communications-i-fall-2006/video-lectures/	ples-of-				

	CO-PO Mapping														
		Programme Outcomes (PO) PSO													
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	2													
CO2		2													
CO3		2													
CO4 2															
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															

Each CO of the course must map to at least one PO.

Assessment

The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course										
F	Bloom's Taxonomy Level	T1	T2	ESE	Total					
1	Remember									
2	Understand									

3	Apply	10	5	10	25
4	Analyse	10	5	20	35
5	Evaluate			10	10
6	Create		10	20	30
	Total	20	20	60	100

Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)											
	AY 2021-22										
			Cour	se Information	า						
Program	nme		B.Tech. (Electric	cal Engineering	<u>y</u>)						
Class. S	lemest	er	Final Year B Tech Sem VII								
Course	Code										
Course	Name		Professional Elective 4: Advanced Power Electronics								
Desired	Requ	isites:	Power Electroni	Power Electronics							
	-		1								
Te	aching	g Scheme	Examination Scheme (Marks)								
Lecture	•	3 Hrs./week	T1	T2	ESE	Total					
Tutoria	l	-	20	20	60	100					
Practica	al	-									
Interac	tion	-			Credits: 3						
			Cou	rse Objectives							
1	This	course intends to	o provide advance	d knowledge o	f different power electro	nic converters,					
	multi	-level inverters	and resonant conv	erters.							
2	It is a	imed to impart	skills of analysis f	for different typ	bes of advanced converte	ers and shunt active					
	powe	r filters.	• . 1 • .1		C 1°CC	1					
3	Make	the students ac	quainted with con	trol strategies of	of different types of adva	inced converters					
	and s	nunt active pow	er Inters.) with Plaam?	s Taxonomy Loval						
At the e	nd of t	Lours the st	udonte will be obl	o to	s raxonomy Lever						
At the e	Disti	nguish configur	ation and working	t iO, t of different ac	lyanced nower electroni	2 Understand					
CO1	CONVE	erters	auon and working	g of unreferit ac	ivaliced power electronic	Understand					
CO2	Anal	vze different ad	vanced power elec	ctronic convert	ers and systems.	Analyze					
	Eval	uate performance	ce of different pow	ver electronic s	vstem using power	Evaluate					
CO3	electi	onic devices an	d converters.								
						· ·					
Modu	e		Modu	le Contents		Hours					
	P	WM rectifiers									
_	A	dvantages & d	isadvantages of t	hree phase the	yristor converter, Sing	le					
I	pl	hase and three	phase VSI PWM	converters w	orking, types, Control	of 6					
	P	WM rectifiers, a	analysis and applic	cation. Three p	hase CSI PWM convert	er,					
		ontrol and applic	cations.								
		hraa phaga two	lers	invortor	various DWM mother						
		Intel phase two Initilevel Volta	level voltage sol	verter Types:	Diode clamp multiles	18, vel					
II	in	verter flying c	apacitor multileve	el inverter cas	caded multilevel invert	er 8					
	ar	oplications of	multilevel inverte	ers, compariso	n of multilevel invert	er.					
	C	ontrol method:	Multiple carrier P	WM for MLI							
	R	esonant pulse i	nverters								
	S	eries resonant	inverter with uni	directional and	d bi-directional switche	es,					
III	pa	arallel resonant	inverters, volta	ge control of	resonant inverters, ze	ro 8					
	cı	/S									
	re	sonant converte									
		hotovoltaic Inv	erters		(1						
		notovoltaic Inve	erters structures d	Linuator fill	bridge topology such	as					
IV	H L.	5 inverter, Her	tructures derived	from NDC tore	logy such as neutral rel	nt 6					
		amped half br	idge inverter og	1000000000000000000000000000000000000	nogy such as neutral pol	V					
	in	verter	iuge inverter, et	mengy INIC I	nverter, unce phase r	•					
	111	iverter.									

V	Matrix Converters and Z source invertersTopology, working and control methods of Matrix converters, Variouscircuit topologies and control of Z source inverter, Application of Z sourcein induction motor control.	6
VI	Active power filtersPower Quality Issues due to power Electronics, Introduction to active powerfilter, types of active power filters overall control of shunt active powerfilter, control of shunt active filter based on SRF theory. Control of shuntactive filter based on instantaneous power theory. harmonic compensation& reactive power compensation.	6
	Text Books	
1	M. H.Rashid, " <i>Power Electronics: circuits devices and applications</i> ", Pearson E edition.	Education, Third
	References	
1	B. K. Bose, "Modern Power Electronics & AC drives", PHIPL, New Delhi.	
2	M. B. Patil, V. Ramayanan and V. T. Ranganathan, "Simulation of Power Electron Narosa publication.	ronics circuits",
3	IEEE Transaction papers.	
	Useful Links	
1	NPTEL Video lectures on Advanced power Electronics	

	CO-PO Mapping														
		Programme Outcomes (PO)											PSO		
	1	1 2 3 4 5 6 7 8 9 10 11 12 1 2 3													
CO1	1	2													
CO2		2													
CO3			2		1										
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															
Each CO	of the	course	must r	nap to	at leas	t one F	Ю.								

Assessment

	Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course										
E	Bloom's Taxonomy Level	T1	T2	ESE	Total						
1	Remember										
2	Understand	10	5	10	25						
3	Apply										
4	Analyse	5	10	20	35						
5	Evaluate	5	5	30	40						
6	Create										
	Total	20	20	60	100						

	Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)										
			Government	AY 2021-22							
	Course Information										
Progr	Programme B.Tech. (Electrical Engineering)										
Class,	Semeste	r	Final Year B.	Tech., Sem VII							
Cours	Course Code										
Cours	se Name		Professional E	Elective 5: Powe	r System Operation and C	ontrol					
Desire	ed Requis	sites:	Power System	n Engineering, P	ower System Analysis and	l Stability,					
			Control Syste	m Engineering, 1	Power Electronics	-					
			1								
'	Teaching	Scheme		Examina	ation Scheme (Marks)						
Lectu	re	3 Hrs/week	T1	T2	ESE	Total					
Tutor	ial	-	20	20	60	100					
Practi	ical	-									
Intera	action	-			Credits: 3						
			Co	ourse Objectives	5						
1	This co	urse provides th	e knowledge of	Power System	Operation.						
2	lt gives	the knowledge	of various contr	rols in power sys	stems.						
		Course	e Outcomes (C	O) with Bloom ²	's Taxonomy Level	TT 1 / 1'					
CO1	Explain	the concepts	of operation	of power syst	tem considering various	Understanding					
<u> </u>	Analwa	nts of power ap	paratus.	d in norman arrata		Analyzina					
C02	Summe	e different contra	de in Dower Su	a in power syste		Understanding					
	Summa	irize recent tren	us in Power Sy	stem Operation.		Understanding					
Madala Madala Castanta Harra											
Modu	ıle		Modu	ile Contents		Hours					
Modu	ıle Intr	oduction to Ch	Modu aracteristics o	ıle Contents f Modern Powe	er Systems	Hours					
Modu I	ile Intr Phys	oduction to Ch sical Structure,	Modu aracteristics of Operation ar	ile Contents f Modern Powe nd Control Fur	e r Systems actions and Hierarchies.	Hours 4					
Modu I	Ile Intr Physic Desire	oduction to Ch sical Structure, ign and Operatin	Modu aracteristics of Operation ar ng Criteria	ile Contents f Modern Powe nd Control Fur	e r Systems actions and Hierarchies,	Hours 4					
Modu I	IleIntrPhysicDesignedEquition	oduction to Ch sical Structure, gn and Operatin ipment and Sta	Modu aracteristics of Operation ar ng Criteria ability Constra	ile Contents f Modern Powe nd Control Fur iints	e r Systems actions and Hierarchies,	Hours 4					
Modu I	IleIntrPhysDesiEquCap	oduction to Ch sical Structure, ign and Operatin ipment and Sta abilities and	Modu aracteristics of Operation ar og Criteria ability Constra Constraints of	ile Contents f Modern Powe ad Control Fur ints f Generators/E	e r Systems actions and Hierarchies, xciters/Turbines/Network	Hours 4					
Modu I II	IleIntrPhysDesiEquCapEler	oduction to Ch sical Structure, gn and Operatin ipment and Sta abilities and nents (Lines, Tr	Modu aracteristics of Operation ar ang Criteria ability Constra Constraints or cansformers etc	Ile Contents f Modern Powe nd Control Fur ints f Generators/E .),Constraints of	er Systems actions and Hierarchies, xciters/Turbines/Network Energy Supply Systems,	Hours 4 8					
Modu I II	ile Intr Phys Desi Equ Cap Eler Load	oduction to Ch sical Structure, ign and Operatin ipment and Sta abilities and nents (Lines, Tr d Characteristic	Modu aracteristics of Operation ar og Criteria ability Constra Constraints o ransformers etc s, Introduction	Ile Contents f Modern Powe nd Control Fur ints f Generators/E .),Constraints of to Angle/Voltag	er Systems nctions and Hierarchies, xciters/Turbines/Network Energy Supply Systems, ge Instability phenomena,	Hours 4 8					
Modu I II	ile Intr Phys Des: Equ Cap Eler Load Stab	oduction to Ch sical Structure, ign and Operatin ipment and Sta abilities and nents (Lines, Tr d Characteristic ility Constraints	Modu aracteristics of Operation ar ng Criteria ability Constra Constraints of cansformers etc s, Introduction	Ile Contents f Modern Powe nd Control Fur ints f Generators/E .),Constraints of to Angle/Voltag	er Systems actions and Hierarchies, exciters/Turbines/Network Energy Supply Systems, ge Instability phenomena,	Hours 4 8					
Modu I II	IleIntrPhysicDesideEquenceCapElerLoadStabFree	oduction to Ch sical Structure, ign and Operatin ipment and Sta abilities and nents (Lines, Tr d Characteristic ility Constraints quency Contro	Modu aracteristics of Operation ar ang Criteria ability Constra Constraints of ransformers etc s, Introduction s.	Ile Contents f Modern Powe and Control Fur ints f Generators/E .),Constraints of to Angle/Voltag	er Systems nctions and Hierarchies, exciters/Turbines/Network Energy Supply Systems, ge Instability phenomena,	Hours 4 8					
Modu I II	Ile Intr Phys Dess Equ Cap Eler Load Stab	oduction to Ch sical Structure, ign and Operatin ipment and Sta abilities and nents (Lines, Th d Characteristic ility Constraints quency Control of L	Modu aracteristics of Operation ar ag Criteria ability Constra Constraints of cansformers etc s, Introduction s. bl Frequency : Go	Ile Contents f Modern Powe and Control Fur ints f Generators/E .),Constraints of to Angle/Voltag	er Systems nctions and Hierarchies, exciters/Turbines/Network Energy Supply Systems, ge Instability phenomena, lary Control of Frequency	Hours 4 8 8					
Modu I II III	Ile Intr Phys Des: Equ Cap Eler Load Stab Free Prin : AC	oduction to Ch sical Structure, ign and Operatin ipment and Sta abilities and nents (Lines, Tr d Characteristic ility Constraints quency Control of E EC	Modu aracteristics of Operation ar og Criteria ability Constra Constraints of cansformers etc s, Introduction s. d Frequency : Go	Ile Contents f Modern Powe and Control Fur ints f Generators/E .),Constraints of to Angle/Voltag	er Systems actions and Hierarchies, exciters/Turbines/Network Energy Supply Systems, ge Instability phenomena, lary Control of Frequency	Hours 4 8 8					
Modu I II III IV	Ile Intr Phys Dess Equ Cap Eler Load Stab Free Prin : AC	oduction to Ch sical Structure, ign and Operatin ipment and Sta abilities and nents (Lines, Tr d Characteristic ility Constraints quency Control mary Control of GC cage control	Modu aracteristics of Operation ar ang Criteria ability Constra Constraints of cansformers etc s, Introduction s. I Frequency : Go	Ile Contents f Modern Powe and Control Fur ints f Generators/E .),Constraints of to Angle/Voltag overnors, Second	er Systems nctions and Hierarchies, exciters/Turbines/Network Energy Supply Systems, ge Instability phenomena, lary Control of Frequency	Hours 4 8 8 8 8 8 8					
Modu I II III IV	Ile Intr Phys Dess Equ Cap Eler Load Stab Free Prin : AC Volt Auto	oduction to Ch sical Structure, ign and Operatin ipment and Sta abilities and nents (Lines, Tr d Characteristic ility Constraints quency Control ary Control of age control omatic Voltage	Modu aracteristics of Operation ar ag Criteria ability Constra Constraints of cansformers etc s, Introduction s. I Frequency : Go Regulators (gen	Ile Contents f Modern Powe and Control Fur ints f Generators/E .),Constraints of to Angle/Voltag overnors, Second merators), Shunt (er Systems nctions and Hierarchies, exciters/Turbines/Network Energy Supply Systems, ge Instability phenomena, lary Control of Frequency Compensation, SVC	Hours 4 8 8 8 8 8					
Modu I II III IV V	Ile Intr Phys Des: Equ Cap Eler Load Stab Free Prin : AC Volt Auto	oduction to Ch sical Structure, ign and Operatin ipment and Sta abilities and nents (Lines, Tr d Characteristic ility Constraints quency Control mary Control of GC cage control pomatic Voltage 1 oduction to Por DC, FACTS, Lo	Modu aracteristics of Operation ar of Criteria ability Constra Constraints of ansformers etc s, Introduction s. I Frequency : Go Regulators (gen wer Flow Cont ad Curves, Uni	Ile Contents f Modern Powe and Control Fur ints f Generators/E .),Constraints of to Angle/Voltag overnors, Second herators), Shunt (trol it Commitment,	er Systems actions and Hierarchies, exciters/Turbines/Network Energy Supply Systems, ge Instability phenomena, lary Control of Frequency Compensation, SVC	Hours 4 8 8 8 8					
Modu I II III IV V	Ile Intr Phys Dess Equ Cap Eler Load Stab Free Prin : AC Volt Auto HVI Opti	oduction to Ch sical Structure, ign and Operatin ipment and Sta abilities and nents (Lines, Tr d Characteristic ility Constraints quency Control of ary Control of age control omatic Voltage 1 oduction to Por DC, FACTS, Lo mization Metho	Modu aracteristics of Operation ar ang Criteria ability Constra Constraints of cansformers etc s, Introduction s. Frequency : Go Regulators (gen wer Flow Cont ods	Ile Contents f Modern Powe and Control Fur ints f Generators/E .),Constraints of to Angle/Voltag overnors, Second merators), Shunt (trol it Commitment,	er Systems nctions and Hierarchies, exciters/Turbines/Network Energy Supply Systems, ge Instability phenomena, lary Control of Frequency Compensation, SVC Introduction to the use of	Hours 4 8 8 8 8 6					
Modu I II III IV V	Ile Intr Phys Dess Equ Cap Eler Load Stab Free Prin : AC Volt Auto Intr HVI Opti	oduction to Ch sical Structure, ign and Operatin ipment and Sta abilities and nents (Lines, Tr d Characteristic ility Constraints quency Control ary Control of ary Control of ary Control of oduction to Por DC, FACTS, Lo mization Metho	Modu aracteristics of Operation ar ing Criteria ability Constra Constraints of ansformers etc s, Introduction s. I Frequency : Go Regulators (gen wer Flow Cont bad Curves, United Cower System (Ile Contents f Modern Powe and Control Fur ints f Generators/E .),Constraints of to Angle/Voltag overnors, Second merators), Shunt (trol it Commitment, Operation and (er Systems nctions and Hierarchies, exciters/Turbines/Network Energy Supply Systems, ge Instability phenomena, lary Control of Frequency Compensation, SVC Introduction to the use of Control	Hours 4 8 8 8 6					
Modu I II III IV V VI	IleIntrPhysDesiEquCapElerLoadStabFreePrin: ACVoltAutoIntrHVIOptiRecPow	oduction to Ch sical Structure, ign and Operatin ipment and Sta abilities and nents (Lines, Tr d Characteristic ility Constraints quency Control mary Control of EC cage control oduction to Por DC, FACTS, Lo mization Metho ent Trends in F er former, gas	Modu aracteristics of Operation ar of Criteria ability Constra Constraints of ansformers etc s, Introduction s. I Frequency : Go Regulators (gen wer Flow Cont ods Power System (insulated tran	Ile Contents f Modern Powe and Control Fur ints f Generators/E .),Constraints of to Angle/Voltag overnors, Second herators), Shunt (trol it Commitment, Operation and (nsmission lines	er Systems nctions and Hierarchies, exciters/Turbines/Network Energy Supply Systems, ge Instability phenomena, lary Control of Frequency Compensation, SVC Introduction to the use of Control , deregulation in power	Hours 4 8 8 8 6					
Modu I II III IV V VI	IleIntr Phys DessEqu Cap Eler Load StabFree Prin : ACVolt AutoIntr HVI OptiRec Pow syste	oduction to Ch sical Structure, ign and Operatin ipment and Sta abilities and nents (Lines, Tr d Characteristic ility Constraints quency Control of ary Control of ary Control of age control of contic Voltage 1 oduction to Por DC, FACTS, Lo mization Metho ent Trends in F er former, gas ems.	Modu aracteristics of Operation ar ang Criteria ability Constra Constraints of ansformers etc s, Introduction s. Frequency : Go Regulators (gen wer Flow Cont ad Curves, United bad Curves, United of insulated trans	Ile Contents f Modern Powe and Control Fur ints f Generators/E .),Constraints of to Angle/Voltag overnors, Second herators), Shunt (trol it Commitment, Operation and (nsmission lines)	er Systems nctions and Hierarchies, Exciters/Turbines/Network Energy Supply Systems, ge Instability phenomena, lary Control of Frequency Compensation, SVC Introduction to the use of Control , deregulation in power	Hours 4 8 8 8 6 4					
Modu I II II IV V VI	IleIntrPhysicDesideEquilibriumCapElerLoadStabFreePrini: ACVoltaAutoIntrHVIOptiRecPowsystem	oduction to Ch sical Structure, ign and Operatin ipment and Sta abilities and nents (Lines, Tr d Characteristic ility Constraints quency Control mary Control of GC cage control oduction to Po DC, FACTS, Lo mization Metho ent Trends in F er former, gas ems.	Modu aracteristics of Operation ar ing Criteria ability Constra Constraints of ansformers etc s, Introduction s. I Frequency : Go Regulators (gen wer Flow Cont bad Curves, United Sower System (a insulated tran	Ile Contents f Modern Powe and Control Fur ints f Generators/E .),Constraints of to Angle/Voltag overnors, Second merators), Shunt (trol it Commitment, Operation and (nsmission lines	er Systems nctions and Hierarchies, exciters/Turbines/Network Energy Supply Systems, ge Instability phenomena, lary Control of Frequency Compensation, SVC Introduction to the use of Control , deregulation in power	Hours 4 8 8 8 6 4					
Modu I II III IV V VI	IleIntrPhyseDeservedEqueCapElerLoadStabeFreePrine: ACCVoltAutoIntrHVIOptiRecPowsystem	oduction to Ch sical Structure, ign and Operatin ipment and Sta abilities and nents (Lines, Tr d Characteristic ility Constraints quency Control of C cage control of C cage control of C control of C c	Modu aracteristics of Operation ar ing Criteria ability Constra Constraints of ransformers etc s, Introduction s. I Frequency : Go Regulators (gen wer Flow Cont ad Curves, United bads Power System (a insulated tran	Ile Contents f Modern Powe and Control Fur ints f Generators/E .),Constraints of to Angle/Voltag overnors, Second herators), Shunt (trol it Commitment, Operation and (nsmission lines Text Books	er Systems nctions and Hierarchies, exciters/Turbines/Network Energy Supply Systems, ge Instability phenomena, lary Control of Frequency Compensation, SVC Introduction to the use of Control , deregulation in power	Hours 4 8 8 8 6 4					
Modu I II III IV V VI	IleIntr Phys DesiDesiIntr Phys DesiEqu Cap Eler Load StabFree Prin : ACVolt AutoIntr HVI OptiRec Pow system	oduction to Ch sical Structure, ign and Operatin ipment and Sta abilities and nents (Lines, Tr d Characteristic ility Constraints quency Control mary Control of GC cage control oduction to Por DC, FACTS, Lo mization Metho ent Trends in F er former, gas ems.	Modu aracteristics of Operation ar ng Criteria ability Constra Constraints of ansformers etc s, Introduction s. I Frequency : Go Regulators (gen wer Flow Cont bad Curves, United code insulated trans- lysis: Operation	Ile Contents f Modern Powe and Control Fur ints f Generators/E .),Constraints of to Angle/Voltag overnors, Second merators), Shunt (trol it Commitment, Operation and (nsmission lines Text Books an and Control by	er Systems nctions and Hierarchies, exciters/Turbines/Network Energy Supply Systems, ge Instability phenomena, lary Control of Frequency Compensation, SVC Introduction to the use of Control , deregulation in power	Hours 4 4 4 8 8 8 8 8 8 6 6 4 6 4 6 6 6 6 6 6					
Modu I II III IV V VI I 1	IleIntr Phys DesiEqu Cap Eler Load StabFree Prin : ACVolt AutoIntr HVI OptiRec Pow syste	oduction to Ch sical Structure, ign and Operatin ipment and Sta abilities and nents (Lines, Tr d Characteristic ility Constraints quency Control mary Control of EC cage control oduction to Por DC, FACTS, Lo mization Metho ent Trends in F er former, gas ems.	Modu aracteristics of Operation ar og Criteria ability Constra Constraints of ansformers etc s, Introduction s. I Frequency : Go Regulators (gen wer Flow Cont ods Power System (insulated transl lysis: Operation	Ile Contents f Modern Powe and Control Fur ints f Generators/E .),Constraints of to Angle/Voltag overnors, Second merators), Shunt (trol it Commitment, Operation and (nsmission lines Text Books a and Control by	er Systems nctions and Hierarchies, exciters/Turbines/Network Energy Supply Systems, ge Instability phenomena, lary Control of Frequency Compensation, SVC Introduction to the use of Control , deregulation in power	Hours 4 4 8 8 8 8 6 6 4 Control India,					
Modu I II III IV V VI VI	IleIntr Phys DessEqu Cap Eler Load StabFree Prin : ACVolt AutoIntr HVI OptiRec Pow syste	oduction to Ch sical Structure, ign and Operatin ipment and Sta abilities and nents (Lines, Tr d Characteristic ility Constraints quency Control of C cage control of C cage control of C control of C c	Modu aracteristics of Operation ar ng Criteria ability Constra Constraints of cansformers etc s, Introduction s. I Frequency : Go Regulators (gen wer Flow Cont ods Power System (insulated translated translate	Ile Contents f Modern Powe and Control Fur ints f Generators/E .),Constraints of to Angle/Voltag overnors, Second merators), Shunt (trol it Commitment, Operation and (nsmission lines Text Books and Control by Beforences	er Systems nctions and Hierarchies, exciters/Turbines/Network Energy Supply Systems, ge Instability phenomena, lary Control of Frequency Compensation, SVC Introduction to the use of Control , deregulation in power	Hours 4 4 4 8 8 8 8 8 6 6 4 6 4 6 6 6 6 6 6 6					

1	Power System Operation and Control Robert Herschel Miller, McGraw Hill Professional, 1994.
2	Power System Operation and Control by DR. K. UMA RAO, Wiley India, 2010
3	Power System Operation and Control by N.V.Ramana Pearson Education India, 2010.
	Useful Links
1	https://nptel.ac.in/courses/108/104/108104052/

	CO-PO Mapping												
	Programme Outcomes (PO) PSO												
	1 2 3 4 5 6 7 8 9 10 11 12 1 2 3												
CO1		2											
CO2	1	2											
CO3	CO3 1 2 2												
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High													
E 1 CO	C (1				. 1	(T					-		

Each CO of the course must map to at least one PO.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course										
F	Bloom's Taxonomy Level	T1	T2	ESE	Total					
1	Remember									
2	Understand	15	10	20	45					
3	Apply									
4	Analyse	5	10	40	55					
5	Evaluate									
6	Create									
	Total	20	20	60	100					

	Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)										
		(Government 2	AV 2021-22								
		Cor	Irse Information								
Program	nme	B.Tech. (Elect	rical Engineering)								
Class. S	emester	Final Year Yea	ar B. Tech Sem V	Π							
Course Code											
Course	Name	Professional E	lective 5 : Introduc	tion to Embedded Syste	ms						
Desired	Requisites:	Analog and Di	gital Circuits								
Teaching Scheme Examination Scheme (Marks)											
Lecture	3 Hrs/week	T1	T2	ESE	Total						
Tutoria	1 -	20	20	60	100						
Practica	al -		11	I							
Interact	tion -		C	Credits: 3							
		Co	ourse Objectives								
1	To develop basic know	owledge of embe	edded systems and t	their features.							
2	To provide skills for	programming D	SP for applications	in Electrical Engineerin	ıg.						
3	To impart skills for i	nterfacing peripl	herals to microcont	rollers and develop emb	edded system.						
	Cours	se Outcomes (C	O) with Bloom's 7	Faxonomy Level							
At the e	nd of the course, the s	tudents will be a	ble to,								
CO1	Explain the salient f	eatures of embed	dded systems.		Understanding						
CO2	Apply programming	techniques to de	evelop embedded sy	ystems	Applying						
CO3	Implement the appli	cations related to	o interface microco	ontroller with electrical	Applying						
	and electronics syste	ms.	• . 11								
CO4	Construct project pr	ototypes using n	nicrocontrollers.		Applying						
Modul	0	Mod	ula Contonta		Uouma						
Modul	e Introduction	Miou	ule Contents		nours						
Ι	Modular approa Modern Microco of Microcontrolle	ch to Embedde ntrollers, Selecti er Ecosystem	ed System Design on Criteria for Mic	, Salient Features of crocontroller, Elements	5						
II	MSP 430 Archit Power Supply fo Architecture, Pro MSP430	ecture r Embedded Sys ogramming Meth	tems, Introduction nods for MSP 430,	to MSP 430, MSP 430 Low Power Modes in	5						
III	Basic Programm Interfacing switc Debouncing and switches, Interfac	ning using MSP hes, general pur control, Using cing rotary encoc	430 pose I/O devices v Analog to Digita ders, seven segment	with MSP 430, Switch al Converters to read t displays	7						
IV	IV Digital I/O Programming and Interrupts GIT, MSP430 Digital I/O, MSP430 Digital I/O: Switch Interfacing, 6 MSP430 Clock System and Reset, Interrupts in MSP430, Types and 6										
V	Peripheral Inter Interfacing Liqu Introduction and Timer Capture Converters and D	facing id Crystal Dis Timer Capture LCD interfacio Digital to Analog	splays(LCD), MSI , Pulse Width Mo ng, Interfacing of Converters	P430 Timer Module: odulation, PWM using f Analog to Digital	7						

VI	Serial Communication and Embedded Project PrototypingSerial Communication Protocols, USCI Module in MSP430, MSP430Timer in Capture Mode, Building an Electronics Project, CircuitPrototyping Techniques, Single Purpose Computers, ProjectDemonstration from Concept to Final	6
	Text Books	
1	Cem Unsalan and H. Deniz Gurhan, 'Programmable Microcontrollers with App MSP430 LaunchPad with CCS and Grace', McGraw Hill Education, 1 st Edition	plications: 1, 2018
2	John Davies, 'MSP430 Microcontroller Basics', Elsevier, 1st Edition, 2010	
	References	
1	Manuel Jiménez, Rogelio Palomera, Isidoro Couvertier 'Introduction to Embedo Using Microcontrollers and the MSP430', Springer, 1st Edition, 2014	led Systems:
2	Adrian Fernandez, Dung Dang, 'Getting Started with the MSP430 Launchpad', edition, 2013	Newnes; 1st
	Useful Links	
1	https://nptel.ac.in/courses/108/102/108102169/	

2 https://www.ti.com/microcontrollers-mcus-processors/microcontrollers/msp430-micrcontrollers/

	CO-PO Mapping														
	Programme Outcomes (PO)											PSO			
	1 2 3 4 5 6 7 8 9 10 11 12 1 2												3		
CO1			3												
CO2					3										
CO3					3										
CO4			3											2	
The strong	ath of r	monnir	a is to	bo wr	itton or	1 2 3.	Whore	1.Lo	11 2·N	ladium	2.Uic	rh			

The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High Each CO of the course must map to at least one PO.

Assessment

	Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course										
E	Bloom's Taxonomy Level	T1	T2	ESE	Total						
1	Remember										
2	Understand	5	10	15	30						
3	Apply	15	10	45	70						
4	Analyse										
5	Evaluate										
6	Create										
	Total	20	20	60	100						

	Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)										
			Government	AY 2021-22	is mistrice /						
			Cou	rse Information	1						
Progra	amme		B.Tech. (Elect	trical Engineering	<u> </u>						
Class.	Semester	•	Final Year Ye	ar B. Tech., Sem	VII						
Course	ourse Code										
Course	e Name		Professional F	Elective 5 :Power	Electronics and M	otor Co	ontrol for Electric				
00025											
Desire	d Requisi	ites:	Fundamentals	of Power Electro	onics, Electrical M	achines	6				
	Eu Requisites. I undamentals of Fower Electronics, Electrical Walennies										
Г	Feaching	Scheme		Examina	tion Scheme (Ma	rks)					
Lectur	e.	3 Hrs/week	T1	T2	ESE		Total				
Tutori	al	-	20	20	60		100				
Practi	cal	_		I I	I						
Intera	ction	_			Credits: 3						
		<u> </u>	<u> </u>								
			Co	urse Objectives							
1	To expla	ain basic knowl	edge related to	power converters	s required for Elect	tric Veł	nicles.				
2	To provi vehicles	ide knowledge	related to AC m	nachines and Perr	nanent magnet ma	chines	used in Electric				
3	To impl	ement motor co	ontrol in Electric	c vehicles using c	lifferent technique	s.					
	· · ·	Cours	e Outcomes (C	O) with Bloom's	s Taxonomy Level	1					
CO1	Explain	the concept of	power converte	ers used in Electr	ic Vehicles		Understanding				
CO1	Determ	ine operation	of various elec	trical machines	required for Elec	trical	Applying				
02	vehicles	•			-						
CO3	Outline	suitable contro	l techniques for	motors used for	Electric vehicles.		Analyzing				
Modu	le		Modu	le Contents			Hours				
I	EV a conv RLE Sour Conv	er Converters and HEV conf erters, Principl Load and fil ce, Boost Converter	for EV iguration based e of Step Dow ter, Boost Cor nverter with F	on power convertion, Bu on Operation, Bu overter with Res ilter and Resist	erters, Classificati ck Converter with sistive Load and ive Load, Buck-	on of 1 RL, EMF Boost	6				
II	Converter DC-DC Converters in EV Converter classification, Two Quadrant Converters, First and Second II Quadrant Converter, Four Quadrant Chopper, Multi-input DC-DC Converters, Flux Additive DC-DC Converter, Multi-input converter Using Wish Comp Victors Supress										
III	DC DC DC R-L Park	AC / AC- DC AC Converters AC Inverter wi Load, Three J 's transformation	Converters in I for EV, Princ th R Load, Sin phase AC to D on, Clarke's tran	EV iple of Operation gle Phase Bridge C converter for nsformation.	n, Single Phase B e DC-AC Inverter EV, PWM techr	ridge with nique,	6				
IV	A.C. Elect prod and I	Electrical Ma trical Machine uction, Rotatir Mechanical An	chines for Hybres in EVs and g Magnetic Figle, Traction M	HEVs, Physica eld, Second Ma otors,	e Vehicles I Concepts of To gnetic Field, Elec	orque etrical	6				

V	Permanent magnet (PM) motors for Hybrid and Electric Vehicles Principle of Operation of PM Machine, Operation of PM Machine Supplied by DC-AC Converter with 120° Mode of Operation, Operation of PM Machine Supplied by DC-AC Converter with 180° Mode of Operation, Steady State Modelling of Permanent Magnet Machines, The d - q axis model of Two Phase Permanent Magnet (PM) Machine, Three Phase to Two Phase Transformation	6						
VI	Motor Control in EV Induction motor control - Field Oriented Control (FOC), Direct Rotor Oriented FOC, Indirect Rotor Oriented FOC, PM motor control- Control Strategies of PM Machines Constant Torque Angle Control, Constant Mutual Air gap Flux Linkage Control, Optimum Torque per Ampere Control	6						
1	Text Books							
1	"Electric motor and control techniques", 2 nd Edition, Irving M. Gottlieb, T	ata McGraw Hill.						
2	"AC Motor Control and Electrical Vehicle Applications", Dr. Kwang Hee N	am, CRC press.						
3	"Advanced Electric Drive Vehicles (Energy, Power Electronics, and Machines)", 1st Edition, Ali Emadi, CRC Press.							
	References							
1	Power Converters for Electric Vehicles by L.Ashok Kumar, S. Albert Alexa CRC Press.	ander, 1 st edition,						
2	R. Erickson, D. Maksimovic, Fundamentals of Power Electronics, Springer 2	.001						
	Useful Links							
1	https://nptel.ac.in/courses/108/106/108106170/							
2	https://nptel.ac.in/courses/108/103/108103009/							

CO-PO Mapping															
		Programme Outcomes (PO)										PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3														
CO2		2													
CO3			2												
The str	The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High														
Each C	Each CO of the course must map to at least one PO.														

Assessment

The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

	Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course								
E	Bloom's Taxonomy Level	T1	T2	ESE	Total				
1	Remember								
2	Understand	10		10	20				
3	Apply	10	20	40	70				
4	Analyse			10	10				
5	Evaluate								

6	Create				
	Total	20	20	60	100

Professional Elective (Lab) Courses

Walchand College of Engineering, Sangli								
	(Government Aided Autonomous Institute)							
	AY 2021-22							
	Course Information							
Programme	B.Tech. (Electrical Engineering)							
Class, Semester	Final Year B. Tech., Sem. VII							
Course Code								
Course Name	Professional Elective 4: Intelligent Systems and its Applications Lab							
Desired Requisites:	NIL							

Teachir	ng Scheme	Examination Scheme (Marks)							
Lecture	-	LA1	LA2	ESE	Total				
Tutorial	-	30	30	40	100				
Practical	2 Hrs/Week								
Interaction	_	Credits: 1							

	Course Objectives								
1	To enhance basic knowledge of intelligence system.								
2	To impart knowledge about Artificial neural network and fuzzy logic programming for electrical								
	engineering applications.								
	Course Outcomes (CO) with Bloom's Taxonomy Level								
At the e	nd of the course, the students will be able to								

I ti the c	At the end of the course, the students will be able to,							
CO1	Compare various AI tools.	Understanding						
CO2	Implement algorithms for AI tools.	Applying						
CO3	Study AI tools for Applications in electrical engineering.	Analyzing						

List of Experiments / Lab Activities

List of Experiments:

- 1. Write program to evaluate output of any given architecture of neural network with different transfer
- 2. Functions such as linear logsig tanh, threshold function.
- 3. Verify the fault tolerant nature of neural network by disconnecting few weight link for a given architecture
- 4. Write program for perceptron learning algorithm.
- 5. To study some basic neuron models and learning algorithms by using ANN tool
- 6. Power system failure analysis using ANN tool
- 7. Predict power factor of four bus system using neural network
- 8. Predict system analysis for measurements like rms voltage using ANN tool
- 9. Write supervised and unsupervised ANN program for Signal Frequency Separation using Perceptron
- 10. Temperature monitoring using fuzzy logic
- 11. Speed control of DC motor using fuzzy logic
- 12. Fuzzy logic based washing machine control
- 13. Fuzzy logic based air conditioner
- 14. Design of a Fuzzy Multi-Objective Power System Stabilizer via Linear Matrix Inequalities
- 15. Presentation/mini projects on relevant topics given to students in groups etc.

	Text Books								
1	S. N. Sivanandam, S. Sumathi, S. N. Deepa, "Introduction to Neural Network Using MATLAB								
	6.0", Tata McGraw-Hill, New Delhi, 2006								
2	Kosko B, "Neural Networks and Fuzzy Systems: A dynamical system approach to machine								
	intelligence", Prentice Hall of India, 2009.								
3	Crina Grosan, Ajith Abraham, "Intelligent Systems: A Modern Approach", Springer Verlag,								
	2011								

4	Timothy S.Ross, "Fuzzy Logic with engineering applications", Weily India Pvt. Ltd., 2011						
	References						
1	Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", 1st Edition,						
1	Pearson Education, 2015						
2	Abraham-Kandel, Gideon-Langholz, "Hybrid-Architectures for Intelligent Systems", CRC-						
	Press, 1992.						
2	Adrian A. Hopgood, "Intelligent systems for engineers and scientists", Second Edition, CRC						
5	press, 2001						
Useful Links							
1	http://nptel.ac.in/downloads						
2	http://www.nptelvideos.in						
3	https://ocw.mit.edu/courses						

CO-PO Mapping															
		Programme Outcomes (PO)									PSO				
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3														
CO2		2													
CO3			3										3		
The streng	The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High														

Each CO of the course must map to at least one PO.

Assessment										
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.										
Assessment	sessment Based on Conducted by Typical Schedule (for 26-week Sem)									
T A 1	Lab activities,	Lab Course	During Week 1 to Week 6	20						
LAI	attendance, journal	Faculty	Marks Submission at the end of Week 6	50						
T A D	Lab activities,	Lab Course	During Week 7 to Week 12	20						
LA2	attendance, journal	Faculty	Marks Submission at the end of Week 12	50						
Lab ESE	Lab activities,	Lab Course	During Week 15 to Week 18	40						
	attendance, journal	Faculty	Marks Submission at the end of Week 18	40						
XX7 1 1 1 1	· · · · 1 C									

Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments.

Assessment Plan based on Bloom's Taxonomy Level (Marks) (For lab Courses)									
Bloom's Taxonomy Level	LA1	LA2	Lab ESE	Total					
Remember									
Understand	10			10					
Apply	20	20	20	60					
Analyse		10	20	30					
Evaluate									
Create									
Total Marks	30	30	40	100					

Walchand College of Engineering, Sangli								
(Government Aided Autonomous Institute)								
			Course	Information				
Program	Programme B Tech (Electrical Engineering)							
Class S	Class Samestar Einel Veer B. Tech. Sam VII							
Course Code								
Course	Name		Professional Flect	ive 4 · Process Contr	ol I ab			
Desired	Requi	sites:	Control Systems F	Engineering Lah	01 Lub			
Desired	nequi	51005	Control bystems I					
Те	aching	Scheme		Examination Sch	neme (Marks)			
Lecture		-	LA1	LA2	ESE	Total		
Tutoria	l	-	30	30	40	100		
Practic	al	2 Hrs/Week			11			
Interact	tion	-		Credit	s: 1			
	I		1					
			Cours	e Objectives				
1	This c	course intends to	o provide mathemat	ical model of the pro	cess and verification v	with		
	experi	imentation.	-	1				
2	It den	nonstrate the va	rious types of contro	ollers for SISO system	m.			
2	It prov	vide simulation	of various advance	d controllers used in	process control and m	ultivariable		
3	predic	ctive control.						
4								
		Cours	e Outcomes (CO)	with Bloom's Taxor	nomy Level			
At the e	nd of th	ne course, the st	udents will be able	to,				
CO1	Expe	riment on vario	ous Process Control	systems to evaluate	performance.	Apply		
CO2	Apply	y the tuning tec	hniques for the cont	rollers.		Apply		
CO3	Evalu	ate the perforn	nance of given Proc	ess Control system.		Evaluate		
CO4	Demo	onstrate the use	e of advance control	ler.		Apply		
T · 4 61	. .		List of Experin	nents / Lab Activitie	28			
List of I	Expern	ments:						
1	Stop #2	amongo of first	andan ayatam (ain ala	anna aiter arratam)				
1.	Step le	sponse of multi	approximate and a consistent of the consistence of	capacity system).				
2.	Study of	sponse of mutu of a computer of	ontrolled pressure c	ontrol system				
3. 4	Tuning	of P PI and PI	D controllers based	on process reaction of	urve and Ziegler Nich	ols method		
	Study of	of computer cor	trolled level control	l system		ions method.		
5. 6	Study (of computer cor	trolled flow control	l system				
7.	Tuning	of controllers	for level control sys	tem.				
8.	Tuning	of controllers f	for flow control syst	tem.				
9.	Study of	of cascade contr	roller for a flow con	trol system.				
10.	Study of	of PLC and its r	process controlled a	pplications.				
In case of	of mini-	-projects, drawi	ng, presentations et	c, write the relevant of	details of the same.			
		1 5						
			Te	xt Books				
1	Georg Prenti	ge Stephanopou ce-Hall of Indi	los, " <i>Chemical Pro</i> a, 1st Edition 1984.	cess Control - An ini	troduction to Theory c	and Practice",		
				•				
	T1.		Re	eferences		for D		
1	Thom Porfo	as E. Marlin, rmance" 2nd F	"Process Control	- Design Processes	and Control System	for Dynamic		
	FG	Shinskey "Pr	acess Control Sust	$p_{m} = Annlication I$	Design and Tuning"	McGraw_Hill		
2	Puhlia	cation 3rd Edit	ion 1988	m = Application, L	congn and running,			
Cour		tanta fan D. T.	ah Drogramma F	Demonstrate of Elect		V2021 22		

3	Curtis D. Johnson, "Process Control Instrumentation Technology", 7th Edition, Pearson Education, 7th Edition. 2003.
	Useful Links
1	http://nptel.ac.in/downloads/117105077
2	http://www.nptelvideos.in/2012/12/digital-communication.html
2	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-450-principles-of-
3	digital-communications-i-fall-2006/video-lectures/

	CO-PO Mapping														
		Programme Outcomes (PO) PSO													
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1				2											
CO2				2											
CO3				3											
CO4															
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															
Each CO	Each CO of the course must map to at least one PO.														

Assessment								
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.								
Assessment	Based on	Conducted by	Typical Schedule (for 26-week Sem)	Marks				
TA1	Lab activities,	Lab Course	During Week 1 to Week 6	30				
LAI	attendance, journal	Faculty	Marks Submission at the end of Week 6	50				
1.4.2	Lab activities,	Lab Course	During Week 7 to Week 12	20				
LAZ	attendance, journal	Faculty	Marks Submission at the end of Week 12	50				
Lob ESE	Lab activities,	Lab Course	During Week 15 to Week 18	40				
Lau ESE	attendance, journal	Faculty	Marks Submission at the end of Week 18	40				
Week 1 indic	ates starting week of a	semester. The typ	bical schedule of lab assessments is shown,					
considering a	26-week semester. Th	e actual schedule	shall be as per academic calendar. Lab activit	ities/Lab				
performance shall include performing experiments, mini-project, presentations, drawings, programming								
and other suit	table activities, as per t	he nature and req	uirement of the lab course. The experimental	lab				
shall have typ	bically 8-10 experiment	ts.						

Assessment Plan based on Bloom's Taxonomy Level (Marks) (For lab Courses)									
Bloom's Taxonomy Level	LA1	LA2	Lab ESE	Total					
Remember									
Understand									
Apply	30	10	20	60					
Analyse									
Evaluate		20	20	40					
Create									
Total Marks	30	30	40	100					

		۲	Walchand College	e of Engineering,	Sangli		
	(Government Aided Autonomous Institute)						
	AY 2021-22						
			Course	Information			
Progra	mme		B.Tech. (Electric	cal Engineering)			
Class, S	Semest	er	Final Year B. Te	ch., Sem VII			
Course	Code					1	
Course	Name	• • .	Professional Elec	ctive 4 :Advanced	Power Electronics La	b	
Desired	i Kequ	isites:	Power Electronic	28			
Т	eachin	g Scheme		Examination	Scheme (Marks)		
Lecture		-	LA1	LA2	ESE	Total	
Tutoria		_	30	30	40	100	
Practic	al	2 Hrs./Week			10	100	
Interac	tion	-		Cre	edits: 1		
			1				
			Cours	e Objectives			
1	To pr	ovide the advance	e knowledge in the	e field of power ele	ectronics.		
2	To ur	nderstand the wor	king of different p	ower electronic co	nverter through simula	ation and	
	exper	rimentation.					
3	To de	evelop the skills o	f simulation, analy	sis and design of	power electronics systemeters	em.	
		Course	Outcomes (CO)	with Bloom's Tax	onomy Level		
At the e	end of t	he course, the stu	dents will be able	to,			
<u>CO1</u>	Artic	ulate working of	different advance	d power electronic	converters.	Understand	
	Anar	yze different adva	anced power electr	onic converters an	d systems.	Analyze Evoluoto	
CO3	Eval	hardwara and sir	ince of different ac	ivanced power ele	ctronic converters	Evaluate	
	using	, naiuwaie and sii	inulation software.				
			List of Experin	nents / Lab Activi	ties		
List of	Experi	ments:					
	-						
1.	Analys	se the source curr	ent of single phase	e full controlled the	vristor converter.		
2.	Analys	se the source curr	ent of three phase	full controlled thy	ristor converter.		
3.	Amaze	e the performance	of single phase P	WM Rectifier			
4.	Amaze	e the performance	of three phase PW	VM Rectifier			
5.	Analys	sis of performance	e of three phase five	ve level diode clan	nped Multilevel Inverte	er.	
6.	Analys	sis of performance	e of three phase five	ve level cascaded I	H bridge Multilevel Inv	verter.	
7.	Evalu	ate the performan	ce of two level vo	ltage source PWM	Inverter.		
8.	Analys	se the performan	ce of three phase a	z source Inverter			
9.	Analys	se the performanc	e of three phase sh	unt Active power	Filter based on synchr	onously	
10	rotating reference frame theory.						
10.	Measu	rement of source	current harmonics	of three phase did	de bridge rectifier.		
			Те	xt Books			
	M. H	.Rashid, Power	Electronics: circu	its devices and an	pplications, Pearson F	ducation. Third	
	editic	on.			1	·····	
	·						
	References						

1	B. K. Bose, <i>Modern Power Electronics & AC drives</i> , PHIPL, New Delhi.
2	M. B. Patil, V. Ramayanan and V. T. Ranganathan, <i>Simulation of Power Electronics circuits</i> , Narosapublication.

Useful Links

1

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CO-PO Mapping															
	Programme Outcomes (PO) PSO														
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1				3											
CO2			2												
CO3					1									1	
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															

Each CO of the course must map to at least one PO.

Assessment
There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.

Assessment	Based on	Conducted by	Typical Schedule (for 26-week Sem)	Marks
ΤΑΙ	Lab activities,	Lab Course	During Week 1 to Week 6	20
LAI	attendance, journal	Faculty	Marks Submission at the end of Week 6	50
I A 2	Lab activities,	Lab Course	During Week 7 to Week 12	20
	attendance, journal	Faculty	Marks Submission at the end of Week 12	50
Lob ESE	Lab activities, Lab Course		During Week 15 to Week 18	40
Lab ESE	attendance, journal	Faculty	Marks Submission at the end of Week 18	40

Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments.

Assessment Plan based on Bloom's Taxonomy Level (Marks) (For lab Courses)								
Bloom's Taxonomy Level	LA1	LA2	Lab ESE	Total				
Remember								
Understand	5	10	10	25				
Apply								
Analyse	20	10	10	40				
Evaluate	5	10	20	35				
Create								
Total Marks	30	30	40	100				

Open Elective 3

Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)										
			AY	2021-22						
			Course	Information						
Progra	amme		B.Tech. (Electri	cal Engineering))					
Class,	Semester		Final Year B. To	ech., Sem VII						
Cours	e Code									
Cours	e Name		Open Elective 3	: Industrial Auto	omation					
Desire	d Requisi	tes:	Nil							
'	Teaching Scheme Examination Scheme (Marks)									
Lectur	Lecture 3 Hrs/week T1 T2 ESE Total									
Tutori	ial	-	20	20	60	100				
Practi	cal	-			Nil					
Intera	ction	-		(Credits: 3					
			Cours	e Objectives						
1	This cou	rse intends to de	evelop basics of la	dder logic progr	amming for PLC.					
2	It provid	es the foundation	n level knowledg	e of SCADA Sy	stem.					
3	It gives of	overview of vari	ous types of contr	roller for closed	loop control.					
4	It provid	es the application	ons of variable spe	ed drives in ind	ustries.					
	1	Course	Outcomes (CO)	with Bloom's T	axonomy Level					
<u>CO1</u>	Compar	e the various ty	pes of controllers	for Industrial Au	utomation.	Understand				
CO2	Apply th	e knowledge of	PLC and SCADA	A for Industrial A	Automation.	Apply				
<u>CO3</u>	Explain	the use of varia	ble speed drives f	or Industrial Au	tomation.	Understand				
	•			C 4 4		TT				
Modu	le		Module	e Contents		Hours				
Modu	le Meas	surement of Va	Module rious Process Pa	e Contents rameters	ure force displacem	Hours				
Modu	le Meas Meas	surement of Va	Module rious Process Pa ntities such as te	e Contents rameters mperature, press	sure, force, displaceme	ent, 6				
Modu I	le Meas Meas speed	Surement of Va surement of qua l, flow, level, h alibration	Module rious Process Pa ntities such as te umidity, pH etc.,	e Contents rameters mperature, press signal condition	sure, force, displacement	ent, 6				
Modu	le Meas Meas speed and c	surement of Va urement of qua l, flow, level, h alibration.	Module rious Process Pa ntities such as te umidity, pH etc.,	e Contents rameters mperature, press signal condition	sure, force, displacement	ent, 6				
Modu I	le Meas Meas speec and c Proc	surement of Va urement of qua l, flow, level, h alibration. ess Control and duction to proc	Module rious Process Pa ntities such as te umidity, pH etc., l Various Contro cess control. PID	e Contents rameters mperature, press signal condition ollers controller and	sure, force, displacementing, estimation of error tuning, various con	ent, ors 6				
Modu I II	le Meas Meas speed and c Proc Intro- confi	surement of Va urement of qua l, flow, level, h alibration. ess Control and duction to proc gurations such	Module rious Process Pa ntities such as te umidity, pH etc., l Various Contro cess control, PID as cascade con	e Contents rameters mperature, press signal condition ollers controller and trol, feed forw	sure, force, displacementing, estimation of err tuning, various con- ard control, split rai	Hours ent, cors 6 trol nge 6				
Modu I II	le Meas Meas speed and c Proc Intro confi	surement of Va urement of qua l, flow, level, h alibration. ess Control and duction to proc gurations such ol, ratio control.	Module rious Process Pa ntities such as te umidity, pH etc., Various Contro cess control, PID as cascade con override control	e Contents rameters mperature, press signal condition ollers o controller and ttrol, feed forw and selective co	sure, force, displacementing, estimation of err tuning, various con- ard control, split ran	Hoursent, rors6trol nge6				
Modu I II	le Meas Meas speed and c Proc Intro- confi contr	surement of Va urement of qua l, flow, level, h alibration. ess Control and duction to proc gurations such ol, ratio control. ators	Module rious Process Pa ntities such as te umidity, pH etc., I Various Contro cess control, PID as cascade con , override control	e Contents rameters mperature, press signal condition ollers) controller and ttrol, feed forw and selective co	sure, force, displacementing, estimation of err tuning, various con- ard control, split rai ntrol.	Hoursent, rors6trol nge6				
Modu I II III	le Meas Meas speed and c Proc Intro confr contr Actu	surement of Va urement of qua l, flow, level, h alibration. ess Control and duction to proc gurations such ol, ratio control. ators duction to vario	Module rious Process Pa ntities such as te umidity, pH etc., I Various Contro cess control, PID as cascade con override control	e Contents rameters mperature, press signal condition ollers o controller and strol, feed forw and selective co h as flow control	sure, force, displacementing, estimation of err tuning, various con- ard control, split ran ntrol.	Hoursent, cors6trol nge6and6				
Modu I II III	le Meas Meas speed and c Proc Intro confri contr Actu Intro pneu	surement of Va urement of qua l, flow, level, h alibration. ess Control and duction to proc gurations such ol, ratio control. ators duction to vario matic, servo mo	Module rious Process Pa ntities such as te umidity, pH etc., d Various Contro cess control, PID as cascade con override control pus actuators such tors, symbols and	e Contents rameters mperature, press signal condition ollers o controller and ttrol, feed forw and selective co h as flow contra- characteristics.	sure, force, displacementing, estimation of err tuning, various contrard control, split ran ntrol.	Hoursent, rors6trol nge6and				
Modu I II III	le Meas Meas speed and c Proc Intro- confri contr Actu Intro- pneu	surement of Va urement of qua l, flow, level, h alibration. ess Control and duction to proc gurations such ol, ratio control. ators duction to vario matic, servo mo	Module rious Process Pa ntities such as te umidity, pH etc., Various Control esess control, PID as cascade con override control ous actuators such tors, symbols and	e Contents rameters mperature, press signal condition ollers o controller and ttrol, feed forw and selective co h as flow contru- characteristics.	sure, force, displacementing, estimation of error tuning, various control, split rannard control, split rannard.	Hoursent, rors6trol nge6and6				
Modu I II III	le Meas Meas speec and c Proc Intro- confri contr Actu Intro- pneus PLC Intro-	surement of Va urement of qua l, flow, level, h alibration. ess Control and duction to proc gurations such ol, ratio control ators duction to vario matic, servo mo	Module rious Process Pa ntities such as te umidity, pH etc., I Various Contro cess control, PID as cascade con override control ous actuators such tors, symbols and ence control and p	e Contents rameters mperature, press signal condition ollers o controller and strol, feed forw and selective co h as flow control characteristics. relay ladder logi	sure, force, displacementing, estimation of error tuning, various contard control, split ranntrol. ol valves, Hydraulic action of the system,	Hoursent, cors6trol nge6and6I/O6				
Modu I II III IV	le Meas Meas speed and c Proc Intro confri contr Actu Intro pneus PLC Intro modu	surement of Va urement of qua l, flow, level, h alibration. ess Control and duction to proc gurations such ol, ratio control. ators duction to vario matic, servo mo duction to seque iles, scan cycle,	Module rious Process Pa ntities such as ter umidity, pH etc., d Various Contro cess control, PID as cascade con override control ous actuators such tors, symbols and ence control and a programming of	e Contents rameters mperature, press signal condition ollers 0 controller and ttrol, feed forw and selective co h as flow contre- characteristics. relay ladder logi timers, counters	sure, force, displacementing, estimation of err tuning, various contrard control, split ran ntrol. ol valves, Hydraulic a c, basic PLC system, and I/O programming	Hoursent, rors6trol nge6and6I/O6				
Modu I II III IV	le Meas Meas speed and c Proc Intro- confri contri Actu Intro- pneu PLC Intro- modu	surement of Va urement of qua l, flow, level, h alibration. ess Control and duction to proc gurations such ol, ratio control. ators duction to vario matic, servo mo duction to seque eles, scan cycle, DA for Industr	Module rious Process Pa ntities such as te umidity, pH etc., I Various Control esess control, PID as cascade con override control ous actuators such tors, symbols and ence control and a programming of ial Automaton	e Contents rameters mperature, press signal condition ollers 0 controller and ttrol, feed forw and selective co h as flow contru- characteristics. relay ladder logi timers, counters	sure, force, displacementing, estimation of err tuning, various con- ard control, split ran ntrol. ol valves, Hydraulic a c, basic PLC system, and I/O programming.	Hoursent, rors6trol nge6and6I/O6				
Modu I II III IV V	le Meas Meas speed and c Proc Intro- confri contr Actu Intro- pneu PLC Intro- modu SCA Com	surement of Va urement of qua l, flow, level, h alibration. ess Control and duction to proc gurations such ol, ratio control, ators duction to vario matic, servo mo duction to seque iles, scan cycle, DA for Industr ponents of SO	Module rious Process Pa ntities such as ter umidity, pH etc., I Various Contro cess control, PID as cascade con override control ous actuators such tors, symbols and ence control and n programming of ial Automaton CADA systems,	e Contents rameters mperature, press signal condition ollers o controller and trol, feed forw and selective co h as flow contro- characteristics. relay ladder logi timers, counters functions, cla	sure, force, displacementing, estimation of error tuning, various contard control, split ranntrol. ol valves, Hydraulic action of scale statements of scale statements of scale statements of scale statements of scale scale statements of scale scale statements of scal	Hours ent, fors 6 trol nge 6 trol And 6 I/O 6				
Modu I II III IV V	le Meas Meas speed and c Proc Intro confri contr Actu Intro pneus PLC Intro modu SCA Comp	surement of Va urement of qua l, flow, level, h alibration. ess Control and duction to proc gurations such ol, ratio control. ators duction to vario matic, servo mo duction to seque iles, scan cycle, DA for Industr ponents of So orking and comm	Module rious Process Pa ntities such as ter umidity, pH etc., I Various Contro cess control, PID as cascade con override control ous actuators such tors, symbols and ence control and r programming of ial Automaton CADA systems, munication protoc	e Contents rameters mperature, press signal condition ollers 0 controller and ttrol, feed forw and selective co h as flow contre- characteristics. relay ladder logitimers, counters functions, cla	sure, force, displacementing, estimation of error tuning, various contrard control, split ranntrol. ol valves, Hydraulic action of scale structure surger and I/O programming ssification of SCAL	Hoursent, rors6trol nge6and6I/O OA,6				
Modu I II III IV V	le Meas Meas speed and c Proc Intro- confri contri Actu Intro- pneu PLC Intro- modu SCA Comp netwo	surement of Va urement of qua l, flow, level, h alibration. ess Control and duction to proc gurations such ol, ratio control. ators duction to vario matic, servo mo duction to seque elles, scan cycle, DA for Industr ponents of SC orking and comm able Speed Driv	Module rious Process Pa ntities such as te umidity, pH etc., Various Control esss control, PID as cascade con override control ous actuators such tors, symbols and ence control and a programming of ial Automaton CADA systems, munication protoc	e Contents rameters mperature, press signal condition ollers 0 controller and ttrol, feed forw and selective co h as flow contre- characteristics. relay ladder logitimers, counters functions, cla cols.	sure, force, displacementing, estimation of error tuning, various control, split ran ard control, split ran ntrol. ol valves, Hydraulic a c, basic PLC system, and I/O programming ssification of SCAI	Hoursent, rors6trol nge6and6I/O6DA,6				
Modu I II III IV V VI	le Meas Meas speed and c Proc Intro- confr contr Actu Intro- pneu PLC Intro- modu SCA Com netwo	surement of Va urement of qua l, flow, level, h alibration. ess Control and duction to proc gurations such ol, ratio control, ators duction to vario matic, servo mo duction to seque iles, scan cycle, DA for Industr ponents of So orking and comma able Speed Driv of variable speed priv-	Module rious Process Pa ntities such as te umidity, pH etc., I Various Contro cess control, PID as cascade con override control ous actuators such tors, symbols and ence control and a programming of ial Automaton CADA systems, munication protocoves peed drives in a	e Contents rameters mperature, press signal condition ollers o controller and ttrol, feed forw and selective co h as flow contro- characteristics. relay ladder logitimers, counters functions, cla cols.	sure, force, displacementing, estimation of error tuning, various con- ard control, split ran ntrol. ol valves, Hydraulic a c, basic PLC system, and I/O programming ssification of SCAI drives, AC drives a	Hoursent, tors6trol nge6and6I/O6DA, and6				
Modu I II II IV V VI	le Meas Meas speed and c Proc Intro confri contri Actu Intro pneus PLC Intro modu SCA Comp netwo	surement of Va urement of qua l, flow, level, h alibration. ess Control and duction to proc gurations such ol, ratio control. ators duction to vario matic, servo mo duction to seque iles, scan cycle, DA for Industr ponents of SC orking and comma able Speed Driv of variable sp pronous motor d	Module rious Process Pa ntities such as ter umidity, pH etc., I Various Contro cess control, PID as cascade con override control ous actuators such tors, symbols and ence control and r programming of ial Automaton CADA systems, munication protoc ves beed drives in a rives applications	e Contents rameters mperature, press signal condition ollers 0 controller and ttrol, feed forw and selective co h as flow contre- characteristics. relay ladder logitimers, counters functions, cla cols. butomation, DC s of variable speet	sure, force, displacementing, estimation of error tuning, various con- eard control, split ran ntrol. ol valves, Hydraulic a c, basic PLC system, and I/O programming ssification of SCAI drives, AC drives a ed drives.	Hoursent, rors6trol nge6and6I/O6DA, and6				
Modu I II III IV V VI	le Meas Meas speed and c Proc Intro- confr contr Actu Intro- pneu PLC Intro- modu SCA Comp netwo Varia Role synch	surement of Va urement of qua l, flow, level, h alibration. ess Control and duction to prod gurations such ol, ratio control. ators duction to vario matic, servo mo duction to seque elles, scan cycle, DA for Industr ponents of SC orking and comm able Speed Driv of variable sp pronous motor d	Module rious Process Pa ntities such as te umidity, pH etc., Various Control esss control, PID as cascade con override control ous actuators such tors, symbols and ence control and the programming of ial Automaton CADA systems, munication protoco ves beed drives in a rives applications	e Contents rameters mperature, press signal condition ollers 0 controller and ttrol, feed forw and selective co h as flow contru- characteristics. relay ladder logitimers, counters functions, cla cols. automation, DC s of variable spect	sure, force, displacementing, estimation of error tuning, various contrard control, split ran ntrol. ol valves, Hydraulic a c, basic PLC system, and I/O programming ssification of SCAI drives, AC drives a ed drives.	Hoursent, rors6trol nge6and6I/O6DA, and6				
Modu I II III IV V VI	le Meas Meas speed and c Proc Intro- confr confr confr Actu Intro- pneu PLC Intro- modu SCA Comp netwo Varia Role synch	surement of Va urement of qua l, flow, level, h alibration. ess Control and duction to proc gurations such ol, ratio control. ators duction to vario matic, servo mo duction to seque iles, scan cycle, DA for Industr ponents of SC orking and commable Speed Driv of variable sp ronous motor d	Module rious Process Pa ntities such as te umidity, pH etc., Various Control exess control, PID as cascade con override control ous actuators such tors, symbols and ence control and a programming of ial Automaton CADA systems, munication protoco ves beed drives in a rives applications Te ald A Raig "Pro-	e Contents rameters mperature, press signal condition ollers 0 controller and ttrol, feed forw and selective co h as flow contru- characteristics. relay ladder logi timers, counters functions, cla cols. sutomation, DC s of variable speet ext Books	sure, force, displacementing, estimation of error tuning, various contard control, split ranntrol. ol valves, Hydraulic at c, basic PLC system, and I/O programming ssification of SCAI drives, AC drives at	Hoursent, rors6trol nge6and6I/O6DA, and6				
Modu I II III IV V VI	le Meas Meas speed and c Proc Intro- confri contr Actu Intro- pneu PLC Intro- modu SCA Comj netwo SCA Comj netwo Naria Role synch	surement of Va urement of qua l, flow, level, h alibration. ess Control and duction to proc gurations such ol, ratio control ators duction to varie matic, servo mo duction to seque tles, scan cycle, DA for Industr ponents of SC orking and comma ble Speed Driv of variable sp pronous motor d W. Webb, Ron	Module rious Process Pa ntities such as ter umidity, pH etc., I Various Contro cess control, PID as cascade control ous actuators such tors, symbols and ence control and re programming of ial Automaton CADA systems, munication protoco ves beed drives in a rives applications Te ald A. Reis "Prog	e Contents rameters mperature, press signal condition ollers 0 controller and ttrol, feed forw and selective co h as flow contre- characteristics. relay ladder logitive timers, counters functions, cla cols. automation, DC s of variable spect xt Books grammable logic Edition	sure, force, displacemening, estimation of err tuning, various con- rard control, split ran ntrol. ol valves, Hydraulic a c, basic PLC system, and I/O programming ssification of SCAI drives, AC drives a ed drives.	Hoursent, cors6trol nge6and6I/O6DA, cand6es & applications"				
Modu I II III IV V VI VI 1 2	le Meas Meas speed and c Proc Intro- confr contr Actu Intro- pneu PLC Intro- modu SCA Com netwo Varia Role synch	surement of Va urement of qua l, flow, level, h alibration. ess Control and duction to proc gurations such ol, ratio control. ators duction to vario matic, servo mo duction to seque tles, scan cycle, DA for Industr ponents of SC orking and comm able Speed Driv of variable sp pronous motor d W. Webb, Ron H publication, I Johnson "Proc	Module rious Process Pa ntities such as ter umidity, pH etc., I Various Control ess control, PID as cascade control ous actuators such tors, symbols and ence control and re programming of ial Automaton CADA systems, munication protocoves beed drives in a rives applications Te ald A. Reis "Prog Eastern Economic	e Contents rameters mperature, press signal condition ollers 0 controller and ttrol, feed forw and selective co h as flow contra- characteristics. relay ladder logitimers, counters functions, cla cols. utomation, DC s of variable spect xt Books grammable logicities Edition.	sure, force, displacemening, estimation of err tuning, various contrard control, split ran ntrol. ol valves, Hydraulic a c, basic PLC system, and I/O programming ssification of SCAI drives, AC drives a et drives.	Hoursent, rors6trol nge6and6I/O6DA, cand6es & applications"cation				

References										
1	1 George Stephanopoulos, " <i>Chemical Process Control - An introduction to Theory and Practice</i> ", Prentice-Hall of India, 1st Edition 1984.									
2	"Fundamentals of Electrical Drives", G. K. Dubey, Narosa publication, 2nd edition.									
Useful Links										

1 NPTEL Lectures

CO-PO Mapping															
		Programme Outcomes (PO)										PSO			
	1 2 3 4 5 6 7 8 9 10 11 12 1 2 3														
CO1		2													
CO2		2			2										
CO3						2								2	
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															
E. I. CO	- f (1	_			. 1	(T	\sim								

Each CO of the course must map to at least one PO.

Assessment

	Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course									
Bloom's Taxonomy Level T1 T2 ESE Total										
1	Remember									
2	Understand	10		20	30					
3	Apply	10	20	40	70					
4	Analyse									
5	Evaluate									
6	6 Create									
	Total 20 20 60 100									

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)



Course Content of

Final Year B. Tech. (Electrical Engineering) Sem- VIII (EVEN)

2021-22

Professional Core (Lab) Courses

Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)											
	AY 2021-22 Course Information										
Course Information											
Progra	mme		B.Tech. (Elect	rical Engineering)							
Class,	Semes	ter	Final Year B.	Гесh., Sem VIII							
Course	e Code	ļ									
Course	e Nam	e	Project 2								
Desire	d Requ	uisites:									
Teaching Scheme Examination Scheme (Marks)											
Lectur	Lecture - LA1 LA2 ESE Total										
Tutoria	Futorial - 30 30 40 100										
Practic	Practical 16 Hrs/Week										
Interac	ction	-		Cred	its: 8						
			Cours	se Objectives							
1	To a	equire the skills	of electrical, ele	ectronic circuit desi	gn and mechanical	assembly.					
2	To de	evelop the skills	of analysis and mbly as per desi	fault diagnosis of t	he electrical, elect	ronic circuit					
3	To te	est the electrical	electronic circu	uit and mechanical a	assembly						
	10 10	Course C	outcomes (CO)	with Bloom's Tax	onomy Level						
At the	end of	the course. the s	students will be	able to.	01101119 20+01						
	Anal	vse and infer the	e reference litera	ature/ research pape	ers critically and	Analys	se				
COI	effici	iently.		I.I.	j i i						
CO2	Cons	truct the model	of the project.			Create	e				
CO3	Eval	uate the perform	ance of the proj	ect.		Evaluat	te				
CO4	Write	e and Present the	e report of the p	roject.		Create	e				
	1		_			1					
			List of Experim	nents / Lab Activi	ties						
List of	Expe	riments:									
1.	Visit t	o a local industr	ty for the study of	of problems of indu	strv.						
2.	Prepar	re the problem b	ased hardware I	Project.							
3.	Prepar	re a report on the	e same.								
	- <u>r</u> · ·	<u> </u>									
Text Books											
1 As per topic Selected and Journal papers. Conference papers. Handbooks.											
1 12 per topre beleeted and bournar papers, conference papers, frandbooks.											
References											
1 As per topic Selected and Journal papers, Conference papers, Handbooks.											
	<u> </u>		I ***	<u> </u>	<u> </u>						
			Us	eful Links							
1											

CO-PO Mapping															
		Programme Outcomes (PO)										PSO			
	1	1 2 3 4 5 6 7 8 9 10 11 12 1 2 3													
CO1	CO1 3 2														
CO2			3	3											
CO3						3					2				
CO4 3 3															
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															
Each CO	Each CO of the course must map to at least one PO.														

Assessment

	Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course									
Blo	Bloom's Taxonomy Level T1 T2 ESE Total									
1	Remember									
2	Understand									
3	Apply									
4	Analyse	5	5	15	25					
5	Evaluate	10	10	30	50					
6 Create 5 5 15 25										
	Total 20 20 60 100									

Professional Elective (Theory) Courses

		Walch	and Colleg	ge of Engin	eering, Sangli					
			(Government A	ided Autonomou	s Institute)					
			A	Y 2021-22						
	Course Information									
Progr	amme		B.Tech. (Ele	ectrical Engin	eering)					
Class,	, Semest	ter	Final Year F	B. Tech., Sem	VIII					
Cours	se Code									
Cours	se Name	esign								
Desire	ed Requ									
			1							
'	Teachin	larks)								
Lectu	re		Total							
Tutor	rial		100							
Practi	ical	-								
Intera	action	-			Credits: 2					
			~							
			Cour	se Objective	S					
1	To dev	elop basic know.	ledge related	to Electric Ve	hicles subsystem.					
2	To pro	vide knowledge	related to desi	ign aspects of	Electric vehicles					
3	The co	ourse aims at enal	oling students	to design of l	BMS and battery	pack la	ayout.			
	G	Course Ou	itcomes (CO)) with Bloom	's Taxonomy Lev	vel				
CO1	Sumn	arize the design	procedure for	· Electric Veh	icles		Understanding			
<u>CO2</u>	Deter	mine the perform	ance of Electr	ric vehicle bas	sed on design deta	ails	Applying			
<u>CO3</u>	Analy	ze different contr	ol system tecl	hniques for E	lectric vehicles		Analyzing			
	-			~						
Modu	ile		Module	Contents			Hours			
Ι	Des Des par Ran elec	sign Principles - finition of hybri allel hybrid, seri- nge extender, Op ctric motor power	I dness, Hybri es, mixed and ptimization as r	d design phi d range exten nd hybridnes	llosophy, Hybrid der (plug-in) hyb s, Battery power	ness: orids, and	5			
П	Des Pov Rec Ma The Co	sign Principles - wer and Mass C quirements, Acce ss, Component S eir Connections, nnections.	II Computations leration Power Sizing, Series Parallel HEV	for Initial V er, Grade-Clin HEV Drivet Drivetrain C	Vehicle Sizing, Pendon mbing Power, Ver rain Components Components and T	ower hicle and Their	5			
III	IIIControl Systems for the HEV and EVs Function of Control System in HEVs and EVs, Elementary of Control Theory, Overview of Control System: The Electronic Control Unit (ECU), Control Area Network, Control Variables5									
IV	BM Intr Des AD pac	IS Design for EV roduction, Impor- sign of BMS, E C, Sensing There k protection, Bat	tance of BM Battery pack rmistor value tery pack inte	MS design, sensing, Sen s, Current va rfacing, Com	Battery pack lay sing voltage sig llues sensing, Ba munication.	yout, nals- ttery	5			

	Degenerative Duching	
	Regenerative Braking	
V	Fundamentals of Regenerative Braking, Energy Consumption in	
v	Braking, Braking Power and Energy on Front and Rear Wheels,	4
	Brake System of EVs and HEVs, Antilock Brake System (ABS)	
	Drive cycle and EV subsystem	
VI	Concept of drive cycle, drive cycles and energy used per km, Design	
V I	of EV drive train, Case Studies: Design of a Hybrid Electric Vehicle	4
	(HEV), Design of a Battery Electric Vehicle (BEV).	
	Text Books	
1	Iqbal Husain, 'Electric and Hybrid Vehicles: Design Fundamentals',	CRC Press,
1	2003	
2	2. C.C. Chan and K.T. Chau, "Modern Electric Vehicle Technology",	OXFORD
	University Press, 2001	
	References	
1	Chris Mi, M. Abul Masrur, David Wenzhong Gao, "Hybrid E	Electric Vehicles
1	Principles And Applications With Practical Perspectives," Wiley Public	ication, 2011.
	Useful Links	
1	https://nptel.ac.in/courses/108/106/108106170/	
2	https://nptel.ac.in/courses/108/103/108103009/	

CO-PO Mapping														
		Programme Outcomes (PO) PSO												
	1 2 3 4 5 6 7 8 9 10 11 12 1 2 3													
CO1	3													
CO2		3												
CO3	CO3 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1													
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High														
Each (CO of	the co	ourse r	nust n	nap to	at lea	st one	PO.						

Assessment

	Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course									
Bloom's Taxonomy LevelT1T2ESETotal										
1	Remember									
2	Understand	10		10	20					
3	Apply	10	20	40	70					
4	Analyse			10	10					
5	Evaluate									
6	6 Create									
	Total 20 20 60 100									

		Wa	Chand Colle (Government	ege of Engine Aided Autonomous	e ring, Sangli Institute)						
	AY 2021-22 Course Information										
	Course Information										
Progra	mme		B.Tech. (Elec	trical Engineerir	ng)						
Class, S	Semes	ster	Final Year B.	Final Year B. Tech., Sem VIII							
Course	Course Code Course Name Professional Elective 6: Solar and Wind Power Gen										
Course	Nam	e	Professional l	Elective 6: Solar	and Wind Power Ge	neration					
Desired											
Tea	aching	g Scheme		Examinatio	on Scheme (Marks)						
Lectur	Total										
Tutoria	100										
Practic	al	-									
Interac	tion	-		(Credits: 2						
			Co	urse Objectives							
1	To c: futur	reate awarenes e.	s about the imp	portance of renew	vable technology for	sustainable					
2	Impa	art the knowled	ge of solar pov	ver generation ar	nd wind power gener	ation					
3	To a	cquaint student	s with possible	e storage systems	s in renewable gener	ation.					
4	Intro	duce recent tre	nds in renewał	ole energy system	n to students.						
		Course	Outcomes (CO	O) with Bloom's	s Taxonomy Level						
At the e	end of	the course, the	students will l	be able to,							
CO1	Dete	rmine need of	RES.			Understanding					
CO2	Exp	lain solar and v	wind power gei	neration and its u	tilization.	Understanding					
CO3	Com	prehend stora	ge systems and	I SMART GRID	system.	Understanding					
Modu	le		Modu	ile Contents		Hours					
	I	ntroduction to	Renewable E	nergy Sources							
T	G	lobal and Ind	ian scenario o	of RES, need for	or alternative energ	y 4					
1	S	ources, advanta	ages &disadva	ntages of RES,	classification of RE	S					
	&	comparison, l	key factors affe	cting RES.							
	S	olar Energy									
	S	olar thermal	power gene	eration, solar	photovoltaic powe	r					
	g	eneration, basi	cs of PV cell,	materials used for	or PV cell, efficienc	y j					
II	0	f PV cell, equ	ivalent electri	cal circuit, oper	n circuit voltage an	d 4					
	s	nort circuit cur	rent, I-V & P-V	v curves, effects	of different electrica	l					
	p	arameters on I	-v & P-v cur	ves, measuremei	nt of solar insolation	1,					
	S	blar concentrat	or, flat plate &	concentrating co	llectors.						
		on Photovol	f DV norman	unversion & Uti	uization						
ттт		rid connected	DV avetom	solo storo 6 true	n- on-griu system a	x 5					
	g r	ower transfor	r v system, sm	three phase inv	o stage converters IC						
	p	f grid connacta	d DV system	. unee phase mv	eners for Pv, contro	1					
	0	i griu connecte	u i v system.								

IV	Wind Resource Assessment Power available in wind, wind turbine power & torque characteristics, types of rotors, characteristics of wind rotor, local effects, wind shear, turbulence & acceleration effects, measurement of wind, wind speed statistics, statistical model for wind data analysis, energy estimation of wind regimes, capacity factor, aerodynamics of wind turbines, airfoil, lift & drag characteristics, power coefficient & tip speed ratio characteristics, electrical generator machines in wind energy systems.	5						
V	Storage and Fuel Cell TechnologiesIntroduction, need for storage for RES, traditional energy storagesystem- battery, fuel cell, principle of operation, types of fuel cell.	3						
VI	Emerging Trends in Renewable Energy Introduction to SG, SG in Indian context, architecture of SG, advantages & disadvantages, key challenges for SG, SG technologies, AMI, PMU, WAMS, standards & codes for grid integration of DG systems.	5						
	Text Books							
1	Boyle, Godfrey, "Renewable Energy", (2nd edition), Oxford University	Press, 2004.						
2	G.S.Sawhney, "Non-Conventional Resources of Energy", PHI Publication	n 2012						
	References							
1	Gary-L. Johnson "Wind Energy Systems" Tata Mc-Graw-Hill Book Com	pany.						
2	James Manwell, J. F. Manwell "Wind Energy Explained: Theory, Design an Application".							
3	3 Paul Gipe "Wind Power, Renewable Energy for Home, Farm, and Busine							
	Useful Links							
1	https://nptel.ac.in/courses/117/108/117108141/							
2	https://onlinecourses.nptel.ac.in/noc20_mm05/preview							
3	https://www.helioscope.com/							

	CO-PO Mapping														
		Programme Outcomes (PO)PSO													
	1	1 2 3 4 5 6 7 8 9 10 11 12 1 2													
CO1		3													
CO2													3		
CO3			3												
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															
Each CO	of the	e cours	se mus	st map	to at l	least o	ne PO								

Assessment

	Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course											
E	Bloom's Taxonomy Level	T1	T2	ESE	Total							
1	Remember											
2	Understand	20	20	60	100							
3	Apply											
4	Analyse											
5	Evaluate											
6	Create											
	Total	20	20	60	100							

	Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)										
			A	Y 2021-22							
			Cours	se Information							
Progr	amme		B.Tech. (Ele	ctrical Engineering	ng)						
Class,	Semeste	r	Final Year B.	Tech., Sem VIII	[
Cours	se Code										
Cours	se Name		Professional I	Elective 7: Flexib	ole AC Transmissio	on Systems					
Desire	ed Requi	sites:	Power System	n Engineering, Po	ower Electronics						
T	eaching	Scheme		Examination	n Scheme (Marks))					
Lectu	re	2 Hrs/week	T1	T2	ESE	Total					
Tutor	ial	-	20	20	60	100					
Practi	ical	-									
Intera	oction	-		С	redits: 2						
			Cour	se Objectives							
1	To mak	e students und	erstand concep	t of FACTs envi	sages the use of po	wer electronics to					
1	improve	system opera	tion by fast & 1	reliable control.							
2	To cove	r concepts of	FACTs includi	ng the description	on, principle of wo	rking and analysis					
<u> </u>	of vario	us FACTs con	trollers.								
3	To stren	gthen the cont	rol of FACTs a	and system intera	actions.						
	Course Outcomes (CO) with Bloom's Taxonomy Level										
CO1	$\begin{array}{c c c c c c c c c c c c c c c c c c c $										
CO2	Choose	the suitable F.	ACTs device/c	ontroller for part	icular application.	Applying					
coa	Analyz	e the character	istics of FACT	of Analyzing							
CO3	the cont	roller on Powe	er System.								
	1		•								
Modu	le		Modul	e Contents		Hours					
	Intro	oduction									
I	Tran Inter Syste Syste Stabi Impo Cont Brief Conr Shun from	smission Int connections, em, Power I em, Limits of lity Considera ortance of Co rollers, Relati Description nected Contro at and Series FACTS Tech	erconnections, Opportunities f Flow in Parall the Loading C ations of a Tra- ontrollable Par ve Importance and Definition llers, Series Connected Con- nology	Why We for FACTS, Flow lel Paths , Pow Capability, Power ansmission Inter rameters , Basic e of Different T ns of FACTS (Connected Con ntrollers, Other	Need Transmissi w of Power in an A ver Flow in Mesh r Flow and Dynan connection, Relati c Types of FAC Cypes of Controlle Controllers , Shu trollers , Combin Controllers, Benef	on AC ed nic ve TS TS TS rs, int ed its					
Π	Stati Obje Line Insta Dam Cont	ic VAR Comp ctives of Shur Segmentation bility, Impro ping, Summ rollable Var	ensator (SVC nt Compensation, End of Line ovement of Transverse of Compo- generation, V) on, Midpoint Vo Voltage Suppor cansient Stability ensator Requirer ariable Impedar	oltage Regulation f t to Prevent Volta y ,Power Oscillati ments, Methods nee Type Static V	for ge 5 on 5 of Var					

	Generators, The Thyristor-Controlled Reactor (TCR), Operating Characteristics of a TCR, The Thyristor-Controlled Transformer (TCT), The Fixed Capacitor–Thyristor-Controlled Reactor (FC–TCR),					
	The Mechanically Switched Capacitor–Thyristor-Controlled Reactor (MSC–TCR), The Thyristor-Switched Capacitor (TSC), The Thyristor-Switched Capacitor–Thyristor-Controlled Reactor (TSC–TCR), A Comparison of Different SVCs.					
	Static Series Compensators					
III	Objectives of Series Compensation, Concept of Series Capacitive Compensation, Voltage Stability, Improvement of Transient Stability, Power Oscillation Damping, Subsynchronous Oscillation Damping, Summary of Functional Requirements, Approaches to Controlled Series Compensation, Variable Impedance Type Series Compensators , GTO Thyristor-Controlled Series Capacitor (GCSC) , Thyristor- Switched Series Capacitor (TSSC), Thyristor-Controlled Series Capacitor (TCSC), Subsynchronous Characteristics , Basic Operating Control Schemes for GCSC, TSSC, and TCSC	5				
IV	Voltage-Sourced Converters and Current sourced converters used in FACTS devices Voltage-Sourced Converters, Basic Concept of Voltage-Sourced Converters, Single-Phase Full-Wave Bridge Converter Operation, Single Phase-Leg Operation, Square-Wave Voltage Harmonics for a Single-Phase Bridge, Three-Phase Full-Wave Bridge Converter, Converter OPeration, Fundamental and Harmonics for a Three-Phase Bridge Converter, Sequence of Valve Conduction Process in Each Phase-Leg ,Transformer Connections for 12-Pulse Operation 24- and 48-Pulse Operation, Three-Level Voltage-Sourced Converter, Operation of Three-Level Converter, Fundamental and Harmonic Voltages for a Three-Level Converter, Three-Level Converter with Parallel Legs, Pulse-Width Modulation (PWM) Converter,Self- and Line-Commutated Current-Source Converters	5				
V	Switching Converter Type Shunt Var Generators Basic Operating Principles, Basic Control Approaches, Static Var Compensators: SVC and STATCOM, The Regulation Slope, Transfer Function and Dynamic Performance, Transient Stability Enhancement and Power Oscillation Damping, Var Reserve (Operating Point) Control, Comparison Between STATCOM and SVC, V-I and V-Q Characteristics, Transient Stability, Response Time, Capability to Exchange Real Power, Operation With Unbalanced AC System, Loss Versus Var Output Characteristic, Physical Size and Installation, Merits of Hybrid Compensator	4				
VI	Switching Converter Type Series Compensators The Static Synchronous Series Compensator (SSSC), Transmitted Power Versus Transmission Angle Characteristic, Control Range and VA Rating, Capability to Provide Real Power Compensation, Immunity to Subsynchronous Resonance, Internal Control, External (System) Control for Series Reactive Compensators	4				
Text Books						
1	Narain G.Hingorani, Laszio. Gyugyi, Understanding FACTS C Technology of Flexible AC Transmission System, Standard Publishers, D	Concepts and elhi, 2001.				

References								
1	A.T. John, Flexible AC Transmission System, Institution of Electrical and Electronic							
1	Engineers (IEEE), 1999.							
2	R. Mohan Mathur, Rajiv. K. Varma, <i>Thyristor – Based Facts Controllers for Electrical</i>							
Z	Transmission Systems, IEEE press and John Wiley & Sons Inc., 2002							
Useful Links								
с	https://nptel.ac.in/courses/108/107/108107114/							

	CO-PO Mapping														
	Programme Outcomes (PO) PSO														
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1			1												
CO2				2											
CO3						2									
The strer	gth of	mapr	oing is	to be	writte	n as 1.	2.3: V	Vhere.	1: Lo	w. 2: I	Mediu	m. 3:	High		

Each CO of the course must map to at least one PO.

Assessment

	Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course											
E	Bloom's Taxonomy Level	T1	Total									
1	Remember											
2	Understand	10		10	20							
3	Apply	10	20	40	70							
4	Analyse			10	10							
5	Evaluate											
6	Create											
	Total	20	20	60	100							

	Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)										
			Α	Y 2021-22							
			Cours	se Information							
Progra	mme		B.Tech. (Electri	ical Engineering)							
Class,	Semes	ter	Final Year B. T	ech., Sem VIII							
Course	e Code	•									
Course	e Nam	e	Professional Elective 7- Illumination Engineering								
Desire	d Req	uisites:	Basic Electrical	Basic Electrical Engineering, Basic Electronics Engineering							
Tea	aching	Scheme	Examination Scheme (Marks)								
Lectur	e	2 Hrs/week	T1	T2	ESE]	Fotal				
Tutoria	al		20	20	60		100				
Practic	al	-									
Interac	ction	-		Cre	edits: 2						
			Cour	rse Objectives							
1	To ir	ntroduce the fu	indamentals of II	lumination Engin	eering.						
2	Top	rovide lighting	g sources, standar	rd practices for ill	lumination leve	ls & mea	surement				
	calculations for designing a system.										
3 To impart technology in the analysis & design of architectural lighting system.											
A	Course Outcomes (CO) with Bloom's Taxonomy Level										
At the e	end of	the course, th	e students will be	e able to,	•						
	Desc	ribe basic ter	ms and laws in ill	lumination engine	eering.		Remember				
<u>CO2</u>	Clas	sity different	types of lamps us	ed for lighting.	. •.	. 1	Apply				
CO3		tify indoor an	d outdoor illum	Evaluate							
	a de	sign aspects a	evaluate differe	ent lighting desig	ns & applicatio	ns.					
Modu	la 🗌		Mod	ula Contonta			Hours				
Modu		lumination E	MUU nginooring Pogi				nours				
		Inimitation E	llumination visi	us bla ranga of liv	abt optical av	stom of					
	h	uman ava vis	ion visual acuity	contrast sensiti	yity visual per	cention					
т		and & bad e	ffects of lighting	, contrast, sensiti	of luminance	artificial	5				
1	5 1i	obting colou	r temperature I	Definition of lur	ninous flux li	iminous	5				
	ir	tensity Lume	en output candels	a laws of illumin	ation light dist	ribution					
		urve Glare C	olour Rendering	Index	ation, nght aist	noution					
		ight sources									
		amp material	s. Discharge La	mps: characteris	stics of low a	nd high					
	m	nercurv and S	odium vapour la	amps. Low Vapo	our Pressure d	ischarge					
11	la	lamps – Mercury Vapour lamp Fluorescent Lamp Compact									
	F	Fluorescent Lamp (CFL). High Vapour Pressure discharge lamps -									
	N	fercury Vapou	amp, Sodium Vapour lamp, Metal, Induction lamps.								
	C	omponents o	f illumination sy	vstem		i					
	B	allast, igniters	s and dimmers fo	or different types	of lamps, Lun	ninaries:					
III	ty	pes, factors,	Lighting Fixture	types, use of re	flectors and re	fractors,	4				
	p]	hysical protec	tion of lighting t	fixtures, luminar	y's standard (II	EC-598-					
	P	art I).	- •								

IV	Indoor lighting Definitions of maintenance factor, Uniformity ratio, Direct ratio, Coefficients of utilisation and factors affecting it, Illumination required for various work planes, Space to mounting height ratio, Interior illumination: Types of fixtures, DLOR and ULOR, Selection of lamp and luminance, utilisation factor, reflection factor and maintenance factor, Determination of Lamp Lumen output, Calculation of wattage of each lamp and no of lamps needed, space to mounting height ratio. Layout of lamp luminaire. Indian standard recommendation and standard practices for illumination levels in various areas.	5							
V	Outdoor lightingStreet Lighting : level of illumination required, Types of fixtures usedand their suitable application, Various arrangements in street lighting,Selection of lamp and luminaire, Calculation of their wattage, Numberand arrangement, space to mounting height ratio, illumination levelavailable on roadFlood Lighting : Terms related to flood lighting, Types of fixtures andtheir suitable applications, Selection of lamp and projector, Calculationof their wattage and number and their arrangement, space to mountingheight ratio, Recommended method for aiming of lamp	5							
VI	Modern trends in illuminationLED luminary designs, Intelligent LED,OLED,QLED fixtures, Naturallight conduiting, Organic lighting system, LASERS, characteristics,features and applications, non-lighting lamps, Optical fiber, itsconstruction as a light guide, features and applications	3							
	Text Books	.							
1	Joseph B. Murdoch, "Illumination Engineering from Edison's Lamp Publisher - York, PA: Visions Communications	to Lasers"							
2	H. S. Mamak, "Book on Lighting", Publisher International lighting Academy	/							
	Keterences	to Lacous"							
1	Publisher - York, PA: Visions Communications	to Lasers							
2	2 M. A. Cayless, A. M. Marsden, <i>"Lamps and Lighting"</i> , Publisher-Butterworth- Heinemann(ISBN978-0-415-50308-2)								
3	National Lighting code 2010(SP 72:2010)								
	Useful Links								
1	https://nptel.ac.in/courses/108/105/108105061/								

	CO-PO Mapping														
		Programme Outcomes (PO)PSO													
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3													1	
CO2	3													1	
CO3		3	1											1	
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															
Each CO	of the	e cours	se mus	st map	to at l	least o	ne PO	•					-		

Assessment

	Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course											
B	loom's Taxonomy Level	T1	T2	ESE	Total							
1	Remember	10		10	20							
2	Understand											
3	Apply	10	10	20	40							
4	Analyse											
5	Evaluate		10	30	40							
6	Create											
	Total	20	20	60	100							