### Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)



### **Credit System and Course Content**

### S. Y. B. Tech. (Electrical Engineering)

### Semester III & IV

Academic Year 2022-23

Sr.No.	Category	Course Code	Course Name		L	Т	Р	Ι	Hrs	Cr	MSE/LA1	ISE/LA2	ESE	Ext
			Professional	Core (Theory)								L L		
1	BS	6MA203	Applied Mathematics for Electrical Engineer	S	3	0	0	0	3	3	30	20	50	
2	PC	6EL201	DC Machines and Transformers		3	0	0	0	3	3	30	20	50	
3	PC	6EL202	Electrical Circuits		3	0	0	0	3	3	30	20	50	
4	PC	6EL203	Analog and Digital Circuits		3	0	0	0	3	3	30	20	50	
5	PC	6EL204	Electrical Generation		3	0	0	0	3	3	30	20	50	
			Professiona	al Core (Lab)										
7	PC	6EL251	DC Machines and Transformers Lab		0	0	2	0	2	1	30	30	40	POE
8	PC	6EL252	Electrical Circuit and Measurement Lab		0	0	2	0	2	1	30	30	40	POE
9	PC	6EL253	Analog and Digital Circuits Lab		0	0	2	0	2	1	30	30	40	POE
10	PC	6EL254	Simulation Lab		0	0	2	1	3	2	30	30	40	
			AICTE Man	datory Courses										
10	MC	6IC201		2	0	0	0	2	0	10	30	10	50	
	Total 17 0 8 1 26 20													

### Credit System for S. Y. B. Tech. (Electrical Engineering) Semester- III AY 2022-23

### Notes:

For Theory courses: There shall be MSE, ISE and ESE. The ESE is a separate head of passing.

For Lab courses: There shall be continuous assessment (LA1, LA2, ESE). The ESE is a separate head of passing. The Y in the PoE indicates external component for ESE.

Minimum two AICTE mandatory courses need to be completed for award of degree.

For further details, refer to Academic and Examination rules and regulations.

Sr.No.	Category	<b>Course Code</b>	Course Name		L	Т	Р	Ι	Hrs	Cr	MSE/LA1	ISE/LA2	ESE	Ext
			Professiona	l Core (Theory)										
1	PC		3	0	0	0	3	3	30	20	50			
2	PC	6EL222	Electrical Transmission and Distribution		3	0	0	0	3	3	30	20	50	
3	PC	6EL223	Power Electronics		3	0	0	0	3	3	30	20	50	
4	PC	6EL224	Signals and Systems		3	1	0	0	4	4	30	20	50	
5	PC	6EL225	Electrical Measurement and Instrumentation		3	0	0	0	3	3	30	20	50	
			Profession	al Core (Lab)										
6	PC	6EL271	AC Machines Lab		0	0	2	0	2	1	30	30	40	POE
7	PC	6EL272	Electrical Transmission and Distribution Lab		0	0	2	0	2	1	30	30	40	OE
8	8 PC 6EL273 Power Electronics Lab							0	2	1	30	30	40	POE
9 PC 6EL275 Electrical Measurement and Instrumentation Lab							2	0	1	1	30	30	40	
				Total	15	1	8	0	24	20				

### Credit System for S. Y. B. Tech. (Electrical Engineering) Semester- IV AY 2022-23

### Notes:

For Theory courses: There shall be MSE, ISE and ESE. The ESE is a separate head of passing.

For Lab courses: There shall be continuous assessment (LA1, LA2, ESE). The ESE is a separate head of passing. The Y in the PoE indicates external component for ESE.

Minimum two AICTE mandatory courses need to be completed for award of degree.

For further details, refer to Academic and Examination rules and regulations.

# Semester- III Professional Core (Theory) Courses

	Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)									
			AV	2022-23						
			Course	Information						
Progr	amme		B.Tech. (Electric	al Engineering)						
Class	Semester		Second Year B	Tech Sem III						
Cours	e Code		6MA203							
Cours	e Name		Applied Mathem	atics for Electrical Engin	eering					
Desire	d Roquisi	tos.	Engineering Mat	hematics Land Engineeri	ng Mathematic	a II				
Desire	u Kequisi	165.	Engineering Mau	nematics I and Engineeri		5 11				
	Teaching	Scheme		Examination Schem	e (Marks)					
Lectur	ro	3 Hrs/week	MSE	ISF	FSF	Total				
Tutori	ic ial	J III S/ WCCK	30	20	<u>ESE</u> 50	100				
1 0101	lai	-	30	Credita: 2	50	100				
				Creans. 5						
			Course	Objectives						
1	To doval	on Mathamatica	Lakilla and anhana	a thinking power of stud	nte					
	To uever	op Matternatica	al concents of Math	e minking power or stud	tions in onging	oring fields				
	10 111100		Outcomes (CO) w	vith Bloom's Taxonomy		ering fields				
At the	end of the	course the stud	ents will be able to							
				,	Bloom's	Bloom's				
СО		Cours	se Outcome Stater	nent/s	Taxonomy	Taxonomy				
					Level	Description				
CO1	Explain	Mathematical Co	oncept in Engineer	ing field	II	Understandin				
CON	Use Mat	hematical and C	omputational Meth	nods to solve the		A remleting of				
02	problems	s in science and	Engineering field.		111	Applying				
Modu	le		Module	Contents		Hours				
_	Prob	ability Distribu	ition							
1	Rand	om variable, C	Continuous random	n variable, Discrete rar	dom variable,	6				
	Binoi	mial distribution	, Poisson distributi	on, Normal distribution.						
		ace Transform	and Its Application	ons Descrition Transfor						
II	Denn and L	ntogral Inverse	1 of Standard functi	Convolution Theorem	Applications to	8				
	solve	linear differenti	al equations I and	, Convolution Theorem, a	superiors					
	Four	ier Series	ui equations, Eaple	dee transform of periodie	runetions.					
	Perio	dic functions, D	virichlet's condition	ns, Definition, Determina	tion of Fourier					
III	coeff	icients (Euler's f	formulae), Expansi	on of functions, Even and	odd functions,	6				
	Chan	ge of Interval an	d functions having	arbitrary period, Half ran	ge Fourier sine					
	and c	osine series.								
	Four	ier Transform				-				
IV	Defin	ition, Fourier Si	ne and Cosine Inte	gral, Fourier sine and Co	sine transform,	6				
	Inver	se Fourier sine a	and Cosine transfor	m, Properties, Parseval's	Identity.					
V	Parti	al differential	equations and its A	standard forms applic	ention to one	6				
v	dimensional Heat equation.									
	Stati	stics				1				
VI	Corre	elation. Linear re	gression. Curve fit	ting (a) Straight line (b) I	Parabolic curve	7				
	(c) Lo	ogarithmic Curv	e.	<i>U</i> ( <i>a</i> ) <i>a a b c c c c c c c c c c</i>						
			Тех	ktbooks						
1	Adva Editio	nced Engineeri on.1978.	ng Mathematics,	Erwin Kreyszig Wiley	Eastern Ltd.	Publication,1 <sup>st</sup>				

2	A Text Book Of Applied Mathematics, Vol I and II, P.N. and J.N. Wartikar, Vidyarthi Griha Prakashan, Pune, 2006.
3	Higher Engineering Maths, B.S.Grewal, Khanna Publication, 39th Edition, 2005.
4	Fundamental of Mathematical Statistics, Gupta and Kapoor
	References
1	Advanced Engineering Mathematics, Wylie C.R., Tata McGraw Hill Publication, 8 <sup>th</sup> Edition,1999.
2	Advanced Engineering Mathematics, H.K. Dass, S. Chand and company Ltd., 1 <sup>st</sup> Edition 1988.
3	An Introduction to probability and Statistics, Vijay Rohatgi,
	Useful Links
1	https://www.youtube.com/watch?v=lkAvgVUvYvY
2	https://www.youtube.com/watch?v=c9NibpoQjDk

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

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)										
			AY	2022-23						
			Course 1	Information						
Progr	amme		B.Tech. (Electric	al Engineering)						
Class.	Semester		Second Year B. 7	Fech., Sem III						
Cours	e Code		6EL201	,						
Cours	e Name		DC Machines and	d Transformers						
Desire	ed Requisi	tes:	Basic Electrical E	Engineering						
	u nequisi		Busic Electrical I							
	Teaching	Scheme		Examination Scheme	(Marks)					
Lectu	re	3 Hrs/week	MSE	ISE	ESE	Total				
Tutor	ial	-	30	20	50	100				
14001				Credits: 3	20	100				
			Course	Objectives						
1	This cou	rse intends to pr	ovide basic concep	ot of DC machines and tran	sformers					
2	It intends application	s to develop skil	ls to evaluate rating	gs of DC machines and tra	nsformers for	various				
3	It intends	s to solve proble	ms on DC machine	es and transformers.						
		Course	Outcomes (CO) w	vith Bloom's Taxonomy I	Level					
At the	end of the	course, the stud	lents will be able to	),						
со		Cours	se Outcome Stater	ment/s	Bloom's Taxonomy Level	Bloom's Taxonomy Description				
CO1	Explain application	the working on of DC machi	principles, Const nes, universal moto	truction, operation and ors and transformers.	III	Applying				
CO2	Discuss 1	numerical proble	ems on DC machin	es, transformer and	IV/	Analyzina				
	universa	motor			10	Anarysing				
CO3	Analyze universal	the performant motor	nce of DC mach	nines, transformers and	IV	Analyzing				
Modu	ıle		Module (	Contents		Hours				
	DC N	<b>Iachines</b>								
	Cons	tructional Deta	ils: Construction of	f D.C. machines, magnetic	circuit of DC					
	mach	ines, commutato	or and brush arrang	gement, EMF equation, tor	que equation,					
	powe	r flow diagram	of D.C. machines.	a and more minding min	din a dia anam					
I	Arma and to	ature winning:	ition dummy coils	ng and wave winding, win	ang diagram	8				
		ature Reaction	• MME due to arm	nature winding flux distril	bution due to					
	armat	ure current and	resultant flux distr	ribution in a machine. Der	nagnetization					
	and c	ross magnetizati	on ampere turns, p	rinciple of compensation, of	compensating					
	wind	ng and its use in	n machines.	1 1 /	1 0					
	D.C.	Motors								
	Conc	ept of back e.m.	f., characteristics of	f D.C. motors, Method of sp	peed controls,					
II	electr	o braking, paral	lel and series opera	ation of motor.	• • • •	8				
	<b>Testing of D.C. Machines:</b> Losses and efficiency, Break test, Swinburn's test,									
	Hopk	inson's test, Ket	tardation test, Field	i test on D.C. series motor.						
	Singl	e rnase Transf	ormer pe EME constin	n nhacor diagram again	alant airavit					
ш	effici	ency losses rea	pe, Emirequation	ntal determination of equi	valent circuit	8				
	baran	neters and calcu	lation of efficiency	and regulation. parallel or	peration. auto					
	transf	ormer principle	and connections.							

	Poly Phase Transformer	
IV	Construction, single phase bank, polarity test, transformer winding, V-V	5
	connection and Scott connection, Vector Grouping YD1, YD11, DY1, DY11,	
	DZ0, DZ 6, YZ1, YZ11.	
	Performance of Transformers	
**	Switching inrush current, on load and off load tap changing, Harmonics in	-
	exciting current causes and effects, Harmonics with different transformer	6
	connections, tertiary winding, oscillating neutral, Testing of transformer as per	
	IS, heat run test, Sumpner's test and equivalent delta test.	
	Universal Motor	
VI	Development of torque & power, rotational and transformer emf in commutator	4
	winding, commutation in universal motor, complex or diagram, circle diagram,	
	operation on A.C. and D.C. supply, compensated winding, applications.	
	Turthasha	
	<b>IEXIDOOKS</b>	antiner" CDC
1	A. E. Clayton and Hancock, The Performance and Design of Direct Current M. Dublishers, 1st Edition, 2004	achines, CBS
	M. G. Soy, "The Performance and Design of Alternating Current Machines" C	PS Dublishors
2	3rd Edition 2004	DS rublishers,
	O E Taylor "Performance Design of AC commutator motors" Wheeler H	Publisher 15th
3	Reprint.	uonsnor, 15th
	References	
1	Purkait and Bandyopadhyay "Electrical Machines", Oxford University Press, 1st	Edition, 2017.
	J. B. Gupta, "Theory and Performance of Electrical Machines", S. K. Kataria and	d Sons, 1st
2	Edition, 2013.	
		~ -
3	Fitzerald and Kingsley, "Electric Machines", Tata McGraw Hill, 7th Edition, 200	07.
1	Kothari and Nagrath, "Electric Machines", McGraw Hill, 5th Edition, 2018.	
+		
1		
	https://nptel.ac.in/courses/108/105/108105017/	
2		

CO-PO Mapping														
		Programme Outcomes (PO)												
	1	2         3         4         5         6         7         8         9         10         11         12         1         2												
CO1	3												2	
CO2		3											3	
CO3		3												3
CO4	CO4													
The strength of mapping is to be written as 1: Low, 2: Medium, 3: High														
<b>F</b> 1 CO	0.1				. 1 .	DO								

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

### Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

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		Walc	hand College	of Engineering	, San	gli					
				2022-23	2)						
			Course	Information							
Progra	amme		B.Tech. (Electric	al Engineering)							
Class.	Semester		Second Year B. 7	Fech., Sem III							
Cours	e Code		6EL202	,							
Cours	e Name		Electrical Circuit	S							
Desire	d Requisi	tes:	Engineering Math	nematics I							
			6 6								
	Teaching	Scheme		Examination Sc	heme	(Marks)					
Lectur	re	3 Hrs/week	MSE	ISE		ESE	Total				
Tutori	ial	-	30	20		50	100				
				Credi	ts: 3						
			Course	Objectives							
1	This cour	rse intends to de	velop an understan	ding of the fundame	ental la	ws and elem	ents of electric				
	It will ma	ake students to l	earn a number of p	owerful engineering	g circui	t analysis tec	hniques such as				
2	nodal ana	alysis, mesh ana	lysis, theorems, sou	arce transformation	and se	veral method	s of simplifying				
	networks	•									
3	The cour	se intends to int	roduce open circuit	, short circuit, trans	missio	n, hybrid par	ameters and				
	their inte	rrelationship			-	-					
A 4 4 h a	and of the	Course	Outcomes (CO) w	ith Bloom's Taxon	omy L	level					
At the		course, the stud	ents will be able to	,		Bloom's	Ploom's				
СО		Cours	e Outcome Staten	nent/s		Taxonomy Level	Taxonomy Description				
CO1	Determin	e voltages, curre sing electrical c	ents, powers, and ec	quivalence of a.c. an	d d.c.	II	Understandin g				
CO2	Calculate	the transient a	nd steady state resp	oonse of first and se	econd	III	Applying				
CO3	Analyze	the parameters of	of two port electrics	al circuits and netwo	orks	IV	Analyzing				
	111111920				<b>, , , , , , , , , , , , , , , , , , , </b>		T mur y 2mg				
Modu	le		Module (	Contents			Hours				
	DC C	lircuits									
	Ohm'	s law, Kirchho	off's law, depend	ent and independe	ent sou	irces, nodes					
I	branc	hes, loops, volta	ge and current divi	sion, Wye Delta tra	nsform	ations, noda	. 8				
	analy	sis, mesh anal	ysis, linearity pro	perty, superpositio	n theo	orem, source	:				
	transi	Ormation, Theve	enin's and Norton's	s theorem, maximur	n powe	er transfer.					
II	Capao	citors, Series a tors. Source free	nd Parallel Capace RC. RL circuits.	citors, Inductors, S step response of RC	Series . RL. c	and Paralle	5				
	Secor	nd Order Circu	its		, , , .						
III	Findi	ng initial and fin	al values, source fr	ee series and paralle	el RLC	circuits, step	6				
		lise of series and	i paraller REC elle	unts, general second	oruer	circuits.					
IV	Sinus nodal Theve	oids, phasors, ir and mesh ar enin's and Norto	npedance and adminalysis, superposition's equivalent circ	ttance, sinusoidal st ion theorem, sour uit.	teady s rce tra	tate analysis	8				
	Powe	r in AC Circui	ts								
v	Instar Appa conve	ntaneous and A rent Power and ention. energy in	verage Power, Ma Power factor, Co coupled circuits	aximum Average P mplex Power, mut	ower, ual inc	RMS Value luctance, do	6				
VI	Two	Port Network	s admittance parat	meters hybrid parar	neters	transmission	6				

	parameters, series connection of two two-port network, parallel connection of													
	two t	wo-por	t netwo	ork, cas	cade co	onnecti	on of ty	wo two	-port ne	etwork				
						Tex	<b>xtbook</b> s	5						
1	1         C. K. Alexandar and M.O. Sadiku, "Fundamentals of Electric Circuits", McGraw Hill EducationMH, 6th Edition,2018, ISBN: 9780078028229													
2	Hayt, Kemmerly, Durbin, "Engineering Circuit Analysis", TMH, 8th Edition, 2012, ISBN: 9781259098635													
						Ref	erence	s						
1	Jame ISBN	s W. N I: 0131	Vilsson 989251	and Su	ısan A.	Riede	l "Elec	tric Cir	cuits"	Prentic	e Hall,	10th E	Edition,	2015,
	L.P. ]	Huelsm	nan, "B	asic Ci	rcuit Tl	neory",	Prentio	ce Hall	3rd Ed	dition, 2	2009, IS	SBN:		
2	9788	120309	9715											
						Usef	ul Linl	ks						
1	https:	://nptel	.ac.in/c	ourses/	/108/10	6/1081	06172/	,						
2	https:	://nptel	.ac.in/c	ourses/	/108/10	5/1081	05159/	r						
3	https:	://nptel	.ac.in/c	ourses/	/108/10	4/1081	04139/	r						
	<u>`</u>				(	CO-PC	) Map	ping						
				l	Progra	mme (	Jutcom	es (PO	)				PS	50
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3													
CO2		3												
CO3		3												
The streng	gth of r	nappin	g is to l	be writt	ten as 1	: Low.	2: Med	lium, 3	High		1	1	1	L
Each CO	of the c	course i	must m	ap to at	t least c	one PO		,	0-					

The assessment is based on MSE, ISE and ESE.

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		Walc	hand College (Government Aidea	of Engineering, San Autonomous Institute)	gli			
			AYZ	2022-23				
			Course l	Information				
Progra	amme		B.Tech. (Electrica	al Engineering)				
Class,	Semester		Second Year B. T	Cech., Sem III				
Cours	e Code		6EL203					
Cours	e Name		Analog and Digit	al Circuits				
Desire	d Requisi	tes:	Basic Electronics	Engineering				
			I					
	Teaching	Scheme		Examination Scheme	(Marks)			
Lectur	re	3 Hrs/week	MSE	ISE	ESE	Total		
Tutori	ial	-	30	20	50	100		
				Credits: 3				
			Course	Objectives				
1	This cour	se aims to intro	duce students the b	asic features of operationa	il amplifier.			
2	It intends or exceed	to provide know l design specific	wledge and experie ations.	nce for implementing sim	ple electronic	circuits to meet		
2	It is aime	d to enable stud	ents for implement	ing combinational logic ci	rcuits for vari	ous		
3	applicatio	ons.	•	<b>č</b>				
4	It intends	to provide know	wledge for impleme	entation of sequential circ	uits using flip-	flops.		
		Course	Outcomes (CO) w	ith Bloom's Taxonomy I	Level			
At the	end of the	course, the stud	ents will be able to	,	1	1		
		G			Bloom's	Bloom's		
	CO Course Outcome Statement/s Bloom's Taxonomy							
		Taxonomy Description						
C01	Summar	ize various anal	og and digital circu	its.	Taxonomy Level II	Description Understandin		
CO1	Summar	ize various anal	og and digital circu	its.	Taxonomy Level II III	TaxonomyDescriptionUnderstandingApplying		
CO1 CO2 CO3	Summar Implemen Construct	ize various anal nt analog and di t basic analog fi	og and digital circu gital circuits to med lters, combinationa	its. et stated applications l and sequential circuits	Taxonomy Level II III III	TaxonomyDescriptionUnderstandingApplyingApplying		
CO1 CO2 CO3 CO4	Summar Implemen Construct Analyze	ize various anal nt analog and di t basic analog fi the performance	og and digital circu gital circuits to med lters, combinationa of electronic circu	its. et stated applications 1 and sequential circuits its	Taxonomy       Level       II       III       III       III       IV	TaxonomyDescriptionUnderstandingApplyingApplyingAnalysing		
CO1 CO2 CO3 CO4	Summar Implemen Construct Analyze	ize various anal nt analog and di t basic analog fi the performance	og and digital circu gital circuits to mea lters, combinationa e of electronic circu	its. et stated applications 1 and sequential circuits its	Taxonomy Level II III III IV	TaxonomyDescriptionUnderstandingApplyingApplyingAnalysing		
CO1 CO2 CO3 CO4 Modu	Summar Implemen Construct Analyze	ize various anal nt analog and di t basic analog fi the performance	og and digital circu gital circuits to med lters, combinationa of electronic circu Module (	its. et stated applications 1 and sequential circuits its Contents	Taxonomy Level II III III IV	Taxonomy         Description         Understandin         g         Applying         Applying         Analysing		
CO1 CO2 CO3 CO4 Modu	Summar Implemen Construct Analyze	ize various anal nt analog and di t basic analog fi the performance amentals of Op	og and digital circu gital circuits to mea lters, combinationa e of electronic circu Module ( p-Amps	its. et stated applications l and sequential circuits its Contents	Taxonomy Level II III III IV	Taxonomy         Description         Understandin         g         Applying         Applying         Analysing		
CO1 CO2 CO3 CO4 Modu	Summar Implemen Construct Analyze Ile Fund Differ	ize various anal- nt analog and di t basic analog fi the performance amentals of Op rential Amplifie	og and digital circu gital circuits to med lters, combinationa of electronic circu <u>Module (</u> p-Amps er(1st stage of OP	its. et stated applications 1 and sequential circuits its Contents -AMP), Ideal Operationa	Taxonomy         Level         II         III         IV         I Amplifiers,	Taxonomy         Description         Understandin         g         Applying         Applying         Analysing		
CO1 CO2 CO3 CO4 Modu	Summar Implemen Construct Analyze t Ile Fund Differ Block	ize various anal nt analog and di t basic analog fi the performance amentals of Op rential Amplific	og and digital circu gital circuits to mea lters, combinationa of electronic circu <b>Module (</b> <b>D-Amps</b> er(1st stage of OP acteristics, op-amp	its. et stated applications l and sequential circuits its Contents -AMP), Ideal Operationa powering, feedback in op	Taxonomy         Level         II         III         III         III         IV         1 Amplifiers,         -amp circuits,	Taxonomy         Description         Understandin         g         Applying         Applying         Analysing		
CO1 CO2 CO3 CO4 Modu	Summar Implemen Construct Analyze t Ile Fund Differ Block invert	ize various anal nt analog and di t basic analog fi the performance amentals of Op rential Amplific Diagram, Char ing, non-invert	og and digital circu gital circuits to med lters, combinationa e of electronic circu <b>Module (</b> <b>p-Amps</b> er(1st stage of OP acteristics, op-amp ting amplifiers, ac	its. et stated applications l and sequential circuits its Contents -AMP), Ideal Operationa powering, feedback in op Ider, subtractor, voltage	Taxonomy         Level         II         III         III         IV         l Amplifiers,         -amp circuits,         comparator,	Taxonomy         Description         Understandin         g         Applying         Applying         Analysing		
CO1 CO2 CO3 CO4 Modu	Summar Implemen Construct Analyze t Ile Fund Differ Block invert differ	ize various anal nt analog and di t basic analog fi the performance amentals of Op rential Amplifie Diagram, Char ing, non-invert ence amplifier,	og and digital circu gital circuits to med lters, combinationa of electronic circu <b>Module (</b> <b>D-Amps</b> er(1st stage of OP acteristics, op-amp ting amplifiers, ac op-amp parameters	its. et stated applications 1 and sequential circuits its Contents -AMP), Ideal Operationa powering, feedback in op Ider, subtractor, voltage s & ratings	Taxonomy         Level         II         III         III         IV         1 Amplifiers,         -amp circuits,         comparator,	Taxonomy         Description         Understandin         g         Applying         Applying         Analysing		
CO1 CO2 CO3 CO4 Modu	Summar Implemen Construct Analyze t Ile Fund Differ Block invert differ Appli Instru	ize various anal nt analog and di t basic analog fi the performance amentals of Op rential Amplific Diagram, Char ing, non-invert ence amplifier, ications of Op-a mentation amp	se Outcome Staten og and digital circu gital circuits to med lters, combinationa e of electronic circu <b>Module (</b> <b>D-Amps</b> er(1st stage of OP acteristics, op-amp ting amplifiers, ac op-amp parameters <b>amps</b> lifier. Integrator, 1	its. et stated applications l and sequential circuits its Contents -AMP), Ideal Operationa powering, feedback in op lder, subtractor, voltage s & ratings Differentiator, Schmitt tr	Taxonomy         Level         II         III         III         III         IV         l Amplifiers,         amp circuits,         comparator,         igger, Active	Taxonomy         Description         Understandin         g         Applying         Applying         Analysing         Hours         6		
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	Com	binatio	onal Ci	rcuits	and Se	quenti	al Circ	uits		•	0 1				
TV.	Revie	ew of k	-map n	11111111Z	ation te	echniqu	le for m	ultiple	outputs	s, static	& dyna	amic	с	)	
IV	nazar	as, mu	itiplexe	er, ae-r fors I	nuitipie	s p 1	nority ( atch D	latch t	r, comp	arator,	$hall \alpha$	F/E	8	)	
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<b>X</b> 7	Coun	ters: N	/Iodulu	s of C	Counter	Sync	hronou	is and	Async	hronou	s coun	ters.			
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	Digit	<b>Digital to Analog and Analog to Digital Converters</b> Binary weighted DAC, R-2R ladder DAC, Ramp ADC, dual slope ADC.													
VI	Binary weighted DAC, R-2R ladder DAC, Ramp ADC, dual slope ADC,														
, ,	successive approximation technique, flash ADC, voltage, current and phase 6														
	angle measurement (block level treatment only).														
						Те	rthook	s							
	Sergi	o Fran	co. "D	esign v	with O	p-Amp	s and	analog	Integra	ated Ci	rcuits"	. Tata	McGra	w-Hill	
1	1 Sergio Franco, "Design with Op-Amps and analog Integrated Circuits", Tata McGraw-Hill Publication, Third Edition, 2001														
2	Aller	n Motte	rshead,	, "Elect	ronic I	Devices	&Circ	uits: A	n Introc	luction	", Prent	ice Ha	ll India	, 2010	
3	A. A	nand K	umar, ʻ	'Funda	mental	s of Dig	gital Ci	rcuits"	Prenti	ce Hall	India,	Fourth	Edition	n, 2014	
	1					Ref	erence	S							
1	R.A. 2012	Gayak	wad, "(	Op-Am	ps & L	linear I	ntegrat	ed Circ	uits", F	Prentice	e Hall I	ndia, F	ourth E	dition,	
	R. L.	Boyles	stad and	d Louis	Nashe	lsky, "I	Electro	nic Dev	vices &	Circui	t Theor	y", Pea	irson		
2	Publi	cations	, Tenth	n Editio	n, 2009	9.									
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Each CO	of the c	course 1	nust m	ap to a	t least o	one PO	•								

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

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Course Information           Programme         B.Tech. (Electrical Engineering)           Class, Semester         Second Year B. Tech., Sem III           Course Code         6FL204           Course Name         Electrical Generation           Desired Requisites:         Basic Electrical Engineering           Lecture         3 Hrs/week         MSE         ISE         ESE         Total           Tutorial         -         30         20         50         100           Creatis: 3         -         30         20         50         100           Conse Objectives         -         -         30         20         50         100           1         To introduce conventional and non-conversional energy conversion system.         -         Halso aims to provide a theoretical background for economic aspect of power generation and tariff.           2         H also aims to provide a theoretical background for economic aspect of power generation and conventional energy sources.         II         Understanding           3         Interpret the students will be able to,         III         Applying           CO2         Course Outcome Statement/s         III         Applying           CO3         Calculate different types of tariff and economic aspect in power generation         I	AY 2022-23								
Programme         B. Tech. (Electrical Engineering)           Class, Semester         Second Year B. Tech., Sem III           Course Code         6EL204           Course Code         6EL204           Course Code         Basic Electrical Contration           Desired Requisites:         Basic Electrical Engineering           Teaching Scheme         Examination Scheme (Marks)           Lecture         3 Hrs/week         MSE         ISE         F3E         Total           Tutorial         -         30         20         50         100           To introduce conventional and non-conversional energy conversion system.         Total Totain         Totain           1         To introduce conventional and non-conversional energy conversion system.         Taxonomy Level           At the end of the course, the students will be able to,         Taxonomy Level         Taxonomy Level           CO         Course Outcome Statement/s         Bloon's Taxonomy Description         Taxonomy Description           Course Collogies         III         Applying         Applying           Course Collogies         IIII         Applying         Applying           Course Course Outcome Statement/s         IIII         Applying           Course Calculate different types of tariff and economic aspect in power	Course Information								
Class, Semester         Second Year B. Tech, Sem III           Course Code         6FI.204           Course Mare         Electrical Generation           Desired Requisites:         Basic Electrical Engineering           Teaching Scheme         Examination Scheme (Marks)           Lecture         3 Hrs/week         MSE         ISE         ESE         Total           Tutorial         -         30         20         50         100           To introduce conventional and non-conversional energy conversion system.         I         To introduce conventional and non-conversional energy conversion system.           1         To introduce conventional and non-conversional energy conversion system.         Bloom's Taxonomy Level           At the end of the course, the students will be able to.         Bloom's Taxonomy Level         Modifier Staxonomy Level           C01         Discuss and claborate power generation technology using conventional and non-conventional energy sources.         II         Modifier Staxonomy Level           C02         Interpret the environmental and social impact of various generation fielenalogies         III         Applying           C03         Calculate different types of tariff and economic aspect in power generation.         III         Applying           C03         Exterm power station         IIII         Applying         Appl	Programme B.Tech. (Electrical Engineering)								
Course Code         6EL204           Course Name         Electrical Generation           Desired Requisites:         Basic Electrical Engineering           Teaching Scheme         Examination Scheme (Marks)           Lecture         3 Hrs/week         MSE         ISE         ESE         Total           Tutorial         -         30         20         50         100           Credits: 3         To introduce conventional and non-conversional energy conversion system.         It also aims to provide a theoretical background for economic aspect of power generation and uariff.           Course Outcomes (CO) with Bloon's Taxonomy Level         At the end of the course, the students will be able to.         Bloom's Taxonomy Level           At the end of the course, the students will be able to.         Bloom's Taxonomy Level         Taxonomy Level           At the end of the course, the students will be able to.         Bloom's Taxonomy Level         Taxonomy Level           COI         Course Outcome Statement/s         Bloom's Taxonomy Level         Taxonomy Level           CO2         Interpret the environmental and social impact of various generation the chanologies         III         Applying           CO3         Calculate different types of tariff and economic aspect in power         III         Applying           CO4         Steam power station         IIII	Class, Semester Second Year B. Tech., Sem III								
Course Name         Electrical Generation           Desired Requisites:         Basic Electrical Engineering           Teaching Scheme         Examination Scheme (Marks)           Lecture         3 Hrs/week         MSE         ISE         ESE         Total           Tutorial         -         30         20         50         100           Course Objectives         Credits: 3         Total           To introduce conventional and non-conversional energy conversion system.         I         Raise and sums to provide a theoretical background for economic aspect of power generation and tarif.           Course Outcomes (CO) with Bloom's Taxonomy Level         At the end of the course, the students will be able to.         Bloom's Taxonomy Description (Course Outcome Statement/s)         Bloom's Taxonomy Description (Course Outcome Statement/s)         Bloom's Taxonomy Description (Course Outcome Statement/s)         Bloom's Cause (Cause Outcome Statement/s)         Bloom's Taxonomy Description (Course Outcome Statement/s)         Bloom's Cause (Cause Outcome Statement/s)	Cours	e Cod	e		6EL204				
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Teaching SchemeExamination Scheme (Marks)Lecture3 Hrs/weekMSEISEESETotalTutorial-302050100Credits: 3Course ObjectivesCourse ObjectivesCourse ObjectivesCourse ObjectivesIntroduce conventional and non-conversional energy conversion system.1To introduce conventional and non-conversional energy conversion system.2It also aims to provide a theoretical background for economic aspect of power generation and lariff.Course Outcomes (CO) with Bloon's Taxonomy DecemberAt the end of the course, the students will be able to.Bloom's Taxonomy DecemberCourse Outcome StatementsBloom's Taxonomy DecemberIIIApplyingCourse Outcome StatementsBloom's Taxonomy DecemberIIIBloom's Taxonomy DecemberIIIState prover stationIIII </td <td>Desire</td> <td>ed Rec</td> <td>luisit</td> <td>es:</td> <td>Basic Electrical E</td> <td>Engineering</td> <td></td> <td></td> <td></td>	Desire	ed Rec	luisit	es:	Basic Electrical E	Engineering			
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Lecture       3 Hrs/week       MSE       ISE       ESE       Total         Tutoral       -       30       20       50       100         To introduce conventional and non-conversional energy conversion system.       It also aims to provide a theoretical background for economic aspect of power generation and tariff.       It also aims to provide a theoretical background for economic aspect of power generation and tariff.         Course Outcomes (CO) with Bloom's Taxonomy Level       Bloom's Taxonomy Level         At the end of the course, the students will be able to,       Bloom's Taxonomy Level         CO       Course Outcome Statement/s       Bloom's Taxonomy Level         At the end of the course, the students will be able to,       Bloom's Taxonomy Level         CO1       Discuss and elaborate power generation technology using conventional and non-conventional energy sources.       III       Applying         CO2       Interpret the environmental and social impact of various generation technologies       III       Applying         CO3       Calculate different types of tariff and economic aspect in power       IIII       Applying         C3       Steam power station       Introduction: Amount of generation of electric power from Conventional and non-conventional sources of energy in India and some developed countries of the world.       6         I       Basic thermodynamic cycles, Schematic arrangement, Types of boilers, Types of p		Teach	ning S	Scheme		Examination Sc	cheme	(Marks)	
Tutorial     -     30     20     50     100       Credits: 3       Course Objectives       1     To introduce conventional and non-conversional energy conversion system.     1	Lectu	re		3 Hrs/week	MSE	ISE		ESE	Total
Credits: 3           Course Objectives           1 To introduce conventional and non-conversional energy conversion system.           2         It also aims to provide a theoretical background for economic aspect of power generation and tariff.           Course Outcomes (CO) with Bloom's Taxonomy Level           At the end of the course, the students will be able to.         Bloom's Taxonomy Level           CO         Course Outcome Statement/s         Bloom's Taxonomy Level           CO1         Discuss and elaborate power generation technology using conventional and non-conventional energy sources.         II         Understandin g           CO2         Discuss and elaborate power generation technology using conventional and non-conventional energy sources.         III         Understandin g           CO3         Calculate different types of tariff and economic aspect in power generation.         III         Applying           CO3         Calculate different types of tariff and economic aspect in power generation.         Hours         Hours           Module         Module Contents         Hours         Hours           Introduction: Amount of generation of electric power from Conventional and non-conventional sources of energy in India and some developed countries of the world.         Hours           I         Basic thermodynamic cycles, Schematic arrangement, Types of boilers, Types of prime movers, Fuel Handling, Ash di	Tutor	ial		-	30	20		50	100
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2	R.K.	Rajput	, "Non-	Conve	ntional	Energy	y Sourc	es and	Utiliza	tion", S	S. Chan	d Publi	ications	•
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<u>CO3</u>		1		2										
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The stren Each CO	gth of r of the o	nappin course	g 1s to l must m	be writh ap to a	ten as 1 t least c	: Low, one PO	2: Med	11um, 3:	: High					

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

# **Professional Core (Lab) Courses**

	Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)					
	AY 2022-23					
Course Information						
Programme	B.Tech. (Electrical Engineering)					
Class, Semester	Second Year B. Tech., Sem III					
Course Code	6EL251					
Course Name	DC Machines and Transformers Lab					
Desired Requisites:	Basic Electrical Engineering Lab					

Teaching	Scheme	Examination Scheme (Marks)							
Practical	2 Hrs/ Week	LA1	LA2	Lab ESE	Total				
Interaction	-	30	30	40	100				
			Credits: 1						

	Course Objectives
1	To develop skills to demonstrate performance operation of DC motors & transformers using different tests.
2	To develop skills to analyze operation and performance of DC machines & transformers.

			<b>T</b> 1
Course Outcomes (	CO) with B	sloom's l'axono	my Level

At the end of the course, the students will be able to,

СО	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Description
CO1	Experiment for verification of electrical characteristics and performance of DC Machines and transformer.	III	Applying
<b>CO2</b>	Analyse the performance of DC Machines and transformer.	IV	Analysing
CO3	Develop appropriate circuit connections and determine ratings of meters to conduct an experiment as a group activity.	IV	Analysing

### List of Experiments / Lab Activities/Topics

### List of Lab Activities:

- 1. Speed control of dc shunt motor (i) Armature control method (ii) Field control method.
- 2. Determination of efficiency of DC motor by Swinburne's test.
- 3. Determination of efficiency of DC motor by Hopkinson's test.
- 4. Brake test on shunt motor to determine its performance and efficiency.
- 5. Load test on compound motor i) cumulative ii) differential.
- 6. To perform open circuit and short circuit test for determining equivalent circuit parameters of a singlephase transformer.
- 7. Parallel operation of single-phase transformer to demonstrate load sharing.
- 8. Scott connections for converting 3 phase to 2 phase supply.
- 9. Equivalent Delta test or Heat run Test for determination of temperature rise and efficiency of 3 phase transformer.
- 10. Parallel connection of 3 phase DY1 and DY11 transformers to demonstrate load sharing.
- 11. Load test on transformer (single and three phase) to determine losses and efficiency using Sumpner's test.
- 12. Develop a circle diagram of Universal motor using load test.

	Textbooks
1	A. E. Clayton and Hancock, "The Performance and Design of Direct Current Machines", CBS
1	Publishers, 1st Edition, 2004.
2	M. G. Say. "The Performance and Design of Alternating Current Machines", CBS Publishers, 3rd
	Edition, 2004.
3	O. E. Taylor, "Performance Design of AC Commutator motors", Wheeler Publisher, 15th Reprint.

References								
1	Purkaitand Bandyopadhyay "Electrical Machines", Oxford University Press, 1st Edition, 2017.							
2	J. B. Gupta, "Theory and Performance of Electrical Machines", S. K. Kataria and Sons, 1st Edition, 2013.							
3	Fitzerald and Kingsley, "Electric Machines", Tata McGraw Hill, 7th Edition, 2007.							
4	Kothari and Nagrath, "Electric Machines", McGraw Hill, 5th Edition, 2018.							
Useful Links								
1								

	CO-PO Mapping													
		Programme Outcomes (PO) PSO												
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1					3									
CO2				3										
CO3				2	1									
The stre	ngth of	mappi	ng is to	be wri	tten as	1,2,3; v	where, 1	: Low,	2: Med	lium, 3	High			

Each CO of the course must map to at least one PO, and preferably to only one PO.

	Assessment								
There are three	There are three components of lab assessment, LA1, LA2 and Lab ESE.								
IMP: Lab ESE	IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%								
Assessment	Based on	Conducted by	Typical Schedule	Marks					

Assessment	Based on	Conducted by	Typical Schedule	Marks
	Lab activities,		During Week 1 to Week 8	
LA1	attendance,	Lab Course Faculty	Marks Submission at the end of	30
	journal		Week 8	
	Lab activities,		During Week 9 to Week 16	
LA2	attendance,	Lab Course Faculty	Marks Submission at the end of	30
	journal		Week 16	
	Lab activities,	Lab Course Faculty and	During Week 18 to Week 19	
Lab ESE	journal/	External Examiner as	Marks Submission at the end of	40
	performance	applicable	Week 19	

		Wal	chand College	e of Engineerin	ng, Sang	gli		
			(Government Ala	$\overline{7}$ 2022 22	uie)			
				2022-23				
Duogu			P. Tash (Electric)	1 Engineering)				
Progr			B. I ech. (Electrica	al Engineering)				
Class,	, Semester		Second Year B. I	ecn., Sem IV				
Cours	se Code		6EL252	<b>x</b> 1				
Cours	se Name		Electrical Circuit	Lab				
Desire	ed Requisi	tes:	Basic Electrical E	Engineering Lab				
	Teaching	Scheme		Examination	Scheme (	Marks)		
Pract	ical	2 Hrs/ Week	LA1	LA2	Lab	ESE		Total
Intera	action		30	30	40	)		100
				Cre	dits: 1			
			Cours	e Objectives				
1	This cour	rse intends to pr	ovide basic practic	al knowledge of el	ectrical ci	rcuit theo	orems	
2	It intends	to develop ski	lls to demonstrate th	ransient and steady	state resp	onse of f	irst a	nd second
	order ele	ctrical circuit.						
3	It aims to	develop an abi	lity to simulate and	l implement variou	s basic ele	ectrical c	ircuits	5.
4	It intends	to develop ski	lls for measuremen	t and instrumentation	on system	l <b>.</b>		
		Cours	e Outcomes (CO)	with Bloom's Tax	onomy L	evel		
At the	end of the	course, the stud	lents will be able to	),				1
						Bloon	n's	Bloom's
CO		Cou	rse Outcome State	ement/s		Taxon	omy	Taxonomy
			<u> </u>	1, , ,	1 '	Leve	el	Description
COI	Determi	<b>ne</b> parameters o	f electrical circuits	and two port netwo	ork using	II		Understand
<u> </u>	<b>Explain</b>	the transient on	l. A standy state respon	nea of first and saco	nd order			
	circuit us	ing hardware a	nd simulation			II		Understand
CO3	Employ	measurement a	nd instrumentation	system for measure	ement of			
	electrical	and physical p	arameters.	system for mousard		III		Apply
								1
			List of Experimen	ts / Lab Activities	Topics			
List o	f Lab Acti	vities:	<b>r</b>					
1.	Implementa	ation of Mesh a	nd Node analysis to	measure current a	nd voltag	e in D.C.	circu	it using
5	software to	ol PSpice.	•		U			C
2.	Verification	n of Superpositi	on Theorem to mea	asure current and v	oltage in e	electrical	circu	it using
1	hardware a	nd validate the	result using softwar	re tool PSpice.	U			e
3.	Verification	n of Thevenin's	and Norton's Theo	brem to obtain equi	valent cire	cuit using	g hard	ware and
	validate the	result using so	ftware tool PSpice.	1		2	2	
4. 1	Determine	transient and st	eady state behaviou	r of a first order ci	rcuit (R-C	circuit)	on ha	rdware and
	validate the	results using s	oftware tool PSpice	<u>.</u>		)		
5	Determine	transient and st	eady state behaviou	r of a second order	circuit (F	R-L-C cir	cuit)	using software
	tool PSnice	indisione and se	eady state sena ind		eneun (I		curry .	using solution
6	Determine	Impedance Ad	mittance Transmis	sion and Hybrid na	rameters	of two no	ort ele	ctrical network
	using hardy	vare and validat	te the result manual	llv		or two pc		ethen network
7	Implements	ation of Mesh a	nd Node analysis to	ny. Si measure current a	nd voltag	e in A C	circu	it using
	software to	ol PSpice	na rivue analysis u	, measure current a	nu vonag	с III А.С.	encu	it using
	Determine	active nower us	ing two wattmeter	method and reactiv	e nower i	ising one	wattı	meter method
	in a three n	hase circuit and	l validate the result	manually	e power t	ising one	w attl	neter methou
	ni a unee-p	mase circuit alle		manually.				
9. 1	Determine	error in single p	mase energy meter	by calibration.	1 1	. do40 11	no14	
	1 1						rocult	

	Textbooks
1	C. K. Alexandar and M.O. Sadiku, "Fundamentals of Electric Circuits", McGraw Hill Education, 6 <sup>th</sup> Edition,2018, ISBN: 9780078028229
2	H. S. Kalsi "Electronic Instrumentation", McGraw Hill Education, Third edition, 2010, ISBN: 9780070702066
	References
1	James W. Nilsson and Susan A. Riedel "Electric Circuits" Prentice Hall, 10th Edition, 2015, ISBN: 0131989251
2	A. K. Sawhney, "A Course in Electrical and Electronics Measurement and Instrumentation", Dhanapat Rai& Company, New Delhi, reprint, 19th Edition, 2010, ISBN: 9788177001006
	Useful Links
1	https://nptel.ac.in/courses/108/105/108105153/
2	https://nptel.ac.in/courses/108/105/108105064/
3	

	CO-PO Mapping													
	Programme Outcomes (PO)										PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1					3									
CO2					3									
CO3					2									
The stre	The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High													
Each CO	O of the	e course	e must 1	nap to a	at least	one PC	), and p	referab	ly to or	nly one	PO.			

		Assessment								
There are three components of lab assessment, LA1, LA2 and Lab ESE.										
IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%										
Assessment Based on Conducted by Typical Schedule Marks										
	Lab activities,		During Week 1 to Week 8							
LA1	attendance,	Lab Course Faculty	Marks Submission at the end of	30						
	journal		Week 8							
	Lab activities,		During Week 9 to Week 16							
LA2	attendance,	Lab Course Faculty	Marks Submission at the end of	30						
	journal		Week 16							
	Lab activities,	Lab Course Faculty and	During Week 18 to Week 19							
Lab ESE	journal/	External Examiner as	Marks Submission at the end of	40						
	performance	applicable	Week 19							
Weak 1 indicat	as starting weak a	fo competer I ab activities	I ab performance shall include perfo	rming						

		Wal	chand College	e of Engineeri	ng, San	gli	
			(Government Ata	7 <b>2022-23</b>	шие)		
			Course	e Information			
Progr	amme		B.Tech. (Electric	al Engineering)			
Class.	Semester		Second Year B 7	Tech Sem III			
Cours	e Code		6EL253				
Cours	e Name		Analog and Digit	al Circuits Lab			
Desire	d Requisi	tes:	Basic Electronics	Lab			
,	Teaching	Scheme		Examination	Scheme (	Marks)	
Practi	cal	2 Hrs/ Week	LA1	LA2	Lab I	ESE	Total
Intera	ction		30	30	40	)	100
				Cr	edits: 1	I	
		1					
			Cours	se Objectives			
1	This lab	course intends t	o provide basic pra	actical knowledge	of various	ICs for dev	eloping linear
	integrate	d circuits.					
2	It intend	s to impart skills	s to implement diff	erent electronic cir	rcuits usin	g operationa	ll amplifier.
3	It aims to	o develop an abi	ality to simulate and	d implement comb	inational a	and sequenti	al circuits.
At the	end of the	course the stur	e Outcomes (CO) lents will be able to	with Bloom's 1a	xonomy L	ever	
At the		course, the stat		<i>,</i>		Bloom's	Bloom's
СО		Cou	rse Outcome State	ement/s		Taxonomy	y Taxonomy
						Level	Description
<b>CO1</b>	Distingu	ish various anal	og and digital circu	uits.		II	Understanding
CO2	Illustrate	linear integrat	ed circuits using e	electronic component	ents like	Ш	Applying
	Op-amps	s, transistors, etc	). 			TTT	
003	Impleme	nt applications	of various analog a	ind digital circuits.		111	Applying
			ist of Experimen	te / I ab Activition	/Topics		
Listof	l ob Acti	vitios.	List of Experimen	its / Lab Activities	s/ ropics		
1. I	Demonstra	tion of the perfo	ormance of opamp	in inverting, non-i	nverting a	nd buffer co	nfiguration
2. I	mplement	ation of a differ	ence amplifier usin	g operational amp	lifier		
3. I	Design of S	Summing, Avera	aging and Scaling	Amplifier using op	amp		
4. I	mplement	ation of Instrum	entation Amplifier	using opamp	I		
5. 0	Constructio	on of Schmitt Ti	igger using opamp				
6. I	Demonstra	tion of the perfo	ormance of half and	l full wave rectifie	r.		
7. I	Design of a	a first order Acti	ve Low Pass filter	using opamp			
8. I	Design of a	a first order Acti	ve High Pass filter	using opamp			
9. I	Developme	ent of various ty	pes of clippers and	clampers.			
10. U	Jse of op-a	amp as different	iator & integrator.				
	llustration	of op-amp as z	ero crossing detect	or & peak detector			
12.1	Developme	ent of phase shift	ter circuit using op	o-amp.	555		
13. I 14 I	Jomonstra	tion of the D on	d IK flip flop		555		
14. I	mnlement	ation of the circ	uits of decoders an	d multipleyers			
16 F	Experimen	tation of decade	counters	a maniplexers.			
17. I	mplement	ation of Half an	d Full Adder circui	its			
	-r-enterne						
			Т	extbooks			
1	Sergi	o Franco, "De	sign with Op-Am	ps and analog Ir	ntegrated	Circuits", 7	Tata McGraw-Hill
	Publi	cation, Third Ed	lition, 2001	- 0	-		

2	Allen Mottershead, "Electronic Devices & Circuits: An Introduction", Prentice Hall India, 2010
3	A. Anand Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, Fourth Edition, 2014
4	
	References
1	R.A. Gayakwad, "Op-Amps & Linear Integrated Circuits", Prentice Hall India, Fourth Edition, 2012.
2	R. L. Boylestad and Louis Nashelsky, "Electronic Devices & Circuit Theory", Pearson Publications, Tenth Edition, 2009.
3	M. Moris Mano and Michael Ciletti, "Digital Design", Pearson Publications, Fifth Edition, 2013
4	
	Useful Links
1	https://nptel.ac.in/courses/108/102/108102112/
2	https://nptel.ac.in/courses/108/102/108102095/
3	https://nptel.ac.in/courses/108/105/108105132/
4	

	CO-PO Mapping													
	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1				3										
CO2				3										
CO3					3									
The stre	The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High													
Each CO	O of the	e course	e must i	nap to	at least	one PC	), and p	referab	lv to or	nlv one	PO.			

		Assessment								
There are three components of lab assessment, LA1, LA2 and Lab ESE.										
IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%										
Assessment Based on Conducted by Typical Schedule Marks										
	Lab activities,		During Week 1 to Week 8							
LA1	attendance,	Lab Course Faculty	Marks Submission at the end of	30						
	journal		Week 8							
	Lab activities,		During Week 9 to Week 16							
LA2	attendance,	Lab Course Faculty	Marks Submission at the end of	30						
	journal		Week 16							
	Lab activities,	Lab Course Faculty and	During Week 18 to Week 19							
Lab ESE	journal/	External Examiner as	Marks Submission at the end of	40						
	performance	applicable	Week 19							
Week 1 indicat	as starting week o	fa semester I ab activities	I ab performance shall include perfo	rming						

	Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)									
			AY	7 2022-23						
			Cours	e Information						
Progra	amme		B.Tech. (Electric	al Engineering)						
Class.	Semester		Second Year B. 7	Fech., Sem III						
Cours	e Code		6EL254							
Cours	e Name		Simulation Lab							
Desire	d Requisi	tes:	Simulation Lab							
	u nequisi									
r	Feaching	Scheme		Examination	Scheme (	(Marks)				
Practi	ral	2 Hrs/ Week	LA1	LA2	Lahl	ESE		Total		
Intera	ction		30	30				100		
Intera	cuon		50		edits: 2	,		100		
				<u> </u>						
			Cours	se Ohiectives						
	This cou	rse intends to p	ovide basic knowl	edge of MATLAB	<b>FMTP</b> at	nd Mi-Pow	ver s	oftware for		
1	developi	ng modelling ar	d programming te	chniques	, L10111 a		VOI	Software for		
	It intends	s to impart skills	s to implement diff	Ferent tool boxes of	f MATLA	B Simulin	k. N	li-Power and		
2	EMTP fo	or electrical eng	ineering applicatio	n.			,			
		Cours	e Outcomes (CO)	with Bloom's Ta	xonomy L	evel				
At the	end of the	course, the stud	lents will be able to	0,						
СО		Cou	rse Outcome State	ement/s		Bloom's Taxonomy Level		Bloom's Taxonomy Description		
CO1	Grasp th Power si	e basic aspects mulation tools.	of MATLAB prog	gramming, EMPT	and Mi-	II		Understanding		
CO2	Solve sir	nple mathemati	cal equations using	g MATLAB		III		Applying		
CO3	Construc	t MATLAB, EN	MTP and Mi-Powe	r software-based p	rojects.	IV		Analyzing		
				<b>^</b>						
		]	List of Experimen	ts / Lab Activities	s/Topics					
List of	Lab Acti	vities:								
1.	Outline	of MATLAB P	rogramming and C	Computation of ari	thmetic, e	xponential	l, tri	gonometric and		
	complex	form operation	using MATLB pro	ogramming.						
2.	Demonst	trate simple mat	rix and array mani	pulation using MA	TLAB.					
3.	Basic M.	ATLAB Progra	mming using contr	ol structures.						
4.	Develop Outling t	a program for p	muling various gra	ipns ( $2D$ and $5D$ ).						
5.	Modellir	o MAILAD SI	wstems with MAT	IAR						
7.	Introduc	tion to graphical	l user interface of l	EMTP and simulat	ion tools.					
8.	Applicat	ion EMTP in Po	ower System.		1011 000151					
9.	Modellir	ng and simulation	on of power flow di	iagram in EMTP.						
10	. Study of	built-in library	examples of electr	ical engg.with EM	TP.					
11	. To famil	iarize with basi	c function of Mi-Pe	ower window and	toolbars.					
12	. To desig	n single line dia	gram of power sys	stem with Mi-Powe	er.					
	(2.5	1 11. 4 .	T	extbooks	71 5 1 1		<u>C1</u>	· · · · ·		
1	"Moo ,Repr	int :2013	llation using MAT	LAB Simulink", W	/iley Publi	ication, Dr	. Sh	ailendra Jain		
	<u> </u>									
			R	eferences						
1	"Mat Edition	lab programmin on.	ng for Engineers",	, Stephen Chapma	in, Thoms	on Learni	ng	publication, 3rd		

2	"Contemporary linear systems using MATLAB", Robert Strum and Donald Kirk, Thomson
3	"Power System Transient Analysis", Theory and Practice using simulation programs, Power System, Eijchi Haginomori Junichi Arai, WILEY Publication.
4	"User manual" for Mi-Power by PRDC Bangalore.
	Useful Links
1	

	CO-PO Mapping													
	Programme Outcomes (PO)											PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2				1									
CO2	1	2												
CO3			3		2									2
CO4														

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, and preferably to only one PO.

	Assessment										
There are three components of lab assessment, LA1, LA2 and Lab ESE.											
IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%											
Assessment Based on Conducted by Typical Schedule Marks											
	Lab activities,		During Week 1 to Week 8								
LA1	attendance,	Lab Course Faculty	Marks Submission at the end of	30							
	journal		Week 8								
	Lab activities,		During Week 9 to Week 16								
LA2	attendance,	Lab Course Faculty	Marks Submission at the end of	30							
	journal		Week 16								
	Lab activities,	Lab Course Faculty and	During Week 18 to Week 19								
Lab ESE	journal/	External Examiner as	Marks Submission at the end of	40							
	performance applicable		Week 19								
Weak 1 indicat	as starting weak a	fo compostor I ab activition	I ab parformanaa shall inaluda parfa	mina							

# Mandatory Life Skill Courses

		Walc	hand College (Government Aided	of Engineering, San d Autonomous Institute)	gli							
			AY	2022-23								
			Course ]	Information								
Progra	amme		B.Tech. (Electric	al Engineering)								
Class,	Semester		Second Year B. 7	Fech., Sem IV								
Cours	e Code		6IC201									
Cours	e Name		Environmental Second	cience								
Desire	d Requisi	tes:	NIL									
			1									
	Teaching	Scheme		<b>Examination Scheme</b>	(Marks)							
Lectur	re	2 Hrs/week	MSE	ISE	ESE	Total						
Tutori	ial	-	30	20	50	100						
				Credits: -								
			Course	Objectives								
1	Infuse an	understanding	of the various envir	ronmental concepts on scie	entific basis in	the functional						
	Provide a	foundation to c	ritically assess the	approaches to pollution of	ontrol environ	mental and						
2	resource	management, su	istainable developr	nent. cleaner technologies.	Environmenta	al Legislation						
-	based on	an understandir	ig of the fundamen	tal, environmental dimensi	ions							
2	Inculcate	the modern cor	cept of green indu	stry and the impact of exce	ess human pop	ulation,						
3	globaliza	tion, and climat	e change on the en	vironment.								
		Course	Outcomes (CO) w	vith Bloom's Taxonomy I	Level							
At the	end of the	course, the stud	ents will be able to	),	1	1						
GO		C	0 4 04 4		Bloom's	Bloom's						
CO		Cours	Course Outcome Statement/s Taxonomy 7									
	Level De											
<u>C01</u>	Describe	key concent	s of Environmer	ntal science and their	Level	<b>Description</b>						
CO1	Describe	key concepts	s of Environmen	ntal science and their	Level	Description Understandin						
CO1 CO2	Describe relationsl Explain e	key concepts hip to engineerin thical and legal	s of Environmer 1g. responsibility of a	ntal science and their n engineer and his role	II	Description Understandin g Understandin						
CO1 CO2	Describe relationsl Explain e in effecti	key concepts nip to engineerin thical and legal ve implementati	s of Environmer ng. responsibility of a on of sustainable a	ntal science and their n engineer and his role ctivities through EIA	Level II II	Description Understandin g Understandin g						
CO1 CO2	Describe relationsl Explain e in effecti and EMS	key concepts nip to engineerin ethical and legal ve implementati	s of Environmer ng. responsibility of a ton of sustainable a e sector	ntal science and their n engineer and his role activities through EIA	Level II II	Description Understandin g Understandin g						
CO1 CO2 CO3	Describe relationsl Explain e in effecti and EMS Predict	key concepts nip to engineerin ethical and legal ve implementati in the corporate impact of con	s of Environmer ng. responsibility of a on of sustainable a e sector temporary issues	ntal science and their n engineer and his role ctivities through EIA (Population Explosion,	Level II II II	Description Understandin g Understandin g Understandin						
CO1 CO2 CO3	Describe relationsl Explain e in effecti and EMS Predict Climate o	key concepts nip to engineerin ethical and legal ve implementati in the corporate impact of con change, Environ	s of Environmer ng. responsibility of a ton of sustainable a e sector temporary issues mental pollution) of	ntal science and their n engineer and his role ctivities through EIA (Population Explosion, on the environment	Level II II II	Description Understandin g Understandin g Understandin g						
CO1 CO2 CO3	Describe relationsl Explain e in effecti and EMS Predict Climate e	key concepts nip to engineerin ethical and legal ve implementati in the corporate impact of con change, Environ	s of Environmen ng. responsibility of a ion of sustainable a e sector temporary issues mental pollution) of	ntal science and their n engineer and his role ctivities through EIA (Population Explosion, on the environment	Level II II II	Description Understandin g Understandin g Understandin						
CO1 CO2 CO3 Modu	Describe relationsl Explain e in effecti and EMS Predict Climate o	key concepts nip to engineerin ethical and legal ve implementati in the corporate impact of con change, Environ	s of Environmer ng. responsibility of a ion of sustainable a e sector temporary issues mental pollution) of Module (	ntal science and their n engineer and his role ctivities through EIA (Population Explosion, on the environment Contents	Level II II II	Description Understandin g Understandin g Understandin g Hours						
CO1 CO2 CO3 Modu	Describe relationsl Explain e in effecti and EMS Predict Climate o	key concepts nip to engineerin ethical and legal ve implementati in the corporate impact of con change, Environ	s of Environmer ng. responsibility of a ion of sustainable a e sector temporary issues mental pollution) of Module ( gy and Biodiversi bl. and Built, Environmental	ntal science and their n engineer and his role ctivities through EIA (Population Explosion, on the environment Contents ty	Level II II II	Description Understandin g Understandin g Understandin g Hours						
CO1 CO2 CO3 Modu	Describe relationsl Explain e in effecti and EMS Predict Climate o lle Envin Introc defini	key concepts nip to engineerin ethical and legal ve implementati in the corporate impact of con change, Environ	s of Environmen ng. responsibility of a ion of sustainable a e sector temporary issues mental pollution) of <b>Module (</b> gy and Biodiversi al and Built En-	ntal science and their n engineer and his role activities through EIA (Population Explosion, on the environment Contents ty vironment, Environmenta ance Components of the l	Level II II II education:	Description Understandin g Understandin g Understandin g Hours						
CO1 CO2 CO3 Modu	Describe relationsl Explain e in effecti and EMS Predict Climate o le Envin Introo defini Atmo	key concepts nip to engineerin ethical and legal ve implementati in the corporate impact of con change, Environ conment, Ecolo luction: Natura tion, scope, obj	s of Environmer ng. responsibility of a ion of sustainable a e sector temporary issues mental pollution) of <b>Module (</b> gy and Biodiversi al and Built Envectives and import	ntal science and their n engineer and his role ctivities through EIA (Population Explosion, on the environment Contents ty vironment, Environmenta ance, Components of the l and Biosphere	Level II II II II Level II Environment:	Description Understandin g Understandin g Understandin g Hours						
CO1 CO2 CO3 Modu	Describe relationsl Explain e in effecti and EMS Predict Climate o Ile Envin Introc defini Atmo Ecolo	key concepts nip to engineerin ethical and legal ve implementation in the corporate impact of con change, Environ change, Environ comment, Ecolo luction: Natura tion, scope, obj sphere, Hydrosp	s of Environmerng. responsibility of a on of sustainable a e sector temporary issues mental pollution) of <b>Module</b> gy and Biodiversi al and Built Envectives and import phere, Lithosphere n, Types (terrestrial	ntal science and their n engineer and his role ctivities through EIA (Population Explosion, on the environment Contents ty vironment, Environmenta ance, Components of the l and Biosphere.	Level II II II education: Environment: Structure and	Description Understandin g Understandin g Understandin g Hours						
CO1 CO2 CO3 Modu	Describe relationsl Explain e in effecti and EMS Predict Climate o lle Envin Introc defini Atmo Ecolo	key concepts nip to engineerin ethical and legal ve implementati in the corporate impact of con change, Environ conment, Ecolo luction: Natura tion, scope, obj sphere, Hydrosp gy: Introductior on, Trophic le	s of Environmen ng. responsibility of a ion of sustainable a e sector temporary issues mental pollution) of <b>Module (</b> gy and Biodiversi al and Built En- ectives and import phere, Lithosphere n, Types (terrestrial evels, Food chair	ntal science and their n engineer and his role activities through EIA (Population Explosion, on the environment Contents ty vironment, Environmenta ance, Components of the l and Biosphere. and aquatic ecosystems), as, food webs, Ecologic	Level II II II education: Environment: Structure and al pyramids,	Description Understandin g Understandin g Understandin g Hours 7						
CO1 CO2 CO3 Modu	Describe relationsl Explain e in effecti and EMS Predict Climate o Ile Envin Introo defini Atmo Ecolo	key concepts nip to engineerin ethical and legal ve implementati in the corporate impact of con change, Environ change, Environ duction: Natura tion, scope, obj sphere, Hydrosp gy: Introduction on, Trophic le gical succession	s of Environmer ng. responsibility of a ion of sustainable a e sector temporary issues mental pollution) of Module ( gy and Biodiversi al and Built En- ectives and import phere, Lithosphere n, Types (terrestrial evels, Food chair n, Biogeochemical	ntal science and their n engineer and his role activities through EIA (Population Explosion, on the environment Contents ty vironment, Environmenta ance, Components of the l and Biosphere. and aquatic ecosystems), as, food webs, Ecologic cycles.	Level II II II education: Environment: Structure and al pyramids,	Description Understandin g Understandin g Understandin g Hours 7						
CO1 CO2 CO3 Modu	Describe relationsl Explain e in effecti and EMS Predict Climate o lle Envin Introo defini Atmo Ecolo functi Ecolo Biolo	key concepts nip to engineerin ethical and legal ve implementati in the corporate impact of con change, Environ conment, Ecolo luction: Natura tion, scope, obj sphere, Hydrosp ogy: Introductior on, Trophic le ogical succession gical Diversity:	s of Environmenng. responsibility of a to of sustainable a sector temporary issues mental pollution) of <b>Module (</b> gy and Biodiversi al and Built Envectives and imported to the sector such as the sector such as the sector such as the sector	ntal science and their n engineer and his role ctivities through EIA (Population Explosion, on the environment Contents ty vironment, Environmenta ance, Components of the l and Biosphere. and aquatic ecosystems), is, food webs, Ecologic cycles. lue of biodiversity: cons	Level         II         II         II         II         Structure and al pyramids, umptive use,	Description Understandin g Understandin g Understandin g Hours 7						
CO1 CO2 CO3 Modu	Describe relationsl Explain e in effecti and EMS Predict Climate o Ile Envir Introc defini Atmo Ecolo functi Ecolo Biolo Threa	key concepts nip to engineerin ethical and legal ve implementati in the corporate impact of con change, Environ conment, Ecolo luction: Natura tion, scope, obj sphere, Hydrosp gy: Introductior on, Trophic le gical succession gical Diversity:	s of Environmen ng. responsibility of a ion of sustainable a e sector temporary issues mental pollution) of Module ( gy and Biodiversi al and Built Envectives and import phere, Lithosphere h, Types (terrestrial evels, Food chair h, Biogeochemical i Introduction, Va y, Conservation of	ntal science and their n engineer and his role ctivities through EIA (Population Explosion, on the environment Contents ty vironment, Environmenta ance, Components of the l and Biosphere. and aquatic ecosystems), as, food webs, Ecologic cycles. lue of biodiversity: cons biodiversity.	Level         II         II         II         II         II         Structure and al pyramids, umptive use,	Description Understandin g Understandin g Understandin g Hours 7						
CO1 CO2 CO3 Modu	Describe relationsl Explain e in effecti and EMS Predict Climate o Ile Envin Introo defini Atmo Ecolo functi Ecolo Biolo Threa	key concepts nip to engineerin ethical and legal ve implementation in the corporate impact of con- change, Environ change, Env	s of Environmer ng. responsibility of a ion of sustainable a e sector temporary issues mental pollution) of Module ( gy and Biodiversi al and Built Envectives and import phere, Lithosphere h, Types (terrestrial evels, Food chair h, Biogeochemical i Introduction, Va y, Conservation of Energy and Natu	ntal science and their n engineer and his role ctivities through EIA (Population Explosion, on the environment Contents ty vironment, Environmenta ance, Components of the I and Biosphere. and aquatic ecosystems), as, food webs, Ecologic cycles. lue of biodiversity: cons biodiversity. ral Resources	Level II II II II education: Environment: Structure and al pyramids, umptive use,	Description Understandin g Understandin g Understandin g Hours 7						
CO1 CO2 CO3 Modu	Describe relationsl Explain e in effecti and EMS Predict Climate o Ile Envin Introc defini Atmo Ecolo functi Ecolo Biolo Threa	key concepts nip to engineerin ethical and legal ve implementati in the corporate impact of con change, Environ conment, Ecolo luction: Natura tion, scope, obj sphere, Hydrosp gy: Introduction on, Trophic le gical succession gical Diversity: ts to biodiversity an Population, un Population	s of Environmen ng. responsibility of a ion of sustainable a e sector temporary issues mental pollution) of <b>Module (</b> <b>gy and Biodiversi</b> and Built Envi- ectives and import phere, Lithosphere n, Types (terrestrial evels, Food chair n, Biogeochemical : Introduction, Va y, Conservation of <b>Energy and Natu</b> Growth and Envi	ntal science and their n engineer and his role activities through EIA (Population Explosion, on the environment Contents ty vironment, Environmenta ance, Components of the l and Biosphere. and aquatic ecosystems), as, food webs, Ecologic cycles. lue of biodiversity: cons biodiversity. ral Resources ronment: Population Dy	Level         II         II         II         II         II         Structure and al pyramids, umptive use, namics, Age	Description Understandin g Understandin g Understandin g Hours 7						
CO1 CO2 CO3 Modu	Describe relationsl Explain e in effecti and EMS Predict Climate o <b>Ile</b> Envir Introd defini Atmo Ecolo functi Ecolo Biolo Threa Hum Huma struct	key concepts in to engineerin ethical and legal ve implementati in the corporate impact of con- change, Environ conment, Ecolo luction: Natura tion, scope, obj sphere, Hydrosp gy: Introduction on, Trophic le gical succession gical Diversity: ts to biodiversit an Population, ures, by Scenario: Eut	s of Environmer ng. responsibility of a ion of sustainable a e sector temporary issues mental pollution) of Module ( gy and Biodiversi al and Built En- ectives and import phere, Lithosphere h, Types (terrestrial evels, Food chair h, Biogeochemical i Introduction, Va y, Conservation of Energy and Natu Growth and Envir	ntal science and their n engineer and his role activities through EIA (Population Explosion, on the environment Contents ty vironment, Environmenta ance, Components of the l and Biosphere. and aquatic ecosystems), as, food webs, Ecologic cycles. lue of biodiversity: cons biodiversity. ral Resources ronment: Population Dy Energy Demand Utilizati	Level         II         III         III         III         III	Description Understandin g Understandin g Understandin g Hours 7						
CO1 CO2 CO3 Modu	Describe relationsl Explain e in effecti and EMS Predict Climate o Ile Envin Introo defini Atmo Ecolo functi Ecolo Biolo Threa Hum Huma struct Energ	key concepts nip to engineerin ethical and legal ve implementation in the corporate impact of con- change, Environ change, Env	s of Environmer ng. responsibility of a ion of sustainable a e sector temporary issues mental pollution) of Module ( gy and Biodiversi al and Built Envi ectives and import phere, Lithosphere h, Types (terrestrial evels, Food chair h, Biogeochemical : Introduction, Va y, Conservation of Energy and Natu Growth and Envi sure projections of ventional Energy S	ntal science and their n engineer and his role ctivities through EIA (Population Explosion, on the environment Contents ty vironment, Environmenta ance, Components of the I and Biosphere. and aquatic ecosystems), as, food webs, Ecologic cycles. lue of biodiversity: cons biodiversity. ral Resources ronment: Population Dy Energy Demand, Utilizatio Sources and Non- Conventioner	Level         II         III         III         III         III	Description Understandin g Understandin g Hours 7 7						
CO1 CO2 CO3 Modu	Describe relationsl Explain e in effecti and EMS Predict Climate o Ile Envin Introc defini Atmo Ecolo functi Ecolo Biolo Threa Hum Huma struct Energ Energ Sourc	key concepts hip to engineerin ethical and legal ve implementati in the corporate impact of con- change, Environ conment, Ecolo luction: Natura tion, scope, obj sphere, Hydrosp gy: Introduction on, Trophic leagical succession gical S	s of Environmerng. responsibility of a ion of sustainable a e sector temporary issues mental pollution) of <b>Module (</b> gy and Biodiversi al and Built Envi- ectives and import phere, Lithosphere n, Types (terrestrial evels, Food chair n, Biogeochemical a Introduction, Va y, Conservation of Energy and Natu Growth and Envi- uure projections of ventional Energy S ems related to energy S	ntal science and their n engineer and his role ctivities through EIA (Population Explosion, on the environment Contents ty vironment, Environmenta ance, Components of the l and Biosphere. and aquatic ecosystems), as, food webs, Ecologic cycles. lue of biodiversity: cons biodiversity. ral Resources ronment: Population Dy Energy Demand, Utilizatio Sources and Non- Conventingy.	Level         II         III         III         III         III	Description Understandin g Understandin g Hours 7 7						
CO1 CO2 CO3 Modu	Describe relationsl Explain e in effecti and EMS Predict Climate o <b>Ile</b> Envin Introo defini Atmo Ecolo functi Ecolo Biolo Threa Hum Huma struct Energ Energ Sourc Natur	key concepts in to engineerin ethical and legal ve implementati in the corporate impact of con- change, Environ <b>conment, Ecolo</b> luction: Natura tion, scope, obj sphere, Hydrosp gy: Introduction on, Trophic le gical succession gical Diversity: ts to biodiversity an Population, ures, sy Scenario: Fut sy Sources, Con- es, Urban probl al Resources: For-	s of Environmen ng. responsibility of a ion of sustainable a e sector temporary issues mental pollution) of Module ( gy and Biodiversi al and Built Envi- ectives and import phere, Lithosphere h, Types (terrestrial evels, Food chair h, Biogeochemical : Introduction, Va y, Conservation of Energy and Natu Growth and Envi- ure projections of ventional Energy S ems related to ener- pod, Water, Forest,	ntal science and their n engineer and his role activities through EIA (Population Explosion, on the environment Contents ty vironment, Environmenta ance, Components of the I and Biosphere. and aquatic ecosystems), as, food webs, Ecologic cycles. lue of biodiversity: cons biodiversity. ral Resources ronment: Population Dy Energy Demand, Utilizatio Sources and Non- Conventi- gy. Geological, Equitable Use	Level         II         III         III         III         III	Description Understandin g Understandin g Hours 7 5						

III	Climate Change, Environmental Quality and Pollution Control Climate change: Global warming, Ozone depletion, Acid Rain. Environmental Impact: Impact of Modern agriculture on the Environment, Impact of Mining on the Environment, Impact of Large dams on the Environment, Environmental pollution: Air, Water, Soil, Noise, Marine, classification of pollutants, their causes, effects and control measures. Case studies.	5
IV	Solid, Hazardous Waste and Disaster Management Solid and Hazardous waste management: Introduction, categories, causes, effects and management of municipal solid waste, Hazardous waste Disaster Management: Introduction, types of disasters, Disaster mitigation. Case studies	4
V	Social Issues, Environmental Management and Legislation Environmental ethics: Introduction, Ethical responsibility, issues and possible solutions. Environmental Management: Introduction to Environmental Impact Assessment, Environmental Management System: ISO 14001Standard, Environmental Auditing, National and International Environmental protection Agencies pertaining to Environmental Protection. Environmental Legislation: Environmental protection act 1986, Water (prevention and control of pollution) Act 1974, Air (prevention and control of pollution) Act 1981, Wild life Protection Act 1972, and Forest Conservation Act 1980.Municipal Solid Wastes (Management and Handling) Rules, 2000	4
VI	Cleaner technology Restoration Ecology, Role of Information Technology in Environment science, green buildings, green products, Consumerism and Waste Products, Minimization of Hazardous Products, Reuse of Waste, By-products, Rainwater Harvesting, Translocation of trees. Some Success Stories. Case studies	3
	Textbooks	
	Mrinalini Pande, "Disaster Management", Wiley Publications New Delhi, First e	dition, 2014
2	N.K Uberoi, "Environmental Studies", Excel Books Publications New Delhi, firs	t eaition, 2005.
	Doforonoos	
1	William. Cunningham and Barbara Woodworth Saigo, "Environmental Science Concern", WCB/McGraw Hill publication, 5th Edition, 1999.	e: A Global
	Useful Links	
1		

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

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

### Semester- IV Professional Core (Theory) Courses

	Walc	hand College (Government Aided	of Engineering, l Autonomous Institute	<b>San</b>	gli				
		AY	2022-23						
		Course ]	Information						
amme		B.Tech. (Electric	al Engineering)						
Semester		Second Year B. 7	Tech., Sem IV						
e Code		6EL221							
e Name		AC Machines							
d Requisi	tes:	DC Machines and	d Transformer						
		1							
Teaching	Scheme		Examination Sc	heme	(Marks)				
re	3 Hrs/week	MSE	ISE		ESE	Total			
ial		30	20		50	100			
Credits: 3									
		Course	Objectives						
This course	rse intends to pro ous machines.	ovide basic concep	ts of operation and p	erforr	nance of async	chronous and			
It intends	to develop imp	licational skill to o	perate asynchronous	and s	ynchronous m	achines.			
It intends	to develop skill	l to determine perfo	ormance asynchrono	us anc	l synchronous	machines.			
	Course	Outcomes (CO) w	ith Bloom's Taxon	omy I	Level				
end of the	course, the stud	ents will be able to	),						
	Cours	se Outcome Stater	nent/s		Bloom's Taxonomy Level	Bloom's Taxonomy Description			
Explain asynchro	the working p nous and synch	principle, construction	ction and operation	n of	II	Understandin g			
Solve nu	merical on asyn	chronous and syncl	hronous machines.		III	Applying			
Analyse machines	the performation	nce of synchron	ous and asynchro	nous	IV	Analysing			
					<u>.</u>				
le		Module (	Contents			Hours			
Sync Const reacti windi	hronous Generative ruction, Princip on, armature re ng	ator le of operation, EM esistance and react	F equation, leakage ance, field excitation	reacta on sys	nce, armature stem, damper	5			
Sync	hronous Motor								
Meth	od of starting, pl	asor diagram, torq	ue and torque angle o	equation	on, V –curves	6			
and e	xperimental setu	ip, hunting and dar	nping, synchronous	conde	nser.				
b c.	<ul> <li>Construction, analysis base speed equation</li> <li>Slip ring Induspeed control</li> <li>Speed control changing, cas</li> <li>Application a</li> </ul>	, Principle of opera ed on approximate on, speed torque cu action Motor: Effect of motor. I of Induction Mo scading, Injection of and Testing: Testing	tion: Phasor diagram e equivalent circuit rve, t of increase in rotor tor: Change of supp of EMF in secondary g as per I.S.S., Indus	, equi Torc resista oly fre trial a	valent circuit, que equation, ance, starting, equency, pole pplications of	5			
	amme Semester e Code e Name d Requisit Teaching re al This cour synchron It intends It intends It intends It intends It intends It intends It synchron Solve nur Analyse machines interform Solve nur Analyse machines interform Solve nur Analyse machines interform Synchron Solve nur Analyse machines interform Synchron Solve nur Analyse machines interform Synchron Solve nur Analyse machines interform Synchron Solve nur Analyse machines interform Synchron Solve nur Analyse machines interform int	Walc.         amme         Semester         e Code         e Code         a Mane         d Requisites:         Teaching Scheme         re       3 Hrs/week         al          al          al          b       3 Hrs/week         al          This course intends to prosynchronous machines.         It intends to develop imp         It intends to develop skill         Course         end of the course, the stud         Course         Explain the working p         asynchronous and synch         Solve numerical on asynch         Analyse the performat         machines.         It intends to develop imp	Walchand College (Government Aidec         (Government Aidec         Course         Imme       B. Tech. (Electric         Semester       Second Year B. Tech         Course         Course         Course         Course         Course         Teaching Scheme         Course Othachines and         Teaching Scheme         Course         Teaching Scheme         Course Othachines and         Teaching Scheme         Course         This course intends to provide basic concep         synchronous machines.         It intends to develop skill to determine perfor         Course Outcome Stater         Explain the working principle, constructor	Watchand Conlege of Engineering, (Government Aided Autonomous Institute AY 2022-23         Course Information         umme       B. Tech. (Electrical Engineering)         Semester       Second Year B. Tech., Sem IV         e Code       6EL221       e         e Name       AC Machines       d         d Requisites:       DC Machines and Transformer       DC Machines and Transformer         Teaching Scheme       Examination Science         re       3 Hrs/week       MSE       ISE         al        30       20	Walchand College of Engineering, San (Government Aided Autonomous Institute)         AY 2022-23         Course Information         mme       B. Tech. (Electrical Engineering)         Semester       Second Year B. Tech., Sem IV         e Code       GEL221         Examination Scheme         Examination Scheme         Reaching Scheme       Examination Scheme         Course Objectives         Teaching Scheme       Examination Scheme         e       3 Hrs/week       MSE         Iteaching Scheme       Examination Scheme         e       3 Hrs/week       MSE         Iteaching Scheme       Examination Scheme         e       3 Hrs/week       MSE       Iteaching Scheme       Examination Scheme         e       3 Hrs/week       MSE       Iteaching Scheme         Teaching Scheme       Examination Scheme         Spinchronous machines.       It intends to develop implicational skill to operate asynchro	Walchand College of Engineering, Sangu (Government Alded Autonomous Institute)         AY 2022-23         Course Information         mme         B.Tech. (Electrical Engineering)         Semester       Second Year B. Tech., Sem IV         e Code         6EL221         Examination Scheme (Marks)         re       3 Hrs/week       MSE       ISE       ESE         all max/week       MSE       ISE       ESE         Course Objectives         This course intends to provide basic concepts of operation and performance of async synchronous machines.         It intends to develop inplicational skill to operate asynchronous and synchronous mat It intends to develop skill to determine performance asynchronous and synchronous mat It intends to develop skill to determine performance asynchronous and synchronous machines.       Bloom's Taxonomy Level         Explain the working principle, construction and operation of asynchronous and synchronous machines.       III			

	Computations and Classification of Three Phase Induction Motor	
	a. Computations: No load test, Blocked rotor test, and circle diagram,	
	starting and types of starter, ratio of starting torque to full load torque.	
IV	b. Double Cage Induction Motor (D.C.I.M.): Construction, Characteristics	8
	and Equivalent circuit.	
	c. Synchronous Induction Motor: Construction, Circle diagram, Phasor	
	diagram.	
	Single Phase Induction Motor and, Three Phase Motor Winding	
	a. Single Phase Induction Motor: Types, Construction, Principle of	
	operation, phasordiagram, equivalent circuit, Experimental	
V	determination of parameter, application.	8
	b. Three Phase Motor Winding Single layer, double layer, Integral and	
	fractional slot winding, distribution factor, pitch factor, Elimination of	
	harmonics voltage.	
	Synchronous Motor	
VI	Method of starting, phasordiagram, torque and torque angle equation, V –curves	7
	and experimental setup, hunting and damping, synchronous condenser.	
	Textbooks	
1	M. G. Say. "Performance Design of AC Machines", CBS Publishers, 4thEdition,	1976.
2	O. E. Taylor, "Performance Design of AC Commutator Motors", Wheeler I	Publisher, 15th
	Reprint.	
	References	
1	J. Chapman, "Electrical Machine", McGraw Hill, 5th Edition, 2009.	
2	J. B. Gupta, "Electrical Machines", SK Kataria and Sons, 3rd edition, 2011.	
3	Fitzerald and Kingsley,"Electric Machine", Tata McGraw Hill, 2nd Edition, 200	0.
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	Useful Links	
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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	
CO1	3													
CO2	3												3	
CO3				2										3
The stren	gth of r	nappin	g is to b	be writt	ten as 1	: Low,	2: Med	lium, 3	High					
Each CO of the course must map to at least one PO.														

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

		Walc	hand College	of Engineering, Sa	angli					
			(Government Atdea	1  Autonomous Institute						
			Course	2022-23						
Drogre			B Tech (Electric	al Engineering)						
Progra	Somester		D. Tech. (Electric	ai Eiigineeriiig)						
Class,	Semester									
Cours			0EL222	viscion and Distribution						
Cours		4	Electrical Transfr	DC Mashing and Distribution						
Desire	a kequisi	tes:	Electrical Circuit	s, DC Machines and Tra	insformers					
	Taaahina	Sahama		Examination Schor	na (Manka)					
Lootuu	reaching	2 Urg/wool	MCE	Examination Schen	ESE	Total				
Tutor		3 HIS/WEEK		15E 20	<b>ESE</b>	100a				
Tutori	al		50		30	100				
				Credits:	•					
			Course	Objectives						
1	Power sy	stem forms a m	ajor part of electric	al systems. This course	will appraise th	e students about				
	the struct	ture and perform	nance analysis of po	ower systems.						
2.	This cou	rse will develop	analytical skills in	the students for investig	ating issues rel	ated to power				
	systems.				•					
3	This cou	rse will help stu	dents in preparing f	for competitive examination of the place of	tions.					
At the	end of the	course the stud	lents will be able to	ith Bloom's Taxonom						
		course, the stud	ients will be uble to	,	Bloom's	Bloom's				
СО		Cours	se Outcome Stater	nent/s	Taxonomy Level	Taxonomy Description				
CO1	Summar	rize structure and	d performance para	ameters of power system	II II	Understandin				
CO2	Interpre distributi	t the perform on system.	nance of generat	tion, transmission an	d III	Applying				
CO3	Scrutini	ze voltage and p	ower factor contro	ol methods for improvin	g IV	Analyzing				
	performa	ince of transmiss	sion and distributio	on systems						
Modu	10		Madula	Contonta		Uouma				
Moau	le Star	tune of Down	Systems and name	contents	ling	nours				
I	Gene of lin	ration, transmissies, types of cond	sion, distribution as ductors, voltage lev	nd utilization of electric vels, R, L, C parameters	al power, types	6				
П	Mech Elect cover	nanical aspects rical clearances ring of sag, types	of transmission lin , safety norms, Sa s of insulators, supp	nes g calculations, effect of port structures, corona.	f wind and ice	7				
Ш	Transmission line representation and performance calculation         Single Line Diagram (SLD), String Efficiency of insulators, PU quantities, short,         medium and long line models, performance calculations, ABCD constants,         Power Circle Diagram.									
IV	Distr Type UG c	<b>ibution System</b> s of feeders, dis ables for LT and	s and Undergrour stributors, AC and d HT systems.	nd Cables DC distribution system	ns, sub-stations,	6				
v	Volta Meth p.f., e and p	<b>age control and</b> ods of voltage of effects of low p.f. o.f. correction.	<b>Power factor imp</b> control, AVRs, tap f., Shunt capacitors	orovement o changing transformers , calculation of reactive	, causes of low power injection	6				

VI	<b>Economic operation of power systems</b> Basics of Economic load sharing, Incremental fuel cost, Economic dispatch neglecting transmissions losses, penalty factor, General Loss Formula, optimum load dispatch considering transmissions losses.	6
	Textbooks	
1	Ashfaq Husain, Electrical Power Systems, CBS, 5th Edition, 2007.	
2	Glover, Sharma, OverbyePower Systems Analysis and Design, Thompson, 5th E	d., 2012.
	References	
1	Nagrath, Kothari, Modern Power System Analysis, TMH, 2nd Edition, 2015	
2	HadiSaadat, Power System Analysis, TMH, 1st Edition, 2002.	
3	Stevenson W.D., Elements of Power System Analysis, TMH, 4th Edition, 2014.	
4		
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	Useful Links	
1	https://nptel.ac.in/courses/108/105/108105104/	

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

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

### Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

		Walc	hand College (Government Aided	of Engineering, San	gli				
			AY	2022-23					
			Course 1	Information					
Progr	amme		B.Tech. (Electric	al Engineering)					
Class,	Semester		Second Year B. T	Tech., Sem IV					
Cours	e Code		6EL223	,					
Cours	e Name		Power Electronic	S					
Desire	ed Requisi	tes:	Analog and Digit	al Circuits					
	Teaching	Scheme		Examination Scheme	(Marks)				
Lectu	re	3 Hrs/week	MSE	ISE	ESE	Total			
Tutor	ial		30	20	50	100			
				 Credits: 3					
			Course	Ohiectives					
	This cou	rse intends to pr	ovide basic knowle	dge of different power ele	ctronic device	s rectifiers			
1	converter	rs, inverters and	choppers.	age of anterent power ere		s, rectificits,			
2	It is aime	d to impart skill	s of analysis for di	fferent types of converters	such as rectif	iers, controlled			
	converter	rs, inverters and	choppers.						
3	Make the	students acquai	inted with design o	f different types of conver	ters such as re	ctifiers,			
	controlle	d converters, inv	verters, choppers ar	nd their associated control	circuit.				
Atthe	and of the	Course the stud	Outcomes (CO) w	ith Bloom's Taxonomy I	Level				
At the		course, the stud	ents will be able to	,	Bloom's	Bloom's			
CO		Cours	a Outcoma Staton		Toyonomy	Taxonomy			
	O Course Outcome Statement/s Taxonomy Taxono								
		Cours	se Outcome Staten	nent/s	Level	Description			
C01	Describe	the basics of the circuits	semiconductor swo	ritches, rectifier, control p-converter and matrix	Level II	Understand			
CO1	Describe converter converter	the basics of r, inverter, cho c circuits.	semiconductor sw oppers, and cyclo	ritches, rectifier, control p-converter and matrix	Level II	Understand			
CO1 CO2	Describe converter converter Calculate converter	the basics of r, inverter, char r circuits. e the performant r, inverter, char	semiconductor swo oppers, and cyclo nce of semiconductor	ritches, rectifier, control p-converter and matrix octor switches, rectifier, p-converter and matrix	I axonomy Level II III	Description       Understand       Apply			
C01 C02	Describe converter converter Calculate converter converter	the basics of r, inverter, cho r circuits. e the performat r, inverter, cho r circuits.	semiconductor sw oppers, and cycle nce of semicondu oppers, and cycle	ritches, rectifier, control p-converter and matrix octor switches, rectifier, p-converter and matrix	I axonomy Level II III	Description       Understand       Apply			
CO1 CO2 CO3	Describe converter Calculate converter converter Analyze inverter,	the basics of r, inverter, cho r circuits. e the performant r, inverter, cho r circuits. the Power Elec choppers, and c	semiconductor sw oppers, and cycle nce of semicondu oppers, and cycle tronic Circuits suc yclo-converter and	ritches, rectifier, control p-converter and matrix octor switches, rectifier, p-converter and matrix h as rectifier, converter, matrix converter circuits.	II II IV	Description       Understand       Apply       Analyze			
CO1 CO2 CO3	Describe converter Calculate converter Analyze inverter,	the basics of r, inverter, cho r circuits. e the performant r, inverter, cho r circuits. the Power Elec choppers, and cy	semiconductor swappers, and cycle nce of semicondu oppers, and cycle tronic Circuits suc yclo-converter and	ritches, rectifier, control p-converter and matrix actor switches, rectifier, p-converter and matrix h as rectifier, converter, matrix converter circuits.	II II IV	Description         Understand         Apply         Analyze			
CO1 CO2 CO3 Modu	Describe converter Calculate converter converter Analyze inverter,	the basics of r, inverter, che r circuits. e the performat r, inverter, che r circuits. the Power Elec choppers, and c	se Outcome Staten semiconductor sw oppers, and cycle nce of semicondu oppers, and cycle tronic Circuits suc yclo-converter and <b>Module (</b>	ritches, rectifier, control p-converter and matrix octor switches, rectifier, p-converter and matrix h as rectifier, converter, matrix converter circuits.	II II IV	Description       Understand       Apply       Analyze			
CO1 CO2 CO3 Modu	Describe converter Calculate converter converter Analyze inverter,	the basics of r, inverter, cho r circuits. e the performan r, inverter, cho r circuits. the Power Elec choppers, and cy	semiconductor swo oppers, and cyclo oppers, and cyclo tronic Circuits suc yclo-converter and Module ( or Switches:	ritches, rectifier, control p-converter and matrix actor switches, rectifier, p-converter and matrix h as rectifier, converter, matrix converter circuits.	II III IV	Description       Understand       Apply       Analyze       Hours			
CO1 CO2 CO3 Modu	Describe converter Calculate converter Analyze inverter,	the basics of r, inverter, char r circuits. e the performant r, inverter, char r circuits. the Power Elec choppers, and cy er Semiconduct	se Outcome Staten semiconductor sw oppers, and cycle nce of semicondu oppers, and cycle tronic Circuits suc yclo-converter and <u>Module (</u> or Switches: leal switch, V-I (	nent/s ritches, rectifier, control p-converter and matrix ritches, rectifier, p-converter and matrix h as rectifier, converter, matrix converter circuits. Contents	Itexel       II       III       IV	Description       Understand       Apply       Analyze			
CO1 CO2 CO3 Modu	Describe converter Calculate converter converter Analyze inverter,	the basics of r, inverter, cho e the performant r, inverter, cho r circuits. the Power Elec choppers, and cy er Semiconduct acteristics of id ng of power set	semiconductor swappers, and cycle nce of semiconductor oppers, and cycle tronic Circuits suc yclo-converter and <b>Module (</b> or Switches: leal switch, V-I C emiconductor devia	nent/s ritches, rectifier, control p-converter and matrix rictor switches, rectifier, p-converter and matrix h as rectifier, converter, matrix converter circuits. Contents Characteristics, Rating, process such as power diode a driver circuits for thereis	Itaxinomy       Level       II       III       IV   rotection and es, transistor, tor GTO and	Tailonomy         Description         Understand         Apply         Analyze         Hours         6			
CO1 CO2 CO3 Modu	Describe converter Calculate converter Analyze inverter,	the basics of r, inverter, char r circuits. the performant r, inverter, char r circuits. the Power Elect choppers, and cy er Semiconduct acteristics of id ng of power set FET, IGBT and	se Outcome Staten semiconductor sw oppers, and cycle nce of semicondu oppers, and cycle tronic Circuits suc yclo-converter and <u>Module (</u> or Switches: leal switch, V-I C emiconductor devia GTO, Study of the o smart power mod	nent/s ritches, rectifier, control p-converter and matrix ritches, rectifier, p-converter and matrix h as rectifier, converter, matrix converter circuits. Contents Characteristics, Rating, pr ces such as power diode e driver circuits for thyrisi hules. Comparative study	rotection and es, transistor, tor, GTO and of MOSEET	Analyze       6			
CO1 CO2 CO3 Modu	Describe converter Calculate converter converter Analyze inverter, <b>ile</b> Powe Chara coolin MOS IGBT thyris	the basics of r, inverter, che r circuits. e the performant r, inverter, che r circuits. the Power Elec choppers, and cy er Semiconduct acteristics of id ng of power se FET, IGBT and r, Introduction to tor, GTO, BJT a	semiconductor swappers, and cycle nce of semiconductor oppers, and cycle tronic Circuits suc yclo-converter and <b>Module (</b> <b>or Switches:</b> leal switch, V-I C emiconductor devise GTO, Study of the o smart power mod and IGBT.	nent/s ritches, rectifier, control p-converter and matrix ritches, rectifier, p-converter and matrix h as rectifier, converter, matrix converter circuits. Contents Characteristics, Rating, pro- ces such as power diode e driver circuits for thyris- fulles, Comparative study	Itaxonomy         Level         II         III         IV         rotection and es, transistor, tor, GTO and of MOSFET,	Description         Understand         Apply         Analyze         Hours         6			
CO1 CO2 CO3 Modu	Describe converter Calculate converter Analyze inverter, <b>ile</b> Powe Chara coolin MOS IGBT thyris	the basics of r, inverter, cho r circuits. e the performant r, inverter, cho r circuits. the Power Elect choppers, and cy er Semiconduct acteristics of id ng of power set FET, IGBT and r, Introduction to tor, GTO, BJT action e Phase and Th	semiconductor swo oppers, and cyclo oppers, and cyclo oppers, and cyclo tronic Circuits suc yclo-converter and <b>Module (</b> <b>or Switches:</b> leal switch, V-I C emiconductor device GTO, Study of the o smart power mod and IGBT. <b>Tree Phase AC to I</b>	nent/s ritches, rectifier, control p-converter and matrix ritcor switches, rectifier, p-converter and matrix h as rectifier, converter, matrix converter circuits. Contents Contents Characteristics, Rating, process such as power diode e driver circuits for thyrisi- fulles, Comparative study DC rectifiers	rotection and es, transistor, tor, GTO and of MOSFET,	Description       Understand       Apply       Analyze       6			
CO1 CO2 CO3 Modu I	Describe converter Calculate converter Calculate converter Analyze inverter, <b>ile</b> Powe Chara coolin MOS IGBT thyris Singl	the basics of r, inverter, che r circuits. e the performant r, inverter, che r circuits. the Power Elect choppers, and co er Semiconduct acteristics of id ng of power se FET, IGBT and r, Introduction to tot, GTO, BJT a e Phase and The e phase half wa	semiconductor swappers, and cycle nce of semicondu oppers, and cycle tronic Circuits suc yclo-converter and <b>Module (</b> or Switches: leal switch, V-I C emiconductor device GTO, Study of the o smart power mod and IGBT. rree Phase AC to I ye and single-phase	nent/s ritches, rectifier, control p-converter and matrix ritches, rectifier, p-converter and matrix h as rectifier, converter, matrix converter circuits. Contents Characteristics, Rating, pri- ces such as power diode e driver circuits for thyris- fulles, Comparative study DC rectifiers are full wave diode bridge.	Itaxonomy         Level         II         III         IV         rotection and es, transistor, tor, GTO and of MOSFET,         Three phase	Description         Understand         Apply         Analyze         6         6			
CO1 CO2 CO3 Modu	Describe converter Calculate converter Analyze inverter, Analyze inverter, Analyze Singl MOS IGBT thyris Singl half v	the basics of r, inverter, cho r circuits. e the performant r, inverter, cho r circuits. the Power Elect choppers, and cy er Semiconduct acteristics of id ag of power see FET, IGBT and c, Introduction to tor, GTO, BJT action e phase half wat wave and three p	semiconductor swo oppers, and cyclo nce of semicondu oppers, and cyclo tronic Circuits suc yclo-converter and <b>Module (</b> <b>or Switches:</b> leal switch, V-I C emiconductor devia GTO, Study of the o smart power mod and IGBT. <b>tree Phase AC to I</b> ve and single-phase hase full wave dioo	nent/s ritches, rectifier, control p-converter and matrix rector switches, rectifier, p-converter and matrix h as rectifier, converter, matrix converter circuits. Contents Contents Characteristics, Rating, process such as power diode e driver circuits for thyrisi- hules, Comparative study DC rectifiers the full wave diode bridge. Transformer power diode bridge, Transformer power diode	rotection and es, transistor, tor, GTO and of MOSFET, Three phase wer rating for	Description       Understand       Apply       Analyze       6       6			

ш	Phase Controlled AC to DC Converters Classification of converters, Single phase half controlled and fully controlled thyristor converters, three pulse and six pulse controlled converters, operation of converter with freewheeling diode. Effect of source inductance on the performance of the converter, overlap – angle. Performance factors for the converter such as displacement factor, distortion factor, total harmonic distortion, ripple factor and transformer utilization factor. Introduction to 12 pulse converter, single phase and three phase dual converter, firing scheme for 1 phase and three phase converters.	8
IV	DC to DC Converters Control of DC-to-DC converters, step down (buck) converter, Analysis of buck converter with RLE load, step up converter, buck – boost converter, full bridge DC to DC converter, concept of multiphase choppers, cuk converter.	6
V	Switch Mode DC – AC InvertersBasic concepts of switch mode inverters, types: VSI and CSI, single phase halfbridge and full bridge inverter, three phase six step inverter, 1200 mode ofconduction, 1800 mode of conduction, three phase PWM Inverter, sinusoidalPWM and selective harmonics elimination methods of PWM. Effect of blankingtime on output voltage in PWM inverters, auto sequentially commutated CSI,Solar Inverters, Introduction to multilevel inverters.	7
VI	Cycloconverters and Matrix ConverterIntroduction to Single phase and three phase cycloconverters. Working and topologies of Matrix converter, control methods, performance analysis of matrix converter.	6
	Textbooks	
1	M. H. Rashid "Power Electronics, Circuits, Devices and Applications", Pearson 4th Edition, November 2017.	Education Inc.,
2	P. S. Bhimra, "Power Electronics", 3rd Edition, Khanna Publishers, 2002.	
	References	
1	B.K. Bose, "Modern Power Electronics and A.C. Drives", Prentice Hall of Publication, 2002.	India Pvt. Ltd.
2	Mohan, UndelandRobins, "Power Electronics, Converter Applications and Desig and sons (Asia) Pvt. Ltd., 3rd Edition, 2010.	n", John Wiley
3	G. K. Dubey and Others "Thyristorised Power Controller", New Edge Internation 1st Edition Reprint, 2005.	nal Publishers,
	Useful Links	
1	NPTEL lectures on Power Electronics	

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

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

		Walc	hand College (Government Aided	of Engineering, San d Autonomous Institute)	gli		
			AY	2022-23			
			Course 1	Information			
Programme         B.Tech. (Electrical Engineering)							
Class,	Semester		Second Year B. 7	Гесh., Sem IV			
Cours	e Code		6EL224				
Cours	e Name		Signals and Syste	ems			
Desire	ed Requisi	tes:	Engineering Matl	hematics I, II and III			
	Teaching	Scheme		Examination Scheme	(Marks)		
Lectur	re	3 Hrs/week	MSE	ISE	ESE	Total	
Tutor	ial	1	30	20	50	100	
				Credits: 4			
			Course	Objectives			
1	This cour computat	rse intends to pr ional methods,	ovide basic knowle notation, and vocat	edge of theoretical structur bulary of linear models.	e, formal repre	esentation,	
2	It is aime	d to impart skill	ls to perform signal	l analysis with reference to	spectrum ana	lysis of	
3	Imparting	basic knowled	ge of signals and s	vstems analysis.			
	<u> </u>	Course	Outcomes (CO) w	vith Bloom's Taxonomy I	Level		
At the	end of the	course, the stud	ents will be able to	),			
со		Cours	se Outcome Stater	nent/s	Bloom's Taxonomy Level	Bloom's Taxonomy Description	
CO1	<b>Describe</b>	the mathemati ems and applica	cal principles of continues of signal productions	ontinuous time, discrete-	II	Understandin	
CO2	Calculat	e the response	of linear systems	s in time domain using		8	
	various t etc.	ools such as co	nvolution, Laplace	e transform, Z transform	III	Applying	
CO3	Analyse transform	frequency doma	in behaviour of line	ear systems using Fourier	IV	Analysing	
	transform	r teeninques.			1	1	
Modu	ıle		Module (	Contents		Hours	
	Intro	duction to Sign	als and Systems				
I	Conti classi invari	nuous and Disc fication of sign ant, causal, BIE	rete - Introduction, als, systems – repr 80 stable, Static, dy	standard signals, signal resentation, classification, ynamic.	epresentation, Linear, Time	7	
Time Domain Analysis of Continuous and Discrete Time SystemsZero state and Zero input response, Impulse response, Convolution and itsIIproperties, Convolution integral,Convolution sum, Properties of Convolution sum, graphical representation of						7	
III	Four Four Trigo Expon period Prope doma	<b>ier Domain An</b> nometric Four nential form, D dic signals, Fo erties of CFT d in.	alysis of Continuo ier series, Com irichlet Conditions purier Transform uality, time revers	bus Time Signal pact Trigonometric Fo s, Frequency domain repr representation of aperi- bal, Convolution – time a	urier series, resentation of odic signals, nd frequency	7	
IV	Defin and Z	ition, Properties	Analysis of Signal , Solution of different nalysis using Lapla	is and System ential equation. Transfer fu ace Transform.	unction, Poles	6	

v	<b>Fourier Domain Analysis of Discrete Time Signal</b> Representation of CT signals using Samples, Nyquist Sampling Theorem Discrete time Fourier Transform, Representation of aperiodic sequence, Properties of DTFT: time reversal, Linear Convolution – time and frequency domain, conjugate symmetry.	6						
VI	Z- Transform Analysis of Discrete Time Signals and Systems	6						
VI	and Zeroes, System analysis using Z-Transform, FIR, IIR systems.	0						
	Textbooks							
1	A.V. Oppenheim, A.S. Wilsky, S.H. Nawab, "Signals and Systems", 2 <sup>nd</sup> Edition, Prentice Hall 1998.							
2	B. P. Lathi, "Principles of Linear systems and signals, 2 <sup>nd</sup> Edition, Oxford Univers	ity press, 2005.						
	References							
1	M. J. Roberts, "Signals and systems", 3 <sup>rd</sup> Edition, Tata McGraw Hill, 2011.							
2	2 Simon Haykin, Barry Van Veen, "Signals and systems", 2 <sup>nd</sup> Edition, Wiley Publications, 2007.							
	Useful Links							
1								

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: Low, 2: Medium, 3: High													
<b>F</b> 1 CO	0.1					DO							

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

Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)						
AY 2022-23						
Course Information						
Programme	B.Tech. (Electrical Engineering)					
Class, Semester	Second Year B. Tech., Sem IV					
Course Code	6EL225					
Course Name	Electrical Measurement and Instrumentation					
Desired Requisites: Basic Electrical Engineering						

Teaching	Scheme	Examination Scheme (Marks)							
Lecture	3 Hrs/week	MSE	ISE	ESE	Total				
Tutorial		30	20	50	100				
		Credits: 3							

	Course Objectives							
1	This course intends to provide basic concepts of errors in measurements and basic fundamentals of Measuring systems. formal representation, computational methods, notation, and vocabulary of							
	linear models.							
2	It is aimed to impart skills to classify bridges, measuring instruments and equipment's and also							
4	demonstrates digital instruments, advance instruments.							
3	To impart basic knowledge of transducer.							
	Course Outcomes (CO) with Bloom's Taxonomy Level							

At the end of the course, the students will be able to,

СО	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Description
CO1	Grasp fundamental concepts of measurement and identify errors in measurement and its statistics.	Π	Understandin g
CO2	Explain working principle and mechanism of measuring instrument.	Π	Understandin g
CO3	Use a proper measuring instrument and modern techniques for measurement of electrical parameters for given application.	III	Applying
<b>CO4</b>	Implement the instrumentation system for measurement of physical parameters.	III	Applying

Module	Module Contents	Hours
I	<b>Introduction</b> Units, Dimensions and Standards, Structure of Measurement Systems, Instrument Types-Active, Passive, Examples of Laboratory Instruments, Static Characteristics & Dynamic Characteristics of Instruments, Measurement Errors, Sensors and Transducers - Overview, Definition, Classification, Selection Criteria.	6
Π	Measuring Instruments Indicating, Integrating, Recording Instruments, Analog & Digital Ammeter and Voltmeter. Essentials of Indicating Instruments Deflecting, Controlling And Damping Systems. Construction, Working Principle, Torque Equation, Advantages & Disadvantages of Moving Iron (MI) (Attraction And Repulsion), Permanent Magnet Moving Coil (PMMC) & Dynamometer Type Instruments, Range Extension of MI Instruments.	6

III	Measurement of Power and Energy Active And Reactive Power Measurement In Three Phase System for Balanced and Unbalanced Load Using Two Wattmeter Method & One Wattmeter Method. Construction, Working Principle, Torque Equation of Single Phase Conventional (Induction Type) Energy Meter, Calibration of Energy Meter, Digital Energy Meter	6				
IV	Measurement of Electrical Quantities Measurement of Low, Medium and High Resistance, Wheatstone Bridge, Kelvin's Double Bridge, Ammeter-Voltmeter Method, Megger, Earth Tester for Earth Resistance Measurement, Maxwell's Bridge, Hay's Bridge, Anderson's Bridge, Schering Bridge and Wien's Bridge.	6				
V	Measurement of Non-electrical Quantities Force Measurement Using Strain Gauges, Displacement Measurements Using LVDT, Temperature Measurement Using RTD, Thermistor, Thermocouple, Bellows and Diaphragm. Flow Measurement Using Rotameter, Electromagnetic Flow Meter. Speed Measurement Using Magnetic Pick-Up And Photoelectric Pick-Up.	6				
VI	<b>Recent Developments</b> DSO, Power Analyzer, Wave Analyzer, Harmonic Distortion Analyzer, Instrument Transformers, Digital Ammeter & Voltmeter	6				
	Textbooks					
1	Alan Morris "Principles of measurement and instrumentation", Prentice Hall-Inc ISBN: 0134897099.	lia, 2004				
2	A. K. Sawhney, "A Course in Electrical and Electronics Measurement and Ins Dhanapat Rai & Company, New Delhi, reprint, 17th Edition, 2005.	trumentation",				
3	Rangan, Mani and Sharma, "Instrumentation Devices and Systems", Tata McGra Delhi, 2nd Edition.	w Hill, New				
4	Helfrick and Cooper, "Modern Electronic Instrumentation and Measuremen Pearson, 2007	t Techniques"				
5	C. D. Johnson, "Process Control Instrumentation Technology", Pearson Education	n.				
	<b>References</b>					
1	M. A. Baldwin, "Fundamentals of Electrical Measurements", Publication – Lya Ludhiyana.	II Book Depot,				
2	Albert D. Helfric, "Modern Electronics measurement & instruments", PHI Ltd, 2	003.				
3	Doebelin E. O., "Measurement Systems", McGraw Hill Book Co.					
4	Patranabis D, "Sensors and Transducers", Wheeler Publishing Co., Ltd. New De	elhi.				
5	Murthy D. V. S., "Transducers and Instrumentation", Prentice Hall of India Pvt. Ltd., New Delhi.					
1	Useful Links					
1	https://nptel.ac.in/courses/100/103/100103133					
2	elearning vtu ac in/ notel jitg ernet in/					
5						

CO-PO Mapping														
		Programme Outcomes (PO)										PS	50	
	1	1 2 3 4 5 6 7 8 9 10 11 12 1 2									2			
CO1	2													
CO2	2													
CO3					2									
CO4					2									
The strength of mapping is to be written as 1: Low, 2: Medium, 3: High														
Each CO of the course must map to at least one PO.														

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

# **Professional Core (Lab) Courses**

Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)						
AY 2022-23						
Course Information						
Programme	B.Tech. (Electrical Engineering)					
Class, Semester	Second Year B. Tech., Sem IV					
Course Code	6EL271					
Course Name	AC Machines Lab					
Desired Requisites:	Basic Electrical Engineering, DC Machines and Transformers					

Teaching	Scheme	Examination Scheme (Marks)								
Practical	2 Hrs/ Week	LA1	LA2	Lab ESE	Total					
Interaction		30	30	40	100					
		Credits: 1								

	Course Objectives
1	This course intends to demonstrate performance operation of synchronous and asynchronous
1	machines.
2	It intends to develop skills to analyse operation and performance of asynchronous and synchronous
2	machines.
	Course Outcomes (CO) with Bloom's Taxonomy Level

At the	At the end of the course, the students will be able to,							
СО	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Description					
CO1	Demonstrate experiment to verify electrical characteristics and performance of induction and synchronous machines.	III	Applying					
CO2	Analyse performance of induction motors and synchronous machines.	IV	Analysing					
CO3	Estimate appropriate ratings and develop circuit connections for an experiment as a group activity.	IV	Analysing					

### List of Experiments / Lab Activities/Topics

### List of Lab Activities:

- 1. No load and Blocked rotor test on induction motor and performance of I.M. from circle diagram
- 2. Study of A.C. Machines parts.
- 3. Study of Induction motor starters.
- 4. Speed control of Induction Motor
- 5. Parameter calculation of single-phase induction motor from No load and Blocked rotor test
- 6. Determination of voltage regulation of alternator using Synchronous Impedance method.
- 7. Determination of voltage regulation of alternator using MMF method
- 8. Determination of voltage regulation of alternator using Zero power factor method.
- 9. Synchronization of alternator with bus bar
- 10. Parallel operation of alternator.
- 11. V-Curves of Synchronous motor.
- 12. Study of starting method of synchronous motor.

Textbooks							
1	M. G. Say. "Performance Design of AC Machines", CBS Publishers, 3rd Edition.						
2	O. E. Taylor, "Performance Design of AC commutator motors", Wheeler Publisher, 15th Reprint.						
	References						
1	J. Chapman, "Electrical Machine", 3/E, S McGraw Hill.						

2	J. B. Gupta, "Electrical Machines", SK Kataria and Sons, New Delhi.					
3	Fitzerald and Kingsley, "Electric Machine", Tata McGraw Hill.					
4						
Useful Links						
1						

	CO-PO Mapping													
				]	Progra	mme C	Outcom	es (PO	)				PS	<b>50</b>
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3													
CO2		3												
CO3														1
The stre	ngth o	f mappi	ng is to	be wri	tten as	1,2,3; v	where,	: Low,	2: Med	lium, 3	: High			
Each CO	Each CO of the course must map to at least one PO, and preferably to only one PO.													

Assessment								
There are three components of lab assessment, LA1, LA2 and Lab ESE.								
Assessment         Based on         Conducted by         Typical Schedule         Mark								
	Lab activities,		During Week 1 to Week 8					
LA1	attendance,	Lab Course Faculty	Marks Submission at the end of	30				
	journal		Week 8					
	Lab activities,		During Week 9 to Week 16					
LA2	attendance,	Lab Course Faculty	Marks Submission at the end of	30				
	journal		Week 16					
	Lab activities,	Lab Course Faculty and	During Week 18 to Week 19					
Lab ESE	journal/	External Examiner as	Marks Submission at the end of	40				
	performance	applicable	Week 19					
Week 1 indicate	es starting week o	f a semester. Lab activities/	Lab performance shall include perfo	rming				

Walchand College of Engineering, Sangli									
	(Government Aided Autonomous Institute)								
	AY 2022-23								
			Course	e Information					
Progr	amme		B.Tech. (Electrica	al Engineering)					
Class,	Semester		Second Year B. T	ech., Sem IV					
Cours	e Code		6EL272						
Cours	e Name		Electrical Transm	ission and Distribu	tion Lab				
Desire	ed Requisi	tes:	Electrical Circuits	s, DC Machines an	d Transfor	rmers			
	Teaching	Scheme		Examination	Scheme (	Marks)			
Practi	cal	2 Hrs/ Week	LA1	LA2	Lab 1	ESE		Total	
Intera	ction		30	30	4(	)		100	
				Cre	dits: 1				
		1							
			Cours	e Objectives					
1	This labored This labored This labored	pratory course co	overs basic study o	f various component	nts/parts c	of power sy	sten	n, used in	
2	It provide and distr	es hands on skil ibution systems	l to conduct simula	tion studies and an	alyze the	performan	ce of	f transmission	
3	It lays th	e foundation for	conducting higher	· level study in pow	ver system	IS			
		Cours	e Outcomes (CO)	with Bloom's Tax	onomy L	evel			
At the	end of the	course, the stud	lents will be able to	),					
GO		G				Bloom'	S	Bloom's	
CO		Cou	rse Outcome State	ement/s		Taxonon	ny	Taxonomy	
C01	Identify	various compo	ents of nower syst	em and their use		IV		Analysing	
CO2	Estimate	e the performan	nce of transmission	n and distribution	systems	V		Evaluate	
CO3	using simulationsVEvaluateCO3Verify the voltage control and power factor improvement by performing case studiesVEvaluate								

List of Experiments / Lab Activities/Topics

List of Lab Activities:

1. Distinguish various symbols used in representation of electrical power system and draw various symbols.

2. Visit to local substation (33KV) for study of various components used in transmission and distribution.

3. Visit to pole mounted substation and study Single Line Diagram of WCE for study of HT and LT distribution system.

4. Development of the MATLAB program for per unit representation of power system quantities.

5. Modelling of transmission line and performance evaluation using MATLAB/MiPower software3

6. Fabrication of scaled model of insulator string and determination of string efficiency and design calculation of transmission towers.

7. Determination of transmission line performance using Transmission Line Simulator (TLS).

8. Calculation of size and rating of capacitor bank for Power Factor Improvement-Case Study.

9. Verification of voltage control by off load transformer tap changing.

10.Examination of economic dispatch using power world/MiPower/MATLAB simulation

Textbooks

1	Power System Analysis: by Hadi Saadat, McGraw-Hill, International edition, 1999.						
2	2 Glover, Sharma, OverbyePower Systems Analysis and Design, Thompson, 5 <sup>th</sup> Ed., 2012						
3	3 Ashfaq Husain, Electrical Power Systems, CBS, 5 <sup>th</sup> Edition, 2007						
	References						
1	Nagrath, Kothari, Modern Power System Analysis, TMH, 2nd Edition, 2015						
Useful Links							
1	Computer Usage / Lab Tool: MATLAB/TLS/Power world/MiPower Simulator						

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

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, and preferably to only one PO.

Assessment									
There are three components of lab assessment, LA1, LA2 and Lab ESE.									
IMP: Lab ESE is	IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%								
Assessment	Based on	Conducted by	Typical Schedule	Marks					
	Lab activities,		During Week 1 to Week 8						
LA1	attendance,	Lab Course Faculty	Marks Submission at the end of	30					
	journal		Week 8						
	Lab activities,		During Week 9 to Week 16						
LA2	attendance,	Lab Course Faculty	Marks Submission at the end of	30					
	journal		Week 16						
	Lab activities,	Lab Course Faculty and	During Week 18 to Week 19						
Lab ESE	journal/	External Examiner as	Marks Submission at the end of	40					
	performance	applicable	Week 19						
Week 1 indicates	starting week of	a semester. Lab activities/L	ab performance shall include perform	ning					

	Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)								
	AY 2022-23								
	Course Information								
Progra	amme		B.Tech. (Electrica	al Engineering)					
Class,	Semester		Second Year B. T	ech., Sem IV					
Cours	e Code		6EL273						
Cours	e Name		Power Electronic	s Lab					
Desire	ed Requisi	tes:	Analog and Digit	al Circuits					
,	Teaching	Scheme		Examination S	Scheme (	Marks)			
Practi	cal	2 Hrs/ Week	LA1	LA2	Lab	ESE	Total		
Intera	ction		30	30	40	) (	100		
				Cre	dits: 1	<sup>1</sup>			
			·						
			Cours	e Objectives					
1	This cou	rse intends to pr	ovide the practical	knowledge of diffe	rent pow	er electronics	devices.		
2	It is aime	ed to impart skil entation.	ls of working of di	fferent power electr	onic conv	verter throug	n simulation and		
3	Make the	e students acqua	inted with simulati	on, analysis and de	sign of po	ower electron	ic converters.		
		Cours	e Outcomes (CO)	with Bloom's Tax	onomy L	evel			
At the	end of the	course, the stud	lents will be able to	),					
со		Cou	rse Outcome State	ement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Description			
CO1	CO1 Demonstrate experiments on basics of converters such as rectifier, III Applying								
CO2	Construc Chopper	t different type with their contr	s of converters suc	th as rectifier, inve simulation.	rter and	IV	Analysing		
CO3	Measure the performance of converters such as rectifier, inverter, and Chopper.       V       Evaluate								

List of Experiments / Lab Activities/Topics

### List of Lab Activities:

- 1. Verify the Voltage and current relationship in 3 phase full wave diode bridge rectifier and evaluate the input current harmonic spectrum.
- 2. Evaluate the load side performance of single-phase full wave half control converter.
- 3. Evaluate the load side performance of single-phase full wave full control converter.
- 4. Evaluate the load side performance of three phase full wave half-controlled converter.
- 5. Evaluate the load side performance of three phase full wave full controlled converter.
- 6. Develop the firing angle control scheme for single phase full wave, half controlled and full controlled converters.
- 7. Develop the firing angle control scheme for three phase full wave half-controlled converter.
- 8. Develop the firing angle control scheme for three phase full wave full controlled converter.
- 9. Evaluate the performance of MOSFET based buck converter.
- 10. Evaluate the performance of MOSFET based boost converter.
- 11. Develop the control circuit for single phase PWM Inverter.
- **12**. Develop the control circuit for three phase square wave Inverter.

### Textbooks

1	M.H.Rashid "Power Electronics, Circuits, Devices and Applications", Pearson Education Inc., 4th Edition, November 2017.								
2	P. S. Bhimra, "Power Electronics", 3rd Edition, Khanna Publishers, 2002.								
	References								
1	B.K. Bose, "Modern Power Electronics and A.C. Drives", Prentice Hall of India Pvt. Ltd. Publication, 2002.								
2	Mohan, Undeland and Robins, "Power Electronics, Converter Applications and Design", John Wiley and sons (Asia) Pvt. Ltd., 3rd Edition, 2010.								
3	G. K. Dubey and Others "Thyristorised Power Controller", New Edge International Publishers, 1st Edition Reprint, 2005.								
	Useful Links								
1									

CO-PO Mapping														
	Programme Outcomes (PO) P											PS	50	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1				3					2					
CO2					3									
CO3				3					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, and preferably to only one PO.													

Assessment										
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%										
Assessment	Based on	Conducted by	Typical Schedule	Marks						
	Lab activities,		During Week 1 to Week 8							
LA1	attendance,	Lab Course Faculty	Marks Submission at the end of	30						
	journal		Week 8							
	Lab activities,		During Week 9 to Week 16							
LA2	attendance,	Lab Course Faculty	Marks Submission at the end of	30						
	journal		Week 16							
	Lab activities,	Lab Course Faculty and	During Week 18 to Week 19							
Lab ESE	journal/	External Examiner as	Marks Submission at the end of	40						
	performance	applicable	Week 19							
Week 1 indicate	es starting week o	f a semester. Lab activities/	Lab performance shall include perfo	orming						
experiments m	ini-project preser	ntations drawings program	ming and other suitable activities a	s ner the						

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 and related activities if any.

		Wal	<b>chand Colleg</b> (Government Aid	e of Engineeri led Autonomous Inst	ng, San	gli			
			AY	Y 2022-23					
			Cours	e Information					
Programme         B.Tech. (Electrical Engineering)									
Class,	Semester		Second Year B. 7	Fech., Sem IV					
Cours	e Code		6EL275						
Cours	e Name		Electrical Measur	rement and Instrum	entation				
Desire	ed Requisi	tes:	Basic Electrical H	Engineering					
			1						
,	Teaching	Scheme		Examination	Scheme (	(Marks)			
Practi	cal	2 Hrs/ Week	LA1	LA2	Lab I	ESE	Total		
Intera	ction	-	30	30	40	)	100		
				Cre	edits: 1	· · ·			
			Cours	se Objectives					
1	This courses and systems,	rse explain and pointer, shunts,	physically identify multipliers etc. of	the parts like mov different types of	ing coil, c deflection	ontrol system systems.	, damping		
2	It aims to quantitie	o develop an abi s.	ility to select and in	mplement various b	oridges for	r measuring e	lectrical		
3	It aims to non-elect	o recognize vari trical quantities.	ous transducers an	d use them in the n	neasureme	ent of various	electrical and		
4	It intends	s to develop skil	lls for measuremen	t and instrumentati	on system	1.			
		Cours	e Outcomes (CO)	with Bloom's Tay	konomy L	level			
At the	end of the	course, the stud	dents will be able t	0,					
CO     Course Outcome Statement/s     Bloom's     Bloo       Level     Descr									
CO1	Explain their cha	the principles an racteristics, limit	nd operation of var itations.	ious measurement	devices,	II	Understanding		
<b>CO2</b>	Execute	measurement of	ridges.	III	Applying				

CO2	Execute measurement of electrical parameters using various bridges.	III	Applying
CO3	Apply proper method, sensors and transducers for specific applications and measurement.	III	Applying
CO4	Explain the principles and operation of various measurement devices, their characteristics, limitations.	Π	Understanding

### List of Experiments / Lab Activities/Topics

### List of Lab Activities:

- 1. Study of Moving iron, PMMC and Dynamometer type instruments (Basic moving systems)
- 2. Measurement of power in three phase balanced and unbalanced circuits by conventional two wattmeter method.
- 3. Calibration of Single-phase energy meter for energy measurement
- 4. Measurement of R, L and C Using Different Bridges and confirmation with analytical calculations.
- 5. Measurement of temperature using RTD
- 6. Comparative study of temperature measurement using RTD and thermocouple
- 7. Study of strain gauge and measurement of force using it
- 8. Study of construction of LVDT and measurement of displacement, force and pressure by using it.
- 9. Measurement of Light intensity using Lux-meter and to realize the light intensity distribution with change in distance.
- 10. Speed measurement using photoelectric pick up, magnetic pick up and stroboscope.

### Textbooks

1	Alan Morris "Principles of measurement and instrumentation", Prentice Hall- India, 2004 ISBN: 0134897099.							
2	A. K. Sawhney, "A Course in Electrical and Electronics Measurement and Instrumentation", Dhanapat Rai & Company, New Delhi, reprint, 17th Edition, 2005.							
3	Rangan, Mani and Sharma, "Instrumentation Devices and Systems", Tata McGraw Hill, New Delhi, 2nd Edition.							
4	C. D. Johnson, "Process Control Instrumentation Technology", Pearson Education.							
References								
1	Albert D. Helfric, "Modern Electronics measurement & instruments", PHI Ltd, 2003.							
2	Doebelin, E. O., "Measurement Systems", McGraw Hill Book Co.							
3	Patranabis, D," Sensors and Transducers", Wheeler Publishing Co., Ltd. New Delhi.							
4	Murthy, D. V. S., "Transducers and Instrumentation", Prentice Hall of India Pvt. Ltd., New Delhi.							
	Useful Links							
1	https://nptel.ac.in/courses/108/105/108105153							
2	https://nptel.ac.in/courses/108/105/108105064							

CO-PO Mapping														
		Programme Outcomes (PO)											PS	50
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1					2									
CO2					3									
CO3					3									
CO4														
The stre	Γhe 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, and preferably to only one PO.

Assessment											
There are three components of lab assessment, LA1, LA2 and Lab ESE.											
is a separate head	of passing.(min 40 %), LA	1+LA2 should be min 40%									
Assessment Based on Conducted by Typical Schedule Marks											
Lab activities,		During Week 1 to Week 8									
attendance,	Lab Course Faculty	Marks Submission at the end of	30								
journal		Week 8									
Lab activities,		During Week 9 to Week 16									
attendance,	Lab Course Faculty	Marks Submission at the end of	30								
journal		Week 16									
Lab activities,	Lab Course Faculty and	During Week 18 to Week 19									
journal/	External Examiner as	Marks Submission at the end of	40								
performance	applicable	Week 19									
	components of la is a separate head <b>Based on</b> Lab activities, attendance, journal Lab activities, attendance, journal Lab activities, journal/ performance	Assessmentcomponents of lab assessment, LA1, LA2 aris a separate head of passing.(min 40 %), LABased onConducted byLab activities, journalLab Course FacultyLab activities, attendance, journalLab Course FacultyLab activities, attendance, journalLab Course FacultyLab activities, journalLab Course FacultyLab activities, journalLab Course Faculty andLab activities, journalLab Course Faculty andperformanceapplicable	Assessmentcomponents of lab assessment, LA1, LA2 and Lab ESE.is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%Based onConducted byTypical ScheduleLab activities, journalLab Course FacultyDuring Week 1 to Week 8Lab activities, journalLab Course FacultyMarks Submission at the end of Week 8Lab activities, journalLab Course FacultyDuring Week 9 to Week 16Lab activities, journalLab Course Faculty and External Examiner as applicableDuring Week 18 to Week 19								