

# **Criterion 1 – Curricular Aspects**

Key Indicator	1.1	Curriculum Design and Development
Metric	1.1.3	Average percentage of courses having focus on employability/
		entrepreneurship/ skill development offered by Electrical and
		Electronics Engineering.

# DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

# SYLLABUS COPY OF THE COURSES HIGHLIGHTING THE FOCUS ON EMPLOYABILITY/ ENTREPRENEURSHIP/ SKILL DEVELOPMENT

# 1. List of courses for the programmes in order of

S. No.	Programme Name
i.	Bachelor of Technology(Electrical and Electronics Engineering)(Full Time)
ii.	Bachelor of Technology(Electrical and Electronics Engineering)(Part Time)

2. Syllabus of the courses as per the list.

Legend :	Words highlighted with Blue Color
	Words highlighted with Red Color
	Words highlighted with Purple Color

- Entrepreneurship
- Employability
- Skill Development

# 1. List of Courses

Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of introduction	
B.Tech. EEE – FT Calculus and Linear Algebra	XMA101	B.Tech. EEE	****	2007-08	
Environmental Sciences	XES102	B.Tech. EEE	<b>Employability</b> -Quiz, Test, Assignment Seminar, Group Discussion	2013-14	
Electrical and Electronics Engineering Systems	XBE103	B.Tech. EEE	Entrepreneurship- Assignment, Seminar Poster Presentation	2007-08	
Applied Physics for Engineers	XAP104	B.Tech. EEE	Entrepreneurship- Assignment, Seminar Poster Presentation	2007-08	
Engineering Graphics	XEG105	B.Tech. EEE	<b>Employability-</b> Drawing Assignment, Model Making	2007-08	
Electrical Circuit Analysis	XEE301	B.Tech. EEE	Employability-Quiz, Test, Problem Solving Assignment	2007-08	
Analog Electronics	XEE302	B.Tech. EEE	<b>Employability</b> -Assignment, Test, Seminar	2007-08	
Electrical Machines - I	XEE303	B.Tech. EEE	<b>Employability</b> -Quiz, Test, Problem Solving Assignment	2007-08	
Electromagnetic Fields	XEE304	B.Tech. EEE	<b>Employability</b> -Quiz, Test, Problem Solving Assignment	2007-08	
Transmission and Distribution	XEE305	B.Tech. EEE	Employability-Assignment, Test, Seminar	2007-08	
In-plant Training - I	XEE306	B.Tech. EEE	<b>Employability</b> -Industrial visit, Viva Voce	2007-08	
Power Systems - I (Apparatus and Modelling)	XEE501	B.Tech. EEE	Employability-Quiz, Test, Problem Solving Assignment	2007-08	
Control Systems	XEE502	B.Tech. EEE	<b>Employability</b> -Quiz, Test, Problem Solving Assignment	2007-08	
Microprocessors and Microcontrollers	XEE503	B.Tech. EEE	<b>Employability</b> -Assignment, Test, Seminar	2007-08	
Professional Elective - 1 (Protection and Switchgear)	XEEE11	B.Tech. EEE	<b>Employability</b> -Quiz, Test, Problem Solving Assignment	2007-08	

Open Elective - 1	X** OE*	B.Tech. EEE	****	2007-08	
Constitution of India	XUM506	B.Tech. EEE	Skill Development- Quiz, Test, Assignment Seminar	2007-08	
In-plant Training - II	XEE507	B.Tech. EEE	<b>Employability</b> -Industrial visit, Viva Voce	2015-16	
Minor Course - I	XEEM01	B.Tech. EEE	Employability-Test	2019-20	
Open Elective – II	X**OE*	B.Tech. EEE	****	2013-14	
Microprocessor and Microcontrollers	XEE702	B.Tech. EEE	<b>Employability</b> -Assignment, test, Seminar	2007-08	
Measurement and Instrumentation	XEE703	B.Tech. EEE	<b>Employability</b> -Quiz, Test, Problem Solving Assignment	2007-08	
Bio-Medical Instrumentation	XEEE31	B.Tech. EEE	<b>Employability</b> -Assignment, test, Seminar	2013-14	
Special Electrical Machines	XEEE41	B.Tech. EEE	<b>Employability</b> -Assignment, test, Seminar	2013-14	
Cyber Security	XUM706	B.Tech. EEE	<b>Employability</b> -Assignment, test, Seminar	2013-14	
Project Phase – I	XEE707	B.Tech. EEE	<b>Employability</b> -Presentation, Viva Voce	2013-14	
Career Development Skills	XGS708	B.Tech. EEE	Skill Development- Presentation, Mock Interviews Group Discussion	2015-16	
In-plant Training – III	XEE709	B.Tech. EEE	<b>Employability</b> -Industrial visit, Viva Voce	2007-08	
Minor Course - II	XEEM02	B.Tech. EEE	Employability-Test	2019-20	
Calculus, Ordinary Differential Equations and Complex Variable	XMA201	B.Tech. EEE	****	2007-08	
Programming for Problem Solving	XCP202	B.Tech. EEE	<b>Entrepreneurship-</b> Test, Assignment, Problem Solving Exercises	2018-19	
English	XGS203	B.Tech. EEE	Skill Development- Vocabulary Building Exercises Interactive Practice Sessions, Writing Practices	2018-19	
Applied Chemistry for Engineers	XAC204	B.Tech. EEE	<b>Employability</b> -Test, Assignment, Seminar, Poster Presentation	2007-08	
Workshop Practices	XWP205	B.Tech. EEE	<b>Entrepreneurship-</b> Machining Processes, Model Making	2007-08	
Mathematics - III	XPS401	B.Tech. EEE	****	2007-08	

(Probability and Statistics)				
Digital Electronics	XEE402	B.Tech. EEE	<b>Employability</b> -Quiz, Test, Problem Solving Assignment	2007-08
Power Electronics	XEE403	B.Tech. EEE	<b>Employability</b> -Assignment, test, Seminar	2007-08
Electrical Machines - II	XEE404	B.Tech. EEE	<b>Employability</b> -Quiz, Test, Problem Solving Assignment	2007-08
Entrepreneurship Development	XUM405	B.Tech. EEE	<b>Entrepreneurship-</b> Quiz, Test, Assignment Seminar, Group Discussion	2013-14
Signals and Systems	XEE406	B.Tech. EEE	<b>Employability</b> -Quiz, Test, Problem Solving Assignment	2018-19
Economics for Engineers	XUM601	B.Tech. EEE	****	2013-14
Power Systems - II (Operation and Control)	XEE602	B.Tech. EEE	<b>Employability</b> -Assignment, test, Seminar	2007-08
Measurement and Instrumentation	XEEE21	B.Tech. EEE	<b>Employability</b> -Assignment, test, Seminar	2007-08
Industrial Automation	XEEE31	B.Tech. EEE	<b>Employability</b> -Quiz, Test, Problem Solving Assignment	2007-08
Open Elective - 2	X**OE*	B.Tech. EEE	****	2013-14
Disaster Management	XUM606	B.Tech. EEE	<b>Employability</b> -Assignment, test, Seminar	2015-16
Minor Course - II	XEEM02	B.Tech. EEE	Employability-Test	2019-20
Open Elective – III	X**OE*	B.Tech. EEE	****	2013-14
Electric Vehicles and Power Management	XEEE51	B.Tech. EEE	<b>Employability</b> -Assignment, test, Seminar	2013-14
High Voltage Engineering	XEEE61	B.Tech. EEE	<b>Employability</b> -Assignment, test, Seminar	2013-14
Project Phase – II	XEE804	B.Tech. EEE	<b>Employability</b> -Presentation, Viva Voce	2013-14
Minor Course - III	XEEM03	B.Tech. EEE	Employability-Test	2019-20

B.Tech. EEE – PT				
Calculus and Linear Algebra	PMA 101	B.Tech. EEE	****	2007-08
Applied Physics for Engineers	PAP 102	B.Tech. EEE	Entrepreneurship- Assignment, Test, Seminar	2007-08
Applied Chemistry for Engineers	PAC 103	B.Tech. EEE	Entrepreneurship- Assignment, Test, Seminar	2007-08

Electrical Circuit Analysis	PEE 104	B.Tech. EEE	<b>Employability</b> -Quiz, Test, Assignment, Mini Project, Viva Voce	2007-08
Transmission and Distribution	PEE 301	B.Tech. EEE	<b>Employability</b> -Assignment, test, Seminar	2007-08
Environmental Sciences	PEE 302	B.Tech. EEE	Entrepreneurship-Test, Assignment, Seminar	2007-08
Signals and Systems	PEE 303	B.Tech. EEE	<b>Employability</b> -Quiz, Test, Problem Solving Assignment	2018-19
Electrical Machines-II	PEE 304	B.Tech. EEE	<b>Employability</b> -Quiz, Test, Assignment, Mini Project, Viva Voce	2007-08
Protection & Switchgear	PEE 501	B.Tech. EEE	<b>Employability</b> -Assignment, test, Seminar	2007-08
Elective – 1 (Digital Logic Circuits)	PEE E11	B.Tech. EEE	<b>Employability</b> -Assignment, test, Seminar	2007-08
Industrial Economics and Foreign Trade	PEE 503	B.Tech. EEE	<b>Employability</b> -Assignment, test, Seminar	2007-08
Power Electronics	PEE 504	B.Tech. EEE	<b>Employability</b> -Quiz, Test, Assignment, Mini Project, Viva Voce	2007-08
Electric Vehicles and Power Management	PEE 701	B.Tech. EEE	<b>Employability</b> -Assignment, test, Seminar	2015-16
Power System Operation and Control	PEE 702	B.Tech. EEE	<b>Employability</b> -Assignment, test, Seminar	2007-08
Elective – 3 (Cyber Security)	PEE E31	B.Tech. EEE	<b>Employability</b> -Assignment, test, Seminar	2007-08
Major Project	PEE 704	B.Tech. EEE	<b>Employability</b> -Presentation, Viva Voce	2007-08
Calculus, Ordinary Differential Equations and Complex Variable	PMA 201	B.Tech. EEE	****	2007-08
Electromagnetic Fields	PEE 202	B.Tech. EEE	<b>Employability</b> -Quiz, Test, Problem Solving Assignment	2007-08
Analog Electronics	PEE 203	B.Tech. EEE	<b>Employability</b> -Assignment, test, Seminar	2007-08
Electrical Machines-I	PEE 204	B.Tech. EEE	<b>Employability</b> -Quiz, Test, Problem Solving Assignment, Mini Project, Viva Voce	2007-08
Digital Electronics	PEE 401	B.Tech. EEE	<b>Employability</b> -Quiz, Test, Problem Solving Assignment	2007-08
Professional Elective- 1(Computer Architecture)	PEE E14	B.Tech. EEE	Employability-Assignment, Test, Seminar	2007-08
Professional Elective- 2(High Voltage	PEE E21	B.Tech. EEE	<b>Employability</b> -Assignment, Test, Seminar	2007-08

Engineering)				
Power Electronics	PEE 404	B.Tech. EEE	<b>Employability</b> -Quiz, Test, Assignment, Mini Project, Viva Voce	2007-08
Elective – 2 (Microprocessors and Microcontrollers)	PEE E26	B.Tech. EEE	Employability-Assignment, Test, Seminar	2007-08
E-Waste Management	PEE 602	B.Tech. EEE	<b>Employability</b> -Quiz, Test, Problem Solving Assignment	2015-16
Disaster Management	PEE 603	B.Tech. EEE	<b>Employability</b> -Assignment, Test, Seminar	2015-16
Measurements and Instrumentation	PEE 604	B.Tech. EEE	<b>Employability</b> -Quiz, Test, Assignment, Mini Project, Viva Voce	2007-08

# SEMESTER I

COU	RSE C	ODE	ODE COURSE NAME			Т	Р	С
X	KMA10	1					0	4
С	Р	Α	CALCULUS AND LINEAR ALGEBR	A	L	Τ	Р	Н
3	0.5	0.5			3	1	0	4
PREI	REQUI	SITE:	Differentiation and Integration					
Cour	se Outo	comes	(XMA 101):	Dom	ain		Leve	el
C01		•	gonal transformation to reduce quadratic form forms.	Cognitiv	ve	Remembering Applying		
CO2	2 Apply power series to tests the convergence of the sequences and series. Half range Fourier sine and cosine series.			Cognitive Psychomotor		Applying Remembering Guided Response		ring
CO3			ivative of composite functions and implicit uler's theorem and Jacobian	Cognitiv Psychon		Guid	embe led oonse	ring
CO4	<b>Explain</b> the functions of two variables by Taylors expansion, by finding maxima and minima with and without constraints using Lagrangian Method. Directional derivatives, Gradient, Curl and Divergence.		Cognitiv Affectiv		Unde	embe erstan eiving	ding	
CO5			rential and Integral calculus to notions of nd to improper integrals.	Cognitiv	/e	App	lying	

	•			
UNIT -I: MATRICES	9+3			
Linear Transformation - Eigen values and Eigen vectors -Properties of Eigen values and Eigen vectors - Cayley-Hamilton Theorem – Diagonalisation of Matrices – Real Matrices: Symmetric - Skew- Symmetric and Orthogonal Quadratic form – canonical form - Nature of Quadratic form and Transformation of Quadratic form to Canonical form (Orthogonal only).				
UNIT- II: SEQUENCES AND SERIES	9+3			
Sequences: Definition and examples-Series: Types and convergence- Series of positive terms – Tests of convergence: Comparison test, Integral test and D'Alembert's ratio test Fourier series: Half range sine and cosine series- Parseval's Theorem.				
UNIT- III: MULTIVARIABLE CALCULUS: PARTIAL DIFFERENTIATION	9+3			
Limit and continuity –Partial differentiation – Total Derivative – Partial differentiation of Functions: Change of Variables – Differentiation of an Implicit Function - Euler's Theor	-			
UNIT-IV: MULTIVARIABLE CALCULUS: MAXIMA AND MINIMA AND VECTOR CALCULUS	9+3			
Taylor's theorem for function of Two variables- Maxima, Minima of functions of two va and without constraints - Lagrange's Method of Undetermined Multipliers – Directional Gradient, Divergence and Curl.				
UNIT-V: DIFFERENTIAL AND INTEGRAL CALCULUS	9+3			
Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma their properties; Applications of definite integrals to evaluate surface areas and volumes				

revolutions.

LECTURE	TUTORIAL	TOTAL
45	15	60

#### **TEXT BOOKS**

- 1. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill New Delhi, 11th Reprint, 2015. (Unit-1, Unit-3 and Unit-4).
- 2. N.P. Bali and Manish Goyal, "A text book of Engineering Mathematics", Laxmi Publications, Reprint, 2014. (Unit-2).
- 3. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 40th Edition, 2010. (Unit-5).

#### **REFERENCE BOOKS**

- 1. G.B. Thomas and R.L. Finney, "Calculus and Analytic geometry", 9th Edition, Pearson Reprint, 2002.
- 2. Veerarajan T., "Engineering Mathematics for first year", Tata McGraw-Hill, New Delhi, 2008.
- 3. D. Poole, "Linear Algebra: A Modern Introduction", 2<sup>nd</sup> Edition, Brooks/Cole, 2005.
- 4. Erwin kreyszig, "Advanced Engineering Mathematics", 9th Edition, John Wiley & Sons,2006.

#### Mapping of COs with GAs

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	<b>GA11</b>	GA12
CO 1	3	2			2					1		2
CO 2	3	2								1		1
CO 3	3	2								1		1
CO 4	3	2								1		1
CO 5	3	2			1					1		2
Total	15	10	0	0	3	0	0	0	0	5	0	7
Scaled Value	3	2			1					1		2

 $1-5 \rightarrow 1, 6-10 \rightarrow 2, 11-15 \rightarrow 3$ 

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COURSE COD	E	COL	JRSE NAME		T	SS	P	C									
XES 102				0	0 T	0	0 D	0									
C:P: A 1.4: 0.3: 0.3		EINVIKUINIV	IENTAL SCIENCES		<u> </u>	<b>SS</b> 0	P 0	<u>Н</u> 3									
Course Outcom		(102).		3	Dom		Le	-									
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CO1 Descr		0	of natural resources	and <b>explair</b>	Cogni	tive	Reme										
		<u>e impacts.</u>	cosystem, biodiversity	and natural and	Cogni	tivo	Under	rstand									
		0	ing ecological balance.	and natural geo		live	Under	Istand									
Idon			ices, preventive meas	ures of major	· Cogni	tive	Reme	mber									
	•	l <b>recognize</b> the disa	· •	ares or major	Affect		Recei										
Fynl			licy dynamics and prac	tice the contro				rstand									
		-	tainable development.				Apply										
<b>Recognize</b> the impact of population and the concept of various welfare Cognitive Understand																	
CO5programs, and apply the modern technology towards environmentalAnalysis																	
protection.																	
UNIT – I: INTRODUCTION TO ENVIRONMENTAL STUDIES AND ENERGY 12																	
Definition, scope	and in	portance – Need f	for public awareness -	Forest resource	es: Use,	defore	estation	, case									
studies Water	resource	es: Use and over-ut	ilization of surface and	ground water, o	lams-ben	efits a	and pro	blems									
– Mineral reso	irces: U	Jses, environment	al effects of mining,	case studies-	ron min	ing(G	ioa), b	auxite									
<b>U</b>			f modern agriculture, fe	<u>+</u>	-			00 0									
			Growing energy need														
			e studies – Land resour				-										
	vidual i	n conservation of	natural resources – E	quitable use o	f resourc	es fo	r susta	inable									
lifestyles.	ogran																
		EMS AND BIOD					7										
			nction of an ecosystem														
			s, food webs and eco														
			on of the (a) Forest ecos														
	-	•	s, streams, lakes, rive														
· · · · · · · · · · · · · · · · · · ·		U / 1	nd ecosystem diversity	- Conservation	01 01001	versit	y: in-si	tu and									
			ΠΤΙΟΝ				10										
				· · · · · · · · · · · · · · · · · · ·	11		_	Ex-situ conservation of biodiversity.UNIT – III: ENVIRONMENTAL POLLUTION10									
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			n (1) inermai polluti	Definition – Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – Solid waste													
management– Role of an individual in prevention of pollution – Pollution case studies – Disaster																	
management: flood, earthquake, cyclone and landslide.																	
management: flo	od, earth	nquake, cyclone and	d landslide.				s – Di	waste									
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#### **TEXT BOOKS**

- 1. Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co, USA, 2000.
- 2. Townsend C., Harper J and Michael Begon, Essentials of Ecology, Blackwell Science, UK, 2003
- 3. Trivedi R.K and P.K.Goel, Introduction to Air pollution, Techno Science Publications, India, 2003.
- 4. Disaster mitigation, Preparedness, Recovery and Response, SBS Publishers & Distributors Pvt. Ltd, New Delhi, 2006.
- 5. Introduction to International disaster management, Butterworth Heinemann, 2006.
- 6. Gilbert M.Masters, Introduction to Environmental Engineering and Science, Pearson Education Pvt., Ltd., Second Edition, New Delhi, 2004.

#### **REFERENCE BOOKS**

- 1. Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II, Enviro Media, India, 2009.
- 2. Cunningham, W.P.Cooper, T.H.Gorhani, Environmental Encyclopedia, Jaico Publ., House, Mumbai, 2001.
- 3. S.K.Dhameja, Environmental Engineering and Management, S.K.Kataria and Sons, New Delhi, 2012.
- 4. Sahni, Disaster Risk Reduction in South Asia, PHI Learning, New Delhi, 2003.
- 5. Sundar, Disaster Management, Sarup & Sons, New Delhi, 2007.

6. G.K.Ghosh, Disaster Management, A.P.H.Publishers, New Delhi, 2006.

#### **E RESOURCES**

- 1. <u>http://www.e-booksdirectory.com/details.php?ebook=10526</u>
- 2. https://www.free-ebooks.net/ebook/Introduction-to-Environmental-Science
- 3. https://www.free-ebooks.net/ebook/What-is-Biodiversity
- 4. <u>https://www.learner.org/courses/envsci/unit/unit\_vis.php?unit=4</u>
- 5. <u>http://bookboon.com/en/pollution-prevention-and-control-ebook</u>
- 6. <u>http://www.e-booksdirectory.com/details.php?ebook=8557</u>
- 7. http://www.e-booksdirectory.com/details.php?ebook=6804
- 8. http://bookboon.com/en/atmospheric-pollution-ebook
- 9. http://www.e-booksdirectory.com/details.php?ebook=3749
- 10. http://www.e-booksdirectory.com/details.php?ebook=2604
- 11. http://www.e-booksdirectory.com/details.php?ebook=2116
- 12. http://www.e-booksdirectory.com/details.php?ebook=1026
- 13. http://www.faadooengineers.com/threads/7894-Environmental-Science

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	3	3	2	1	1	1	1	1	0	0	1	2	2
CO 2	2	1	1	1	1	1	1	1	1	0	0	1	1	1
CO 3	2	1	3			3	1		2	1		1		
CO 4	1	1	2			3	2	3				1	1	1
CO 5	2	1	1			3						1		
Total	10	3	6	3	2	11	4	3	2	2	0	5	4	4
Scaled	2	1	2	1	1	3	1	1	1	1	0	1	1	1

# Mapping of COs with POs

 $1-5 \rightarrow 1, 6-10 \rightarrow 2, 11-15 \rightarrow 3$ 

0 - No Relation, 1 - Low Relation, 2 - Medium Relation, 3 - High Relation

COU	RSE CODE	COURSE NAME	L	Т	Р	С				
X	BE 103	3	1	1	5					
Prere	quisites	ENGINEERING SYSTEMS Physics	L	Т	Р	Н				
<b>C:P:</b> <i>A</i>	A		3	1	2	6				
3:1:0				3       1       1       5         L       T       P       H         3       1       2       6         omain       Level         ive       Remember         ive       Remember         understand       Mechanism         ive       Remember         understand       Understand         ive       Remember         understand       Understand         ive       Remember         understand       Understand         omotor       Mechanism         ive       Remember         understand       Understand         omotor       Origination         ive       Remember         Understand       Understand         per and Current Relations -       Value, Form Factor -         Value, Form Factor -       AC         mple Series, Parallel, Serie       on         on Instruments (Ammeter						
	se Outcomes			ain						
CO1	Define an		Cognitive							
	-	and <b>build</b> and <b>explain</b> AC, DC circuits by Using	D 1							
	measuring d	evices	Psychomo	tor	Mec	hanism				
CO2	Define and	<b>Explain</b> the operation of DC and AC machines.	Cognitive		Rem	ember				
02	Define and	Explain the operation of De and Ac machines.	Coginave							
CO3	Recall and	Illustrate various semiconductor devices and	Cognitive							
		cations and displays the input output	U		Und	erstand				
	characteristi	cs of basic semiconductor devices.	Psychomo	tor	Mec	hanism				
<b>CO4</b>		Explain the number systems and logic gates.	Cognitive							
	Construct t	ne different digital circuit.								
	I abol and Outline the different types of microprocessors         Cognitive									
CO5			Cognitive							
TINIT	and their app			ma						
		IENTALS OF DC AND AC CIRCUITS, MEA								
power Paralle Voltm <b>List o</b>	and Power F el Circuit - neter) and Dyr <b>f Experimen</b>	mation - Fundamentals of AC – Average Value actor, Phasor Representation of sinusoidal quanti Operating Principles of Moving coil and Mo amometer type meters (Watt meter and Energy m ts al Symbols, Tools and Safety Precautions, Power	ities - Simploving Iron neter). Supplies.	le Series Instrum	s, Parall nents (A	lel, Serie				
<ol> <li>Stud</li> <li>Ver</li> <li>Tes</li> <li>by</li> <li>Flue</li> </ol>	dy of Active a fification of A sting of DC V using Voltme	nd Passive elements – Resistors, Inductors and Ca C Voltage, Current and Power in Series and Paral oltage and Current in series and parallel resistors ter, Ammeter and Multimeter. connection with choke.	lel connecti	on.		readboard				
<ol> <li>Stue</li> <li>Ver</li> <li>Tes</li> <li>by</li> <li>Flue</li> <li>Stai</li> </ol>	dy of Active a ification of A sting of DC V using Voltme orescent lamp ircase Wiring.	nd Passive elements – Resistors, Inductors and Ca C Voltage, Current and Power in Series and Paral oltage and Current in series and parallel resistors ter, Ammeter and Multimeter. connection with choke. RICAL MACHINES	lel connecti which are	on. connect	ed in br $9 + 6$	<u>5+0</u>				
<ol> <li>Stud</li> <li>Ver</li> <li>Tess by</li> <li>Flue</li> <li>Stai</li> </ol> UNIT	dy of Active a rification of A sting of DC V using Voltme orescent lamp ircase Wiring.	nd Passive elements – Resistors, Inductors and Ca C Voltage, Current and Power in Series and Paral oltage and Current in series and parallel resistors ter, Ammeter and Multimeter. connection with choke. <b>RICAL MACHINES</b> iple of Operation, Basic Equations, Types and	lel connecti which are Application	on. connect of DC	ed in br 9 + 6 Genera	6+ <b>0</b> ators, DC				
<ol> <li>Stud</li> <li>Ver</li> <li>Tes by</li> <li>Flue</li> <li>Stai</li> </ol> UNIT Constimutor	dy of Active a ification of A ating of DC V using Voltme orescent lamp ircase Wiring. <b>-II: ELECT</b> ruction, Prince s - Basics of	nd Passive elements – Resistors, Inductors and Ca C Voltage, Current and Power in Series and Paral oltage and Current in series and parallel resistors ter, Ammeter and Multimeter. connection with choke. <b>RICAL MACHINES</b> iple of Operation, Basic Equations, Types and Single-Phase Induction Motor and Three Pha	lel connecti which are Application ase Induction	on. connect of DC on Moto	ed in br 9 + 6 Genera or- Con	5+0 ators, DC struction				
<ol> <li>Stud</li> <li>Ver</li> <li>Tes by</li> <li>Flue</li> <li>Stai</li> </ol> <b>UNIT</b> Constructor Princi	dy of Active a ification of A sting of DC V using Voltme orescent lamp ircase Wiring. <b>-II: ELECT</b> ruction, Prince s - Basics of ple of Operation	nd Passive elements – Resistors, Inductors and Ca C Voltage, Current and Power in Series and Paral oltage and Current in series and parallel resistors ter, Ammeter and Multimeter. connection with choke. <b>RICAL MACHINES</b> iple of Operation, Basic Equations, Types and	lel connecti which are Application ase Induction	on. connect of DC on Moto	ed in br 9 + 6 Genera or- Con	5+0 ators, DC struction r.				

Classification of Semiconductors, Construction, Operation and Characteristics: PN Junction Diode – Zener Diode, PNP, NPN Transistors, Field Effect Transistors and Silicon Controlled Rectifier – Applications.

#### **List of Experiments**

- 5. Forward and Reverse bias characteristics of PN junction diode.
- 6. Forward and Reverse bias characteristics of zener diode
- 7. Input and Output Characteristics of NPN transistor.

#### **UNIT- IV: DIGITAL ELECTRONICS**

9 + 6+10

9+ 6+0

Basic of Concepts of Number Systems, Logic Gates, Boolean Algebra, Adders, Subtractors, multiplexer, demultiplexer, encoder, decoder, Flipflops, Up/Down counters, Shift Registers.

#### **List of Experiments**

- 8. Construction and verification of simple logic gates.
- 9. Construction and verification of adders.
- 10. Construction and verification of subtractor.

#### **UNIT- V: MICROPROCESSORS**

Architecture, 8085, 8086 - Interfacing Basics: Data transfer concepts – Simple Programming concepts

LECTURE	TUTORIAL	PRACTICAL	TOTAL
45	15	30	90

#### **TEXT BOOKS**

- 1. Metha V.K., 2008. Principles of Electronics. Chand and Company.
- 2. Malvino, A. P., 2006. Electronics Principles. 7th ed. New Delhi: Tata McGraw-Hill.
- 3. Rajakamal, 2007. Digital System-Principle & Design. 2nd ed. Pearson education.
- 4. Morris Mano, 1999. Digital Design. Prentice Hall of India.
- 5. Ramesh, S. Gaonkar, 2000, Microprocessor Architecture, Programming and its Applications with the 8085, 4th ed, India: Penram International Publications.

# **REFERENCE BOOKS**

- 1. Corton, H.,2004 Electrical Technology. CBS Publishers & Distributors.
- 2. Syed, A. Nasar, 1998, Electrical Circuits. Schaum Series.
- 3. Jacob Millman and Christos, C. Halkias, 1967, Electronics Devices, New Delhi: McGraw-Hill.
- 4. Millman, J. and Halkias, C. C., 1972. Integrated Electronics: Analog and Digital Circuits and Systems, Tokyo: McGraw-Hill, Kogakusha Ltd.
- 5. Mohammed Rafiquzzaman, 1999. Microprocessors Theory and Applications: Intel and Motorola. Prentice Hall International.

# **E-REFERENCES**

- 1. NTPEL, Basic Electrical Technology (Web Course), Prof. N. K. De, Prof. T. K. Bhattacharya and Prof. G.D. Roy, IIT Kharagpur.
- 2. Prof.L.Umanand, http://freevideolectures.com/Course/2335/Basic-Electrical-Technology#, IISc Bangalore.
- 3. http://nptel.ac.in/Onlinecourses/Nagendra/, Dr. Nagendra Krishnapura, IIT Madras.
- 4.Dr.L.Umanand, http://www.nptelvideos.in/2012/11/basic-electrical-technology.html, IISC Bangalore.

#### Mapping of COs with POs

PO         PO         PO           1         2         3
--

CO 1	3	3	1	1	1	1			1	1	1	3	3
CO 2	3	3	1	1	1	1			1	1	1	3	3
CO 3	2	2	2	1	2	2	1	1	1	1	1	3	3
CO 4	2	2	1	1	1	1	1	1	1	1	1	3	3
CO 5	2	2	1	1	1	1	1	1	1	1	1	3	3
Total	12	12	6	5	6	6	3	3	5	5	5	15	15
Scaled	3	3	2	1	2	2	1	1	1	1	1	5	5

 $1-5 \rightarrow 1, 6-10 \rightarrow 2, 11-15 \rightarrow 3$ 

0-No Relation, 1-Low Relation, 2-Medium Relation, 3-High Relation

COURS	SE CODE	COURSE NAME	L T P						
XA	P 104	APPLIED PHYSICS FOR ENGINEERS	3	1	2	6			
C:P: A			L	Т	Р	Н			
2.8:0.8:0					_				
	QUISITE:	Basic Physics in HSC level	3	1	48LevelRememberUnderstanMechanisiRememberAnalyze,				
Course (	Outcomes (2	KAP104):	Domai	in	Leve	1			
CO1		he basics of mechanics, explain the principles of	Cognit	ive	Remember				
		and determine its significance in engineering			Understand				
		d technological advances.	Psycho						
CO2		the laws of electrostatics, magneto-statics and	Cognit	ive					
		netic induction; use and locate basic applications of							
	electromag	netic induction to technology.	Psycho			Mechanism			
			Affecti						
CO3		nd the fundamental phenomena in optics by	Cognit	ive					
		ent and <b>describe</b> the working principle and				•			
	application	of various lasers and fibre optics.	Psycho						
			Affecti						
CO4	•	energy bands in solids, discuss and use physics	Cognit	ive					
	principles	of latest technology using semiconductor devices.							
			Psycho						
			Affecti		Rece				
CO5	-	nowledge on particle duality and solve Schrodinger	Cognit	ive		erstand			
		or simple potential.			Appl				
		NICS OF SOLIDS			9+3				
		Newton's laws of motion - work and energy - impulse	and mo	mentum	- torqu	e - law			
		ergy and momentum - Friction.							
	·	Strain - Hooke's law - Stress strain diagram - Class							
	<b>.</b>	torque - Torsion pendulum - Applications of torsion p			<u> </u>	beams			
		ination of Young's modulus: Uniform bending and nor	1-unifor	n bendiı					
		OMAGNETIC THEORY			9+3				
		s - Electrostatic field and potential of a dipole; Die							
		ld - Clausius Mossotti Equation - Laws of magneti							
Lenz's la	w - Maxwe	Il's equation - Plane electromagnetic waves; their trans	nsverse	nature -	express	ion fo			

plane, circularly and elliptically polarized light - quarter and half wave plates - production and detection of plane, circularly and elliptically polarized light.

#### UNIT -III: OPTICS, LASERS AND FIBRE OPTICS

**Optics:** Dispersion- Optical instrument: Spectrometer - Determination of refractive index and dispersive power of a prism- Interference of light in thin films: air wedge - Diffraction: grating.

**LASER**: Introduction - Population inversion -Pumping - Laser action - Nd-YAG laser - CO<sub>2</sub> laser – Applications **Fiber Optics**: Principle and propagation of light in optical fiber - Numerical aperture and acceptance angle - Types of optical fiber - Fiber optic communication system (Block diagram).

#### **UNIT –IV: SEMICONDUCTOR PHYSICS**

9+3+6

9+3+12

**Semiconductors**: Energy bands in solids - Energy band diagram of good conductors, insulators and semiconductors - Concept of Fermi level - Intrinsic semiconductors - Concept of holes - doping - Extrinsic semiconductors - P type and N type semiconductors - Hall effect.

**Diodes and Transistors**: P-N junction diode - Forward bias and reverse bias - Rectification action of diode - Working of full wave rectifier using P N junction diodes - PNP and NPN transistors - Three different configurations - Advantages of common emitter configuration - working of NPN transistor as an amplifier in common emitter configuration.

# **UNIT -V: QUANTUM PHYSICS**

9+3+0

Introduction to quantum physics, black body radiation, Compton effect, de Broglie hypothesis, wave – particle duality, uncertainty principle, Schrodinger wave equation (Time dependent and Time independent), particle in a box, Extension to three dimension - Degeneracy.

# **TEXT BOOKS**

- 1. Gaur R. K. and Gupta S. L., "Engineering Physics", Dhanpat Rai Publications, 2009.
- 2. Avadhanulu M. N. "Engineering Physics" (Volume I and II), S. Chand & Company Ltd., New Delhi, 2010.

# **REFERENCE BOOKS**

- 1. Palanisamy P. K., "Engineering Physics", Scitech Publications (India) Pvt. Ltd, Chennai.
- 2. Arumugam M., "Engineering Physics" (Volume I and II), Anuradha Publishers, 2010.
- 3. Senthil Kumar G., "Engineering Physics", 2nd Enlarged Revised Edition, VRB Publishers, Chennai, 2011.
- 4. Mani P., "Engineering Physics", Dhanam Publications, Chennai, 2007.

# **E RESOURCES**

NPTEL, Engineering Physics, Prof. M. K. Srivastava, Department of Physics, IIT, Roorkee.

# LABORATORY

1.	Torsional Pendulum - determination of moment of inertia and rigidity modulus of the given material of the wire.
2.	Uniform Bending - Determination of the Young's Modulus of the material of the beam.
3.	Non-Uniform Bending - Determination of the Young's Modulus of the material of the beam.
4.	Meter Bridge - Determination of specific resistance of the material of the wire.
5.	Spectrometer - Determination of dispersive power of the give prism.
6.	Spectrometer - Determination of wavelength of various colours in Hg source using grating.
7.	Air wedge - Determination of thickness of a given thin wire.
8.	Laser - Determination of wavelength of given laser source and size of the given micro particle using
	Laser grating.
9.	Post office Box - Determination of band gap of a given semiconductor.

10. PN Junction Diode - Determination of V-I characteristics of the given diode.

# **REFERENCE BOOKS**

- 1. Samir Kumar Ghosh, "A text book of Advanced Practical Physics", New Central Agency (P) Ltd, 2008.
- 2. Arora C.L., "Practical Physics", S. Chand & Company Ltd., New Delhi, 2013.
- 3. Umayal Sundari AR., "Applied Physics Laboratory Manual", PMU Press, Thanjavur, 2012.

LECTURE	TUTORIAL	PRACTICAL	TOTAL
45	15	30	90

# Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12	PS O1	PS O 2
CO 1	3	2	2	1					1			1	3	2
CO 2	3		1		1							1	3	3
CO 3	3	2	2	2	1				1			1		
<b>CO 4</b>	3	2	2	2	1				1			1	2	3
CO 5	3		2									1		
Total	15	6	9	6	4				3			5	8	8
Scaled	3	2	2	2	1				1			1	2	2

 $1-5 \rightarrow 1, 6-10 \rightarrow 2, 11-15 \rightarrow 3$ 

0-No Relation, 1-Low Relation, 2-Medium Relation, 3-High Relation

CC	DURSE	CODE	COURSE NA	ME		L	Т	P	С		
	XEG 1	.05				2	0	1	3		
С	Р	Α	ENGINEERING GI	RAPHICS		L	Т	Р	H		
1.75	1	0.25				2	0	2	4		
PRER	EQUIS	ITE: NIL	•								
Course	e outcor	nes:									
			Domain	Level							
CO1			hal and international standards, ctice various curves	Cognitive, Psychomotor Affective	Applying, Guided response and Responds to Phenomena						
CO2	-		act and practice orthographic nts, straight lines and planes.	Cognitive Psychomotor Affective	Understanding, Mechanism and Responds to Phenomena						
CO3		ious positio	and Practice projection of solids ons and true shape of sectioned	Cognitive Psychomotor Affective	Applying, Complex Overt Response and Responds to Phenomena						
CO4	lateral		and Practice the development of of simple and truncated solids, ids.	Cognitive Psychomotor Affective	Overt	rstanding, Response enomena	-		ds		
05			and practice isometric and of simple and truncated solids.	Cognitive Psychomotor Affective	Applying, Complex Overt						

# UNIT-I: INTRODUCTION, FREE HAND SKETCHING OF ENGG. OBJECTS AND CONSTRUCTION OF PLANE CURVE

**6+6** 

Importance of graphics in engineering applications – use of drafting instruments – BIS specifications and conventions as per SP 46-2003.Pictorial representation of engineering objects – representation of threedimensional objects in two-dimensional media – need for multiple views – developing visualization skills through free hand sketching of three-dimensional objects. Polygons & curves used in engineering practice – methods of construction – construction of ellipse, parabola and hyperbola by eccentricity method – cycloidal and involute curves – construction – drawing of tangents to the above curves.

# UNIT -II: PROJECTION OF POINTS, LINES AND PLANE SURFACES

General principles of orthographic projection – first angle projection – layout of views – projections of points, straight lines located in the first quadrant – determination of true lengths of lines and their inclinations to the planes of projection – traces – projection of polygonal surfaces and circular lamina inclined to both the planes of projection.

# UNIT-III: PROJECTION OF SOLIDS AND SECTIONS OF SOLIDS

projection of simple solids like prism, pyramid, cylinder and cone when the axis is inclined to one plane of projection – change of position & auxiliary projection methods – sectioning of above solids in simple vertical positions by cutting plane inclined to one reference plane and perpendicular to the other and above solids in inclined position with cutting planes parallel to one reference plane – true shapes of sections.

# UNIT -IV: DEVELOPMENT OF SURFACES AND INTERSECTION OF SOLIDS

Need for development of surfaces – development of lateral surfaces of simple and truncated solids – prisms, pyramids, cylinders and cones – development of lateral surfaces of the above solids with square and circular cutouts perpendicular to their axes – intersection of solids and curves of intersection – prism with cylinder.

6+6

6+6

6+6

cylinder & cylinder, cone & cylinder with normal intersection of axes and with no offset

# **UNIT -V: ISOMETRIC AND PERSPECTIVE PROJECTIONS**

Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones – principles of perspective projections – projection of prisms, pyramids and cylinders by visual ray and vanishing point methods.

6+6

THEORY	PRACTICAL	TOTAL
30	30	60

#### **TEXT BOOKS**

- 1. Bhatt,N.D, "Engineering Drawing", Charotar Publishing House, 46th Edition-2003.
- 2. Natarajan, K.V, "A Textbook of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2006.
- 3. Dr. P.K. Srividhya, P. Pandiyaraj, "Engineering Graphics", PMU Publications, Vallam, 2013

#### REFERENCES

- 1. Luzadder and Duff, "Fundamentals of Engineering Drawing" Prentice Hall of India PvtLtd, XI Edition 2001.
- 2. Venugopal,K. and Prabhu Raja, V., "Engineering Graphics", New Age International(P) Ltd., 2008.
- 3. Gopalakrishnan.K.R,. "Engineering Drawing, I & II", Subhas Publications, 1998.
- 4. Shah, M.B and Rana, B.C., "Engineering Drawing", Pearson Education, 2005.

# E RESOURCES

- 1. <u>http://periyarnet/Econtent</u>
- 2. http://nptel.ac.in/courses/112103019/

# Mapping of COs with POs

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	2	3	1	1	0	0	0	0	0	0	1	3	2
CO 2	3	2	1	1	1	0	0	0	0	0	0	1	3	3
CO 3	3	2	1	1	1	0	0	0	0	0	0	1	3	3
CO 4	3	2	1	1	1	0	0	0	0	0	0	1	3	3
CO 5	3	2	1	1	1	0	0	0	0	0	0	1	3	3
Total	15	10	7	5	5	0	0	0	0	0	0	5	15	15
Scaled value	3	2	2	1	1	0	0	0	0	0	0	1	3	3

 $1-5 \rightarrow 1, 6-10 \rightarrow 2, 11-15 \rightarrow 3$ 

0-No Relation, 1-Low Relation, 2-Medium Relation, 3-High Relation

# SEMESTER II

	COURS		COURSE NAME		Ι	Т	F		С
	EMA 2		CALCULUS, ORDINARY DIFFERENTIAL I AND COMPLEX VARIABLE	EQUATIONS	3	1	0	)	4
С	Р	Α			Ι			Р	]
3	0	0			3	1		0	
PRE	REQU	ISITE	: Mathematics I (Calculus and Linear Algebra)						
Cour	se out	comes		DomainLond line, surface andCognitiveApplyir					
CO1	<b>CO1</b> Find double and triple integrals and to find line, surface and Cognitive volume of an integral by Applying Greens, Gauss divergence and Stokes theorem.							g berii	ıg
CO2	Sol	ve first	order differential equations of different types olvable for p, y, x and Clairaut's type.	Cognitive	Aj	pply	ving	g	
CO3			ond order ordinary differential equations with befficients using various methods.	Cognitive	Re	eme	mt	perii	ng
CO4	harı	nonic f	quations to verify analytic functions and to find functions and harmonic conjugate. mapping of translation and rotation. Mobius	Cognitive	Understanding Remembering Guided			-	
		sforma		Psychomotor					
CO5	invo	olving	The second secon	Cognitive	Aj	pply	ving	g	
		es, zer	os of analytic functions, singularities, Laurent's	Affective	Receiving				
UNI	Г -I: М	IULTI	VARIABLE CALCULUS (INTEGRATION)		12	)			
Chan integr	ge of v rals - s	variable calar su	on: Double integrals (Cartesian) - change of order or es (Cartesian to polar) - Triple integrals (Cartesian), urface integrals - vector surface integrals - Theorems ORDER ORDINARY DIFFERENTIAL EQUAT	Scalar line inter of Green, Gaus	gra	ls - nd S	ve	ctor	line
			Bernoulli's equations - Euler's equations - Equation ations solvable for y- equations solvable for x and C		deg	gree	: e	qua	tions
	Γ-III:		INARY DIFFERENTIAL EQUATIONS O		12				
Secon - Cau	nd orde ichy-E		r differential equations with variable coefficients- n uation- Power series solutions- Legendre polynomi perties.				-		

UNIT-IV: COMPLEX VARIABLE – DIFF	FERENTIATION		12					
Differentiation-Cauchy-Riemann equations-	analytic functions-har	monic functions-	finding harmonic					
conjugate- elementary analytic functions (ex	ponential, trigonometri	c, logarithm) and	l their properties-					
Conformal mappings- Mobius transformations and their properties.								
UNIT-V: COMPLEX VARIABLE – INTE	GRATION		12					
Contour integrals - Cauchy-Goursat theorem (	(without proof) - Cauch	y Integral formul	a (without proof)-					
Liouville's theorem (without proof)- Tayl	or's series- zeros of	analytic functio	ns- singularities-					
Laurent's series - Residues- Cauchy Residue		•	-					
involving sine and cosine- Evaluation of certain improper integrals using the Bromwich contour.								
	LECTURE	TUTORIAL	TOTAL					

45

15

60

# **TEXT BOOKS**

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 40th<sup>th</sup> Edition, 2008. **REFERENCE BOOKS** 

- 1.G.B. Thomas and R.L. Finney, "Calculus and Analytic geometry", 9<sup>th</sup> Edition, Pearson, Reprint, 2002.
- 2. Erwin kreyszig, "Advanced Engineering Mathematics", 9th Edition, John Wiley & Sons, 2006.
- 3.W. E. Boyce and R. C. DiPrima, "Elementary Differential Equations and Boundary Value Problems", 9<sup>th</sup>Edn. Wiley India, 2009.
- 4. S. L. Ross, "Differential Equations", 3<sup>rd</sup> Ed., Wiley India, 1984.
- 5.E. A. Coddington, "An Introduction to Ordinary Differential Equations", Prentice Hall India, 1995.
- 6. E. L. Ince, "Ordinary Differential Equations", Dover Publications, 1958.
- 7.J. W. Brown and R. V. Churchill, "Complex Variables and Applications", 7<sup>th</sup> Ed., McGraw Hill, 2004.
- 8. N.P. Bali and Manish Goyal, "A text book of Engineering Mathematics", Laxmi Publications, Reprint, 2008.

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
CO 1	3	2			2					1		2
CO 2	3	1								1		1
CO 3	3	1								1		1
CO 4	3	2								1		1
CO 5	3	2			1					1		2
Total	15	8	0	0	3	0	0	0	0	5	0	7
Scaled	3	2			1					1		
	•	•		$1-5 \rightarrow$	1. 6	$-10 \rightarrow 2$	2	$11 - 15 \rightarrow$	• 3	•	•	•

Mapping of COs with GAs

0 - No Relation, 1 - Low Relation, 2- Medium Relation, 3- High Relation

COURS	SE CODE	COURSE NAME		L	Т	Р	C	
XC	P 202	PROGRAMMING FOR PRO SOLVING	BLEM	3	0	2	5	
PREREC	UISITES			L	Т	Р	Н	
C:P: A							7	
3:1:1								
Course O	Outcomes		Domai	n		Lev	vel	
CO1	Define pr	ogramming fundamentals and Solve	Cognitive			Remen	nber	
	simple pr	simple programs using I/O statements Psychomotor				Understand		
						Apply		
CO2	<b>Define</b> s	yntax and write simple programs	Cognitive			Remember		
	using con	trol structures and arrays	Psychomotor			Understan		
						Apply		
CO3	Explain a	and <b>write simple programs</b> using	Cognitive			Underst	tand	
	functions	and pointers	Psychomotor			Apply		
CO4	Explain a	and <b>write simple programs</b> using	Cognitive			Unders		
	structures	and unions	Psychomotor			Apply		
						Analyz	e	
CO5	Explain a	and <b>write simple programs</b> using	Cognitive Psyc	chome	otor	Remen	nber	
	files and l	Build simple projects				Unders	tand	
						Create		

#### **UNIT- I: PROGRAMMING FUNDAMENTALS AND INPUT/ OUTPUT STATEMENTS** 9+6

#### Theory

Introduction to components of a computer system, Program-Flowchart-Pseudocode-Software-Introduction to C language-Character set-Tokens: Identifiers, Keywords, Constants, and Operatorssample program structure-Header files – Data Types-Variables- Output statements –Input statements. **Practical** 

1. Program to display a simple picture using dots.

2.Program for addition of two numbers

3. Program to swap two numbers

4. Program to solve any mathematical formula.

# **UNIT- II: CONTROL STRUCTURE AND ARRAYS**

#### Theory

Control Structures-Conditional Control statements: Branching, Looping-Unconditional control structures: switch, break, continue, goto statements- Arrays: One Dimensional Array-Declaration-Initialization-Accessing Array Elements-Searching-Sorting-Two Dimensional Arrays-Declaration -Initialization- Matrix Operations - Multi Dimensional Arrays-Declaration- Initialization. Storage classes: auto-extern-static. Strings: Basic operations on strings.

9+6

#### **Practical**

- 1. Program to find greatest of 3 numbers using Branching Statements
- 2. Program to display divisible numbers between n1and n2 using looping Statement
  - 3. Program to remove duplicate element in an array.
  - 4. Program to perform string operations.

5. Performing basic sorting algorith				0 (
UNIT- III: FUNCTIONS AND POINT	TERS			9+6
Theory				
Functions: Built in functions-User De	fined Functions-	-Parameter passi	ng methods-Pass	ing arrays to
functions-Recursion-Programs using	arrays and fun	ctions. Pointers	-Pointer Declara	tion-Address
Operator-Pointer expressions & poin	ter arithmetic-P	ointers and fur	nction-Call by v	alue-Call by
Reference-Pointer to arrays-Use of Po	ointers in self-re	eferential structu	res-Notion of lin	nked list (no
implementation).				
Practical				
1.Program to find factorial of a given n				
2.Programs using Recursion such as Fin	nding Factorial, l	Fibonacci series,	Ackerman function	on etc.
Quick sort or Merge sort				
3.Programs using Pointers				
Theory				9+6
UNIT -IV: STRUCTURES AND UNI Theory Structures and Unions -Giving values Passing structure to elements to function	to members-Ini	<u> </u>		structures-
Theory Structures and Unions -Giving values	to members-Ini	<u> </u>		structures-
<b>Theory</b> Structures and Unions -Giving values Passing structure to elements to function	to members-Ini	<u> </u>		structures-
<b>Theory</b> Structures and Unions -Giving values Passing structure to elements to function Structure within a structure and Union. <b>Practical</b> 1.Program to read and display student matrix	to members-Ini ons- Passing entir ark sheet Structu	re function to fun	nctions- Arrays of s	structures-
<b>Theory</b> Structures and Unions -Giving values Passing structure to elements to function Structure within a structure and Union. <b>Practical</b> 1.Program to read and display student me 2.Program to read and display student me	to members-Ini ons- Passing entir ark sheet Structu arks of a class us	re function to function to function to function to function for the state of the st	nctions- Arrays of s	structures-
Theory Structures and Unions -Giving values Passing structure to elements to function Structure within a structure and Union. Practical 1.Program to read and display student m 2.Program to read and display student m 3.Program to create linked list using Structure	to members-Ini ons- Passing entir ark sheet Structu arks of a class us	re function to function to function to function to function for the state of the st	nctions- Arrays of s	structures-
<b>Theory</b> Structures and Unions -Giving values Passing structure to elements to function Structure within a structure and Union. <b>Practical</b> 1.Program to read and display student methods.	to members-Ini ons- Passing entir ark sheet Structu arks of a class us	re function to function to function to function to function for the state of the st	nctions- Arrays of s	structures-
Theory Structures and Unions -Giving values Passing structure to elements to function Structure within a structure and Union. <b>Practical</b> 1.Program to read and display student m 2.Program to read and display student m 3.Program to create linked list using Stru UNIT- V: FILES	to members-Ini ons- Passing entir ark sheet Structu arks of a class us	re function to function to function to function to function for the state of the st	nctions- Arrays of s	structures-
Theory Structures and Unions -Giving values Passing structure to elements to function Structure within a structure and Union. <b>Practical</b> 1.Program to read and display student m 2.Program to read and display student m 3.Program to create linked list using Stru UNIT- V: FILES Theory	to members-Ini ons- Passing entir ark sheet Structu arks of a class us actures with point	re function to function to function to function to function with variable sing Structures waters	nctions- Arrays of s ith arrays	structures- structure - 9+6
Theory Structures and Unions -Giving values Passing structure to elements to function Structure within a structure and Union. Practical 1.Program to read and display student ma 2.Program to read and display student ma 3.Program to create linked list using Structure UNIT- V: FILES Theory File management in C-File operation for	to members-Ini ons- Passing entir ark sheet Structu arks of a class us actures with point	re function to fun	nctions- Arrays of s ith arrays ning a file- Closin	structures- structure - 9+6 ng a file-The
Theory Structures and Unions -Giving values Passing structure to elements to function Structure within a structure and Union. Practical 1.Program to read and display student m 2.Program to read and display student m 3.Program to create linked list using Structure UNIT- V: FILES Theory File management in C-File operation for getw and putw functions- The fprintf &	to members-Ini ons- Passing entir ark sheet Structu arks of a class us actures with point	re function to fun	nctions- Arrays of s ith arrays ning a file- Closin	structures- structure - 9+6 ng a file-The
Theory Structures and Unions -Giving values Passing structure to elements to function Structure within a structure and Union. Practical 1.Program to read and display student m 2.Program to read and display student m 3.Program to create linked list using Structure UNIT- V: FILES Theory File management in C-File operation for getw and putw functions- The fprintf &	to members-Ini ons- Passing entit ark sheet Structu arks of a class us actures with point functions in C-D fscanf functions	re function to function to function to function to function with variable sing Structures we ters	nctions- Arrays of s ith arrays ning a file- Closin	structures- structure - 9+6 ng a file-The
Theory Structures and Unions -Giving values Passing structure to elements to function Structure within a structure and Union. Practical 1.Program to read and display student m 2.Program to read and display student m 3.Program to create linked list using Stru UNIT- V: FILES Theory File management in C-File operation f getw and putw functions- The fprintf & Practical	to members-Ini ons- Passing entir ark sheet Structu arks of a class us actures with point functions in C-D fscanf functions le to another file	re function to function to function to function to function with variable sing Structures we ters	nctions- Arrays of s ith arrays ning a file- Closin	structures- structure - 9+6 ng a file-The
Theory Structures and Unions -Giving values Passing structure to elements to function Structure within a structure and Union. Practical 1.Program to read and display student mage. 2.Program to read and display student mage. 3.Program to create linked list using Structure UNIT- V: FILES Theory File management in C-File operation for getw and putw functions- The fprintf & Practical 1.Program for copying contents of one file	to members-Ini ons- Passing entir ark sheet Structu arks of a class us actures with point functions in C-D fscanf functions le to another file	re function to function to function to function to function with variable sing Structures we ters	nctions- Arrays of s ith arrays ning a file- Closin	structures- structure - 9+6 ng a file-The

#### **TEXT BOOKS/ REFERENCES**

- 1.ByronGottfried,"ProgrammingwithC", III Edition, (Indian Adapted Edition), TMH publications, 2010
- 2. Yeshwant Kanethker, "Let us C", BPB Publications, 2008
- 3. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", Pearson Education Inc. 2005
- 4. Behrouz A. Forouzan and Richard. F. Gilberg,"A Structured Programming Approach Using C", II Edition, Brooks–Cole Thomson Learning Publications, 2001
- 5. Johnsonbaugh R. and Kalin M., "Applications Programming in ANSIC", III Edition, Pearson Education India, 2003

6. E. Balaguruswamy, Programming in ANSIC, Tata McGraw-Hill

# Mapping of COs with POs

	PO	PO	РО	РО	РО	РО	РО	РО	РО	РО	РО	PO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	2	2	2	2	1								1	0
CO 2	2	-	2	1								1		1
CO 3	2							1						1
<b>CO 4</b>	2	2	2		1	1	1			1				
CO 5	2							1		1				
Total	10	4	6	3	2	1	1	2		2		1	1	2
Scaled	2	1	2	1	1	1	1	1	0	1	0	1	1	1
	0 -	-No Re	elation	1 – L	ow Rela	ation	2 - Mec	dium Re	elation	3 – High Relation			n	

CO	URSE CODE	COURSE NAME	L	Т	Р	SS	C		
	XGS 203		2	0	1	0	3		
Pre-req	uisites (if any)	ENGLISH	L	T	P	SS	H		
C: P: A			2	0	2	0	4		
2.6:0.4:0							-		
	Outcomes (XGS 203	, ,	Doma			vel			
CO1	Ability to recall the 1	neaning for proper usage	Cogni	tive	Re	member	r		
CO2	Apply the techniques	s in sentence patterns	Cogni	tive	Aŗ	oply			
CO3	Identify the common	errors in sentences	Cogni	tive	Re	member	r		
CO4Construct the Nature and Style of sensible WritingCognitiveCreate									
CO5	Practicing the writin	g skills	Psycho	omotor		ided sponse			
CO6	Grasping the technic	ques in learning sounds and etiquettes	Psych	omotor	Ac	lapting			
	: VOCABULARY I						9		
	concept of Word For								
		anguages and their use in English							
-	-	es and suffixes from foreign languages in	English to	form d	erivativ	res			
		l standard abbreviations.							
	I: BASIC WRITIN	G SKILLS					9		
	ence Structures	a in contanges							
	of phrases and clause ortance of proper pun								
-	ting coherence								
	<u> </u>	paragraphs in documents							
	iniques for writing pr								
		COMMON ERRORS IN WRITING					9		
	ect-verb agreement								
•	n-pronoun agreement								
3.3 Misp	placed modifiers								
3.4 Artic	eles								
3.5 Prep									
	indancies								
3.7 Click									
		STYLE OF SENSIBLE WRITING					9		
4.1 Desc	U								
4.2 Defin	<u> </u>								
4.3 Class	• •								
	iding examples or ev								
	ing introduction and								
	V: WRITING PRAC	LICES					9		
	prehension is Writing								
	y Writing								
	I - ORAL COMMU	NICATION							
		practice sessions in Language Lab)							
	ng Comprehension	Practice sessions in Language Lab)							
LISCHI									

- Pronunciation, Intonation, Stress and Rhythm
- Common Everyday Situations: Conversations and Dialogues
- Communication at Workplace
- Interviews
- Formal Presentations

LECTURE	PRACTICAL	TOTAL
30	30	60

#### **Suggested Readings:**

(i) Practical English Usage. Michael Swan. OUP. 1995

- (ii) Remedial English Grammar. F.T. Wood. Macmillan.2007
- (iii) On Writing Well. William Zinsser. Harper Resource Book. 2001
- (iv) Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006
- (v) Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011
- (vi) Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

#### Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12	PS O1	PSO 2
CO1	2	0	0	0	0	0	2	0	1	0	0	0	0	0
CO2	2	0	0	0	0	0	2	0	1	0	0	0	0	0
CO3	1	0	0	0	0	0	1	0	1	0	0	0	0	0
CO4	2	0	0	0	0	0	1	0	1	0	0	0	0	0
CO5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	7	0	0	0	0	0	6	0	4	0	0	0	0	0
Scaled	2	0	0	0	0	0	2	0	1	0	0	0	0	0

1-5=1, 6-10 = 2, 11-15=3

0-No Relation, 1- Low Relation, 2 – Medium Relation, 3- High Relation

COURSE CODE	COURSE NAME	L	Т	Р	С
XAC 204	APPLIED CHEMISTRY FOR ENGINEERS	3	1	1	5
PREREQUISITES	Nil	L	Т	Р	Н
<b>C:P: A</b>		3	1	2	6

3.5:1.0	:0.5					
Course	e Outcomes (XAC 204):	Domain	Level			
CO1	<b>Identify</b> the periodic properties such as ionization energy, electron affinity, oxidation states and electro negativity. <b>Describe</b> the various water quality parameters like hardness and alkalinity.	Cognitive Psychomotor	Remember Perception			
CO2	<b>Explain</b> and <b>Measure</b> microscopic chemistry in terms of atomic, molecular orbitals and intermolecular forces.	Cognitive Psychomotor	Understand Set			
CO3	<b>Interpret</b> bulk properties and processes using thermodynamic and kinetic considerations.	Cognitive Psychomotor Affective	Apply Mechanism Receive			
CO4	<b>Describe, Illustrate</b> and <b>Discuss</b> the chemical reactions that are used in the synthesis of molecules.	Cognitive Psychomotor Affective	Remember Analyze Perception Respond			
CO5	Apply, Measure and Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular	Cognitive	Remember Apply Mechanism			
UNIT	energy levels in various spectroscopic techniquesPsychomotorUNIT – I: PERIODIC PROPERTIES AND WATER CHEMISTRY					
explana UNIT- Thermo Free e reducti methoo	and bases, molecular geometries. <b>Water Chemistry</b> -Water qual ation of hardness, determination of hardness by EDTA method-Intro <b>-II: USE OF FREE ENERGY IN CHEMICAL EQUILIBRIA</b> odynamic functions: energy, entropy and free energy. Estimations nergy and emf. Cell potentials, the Nernst equation and applie on and solubility equilibria. Corrosion-Types, factors affecting is. Use of free energy considerations in metallurgy through Elling less plating, electroless plating of nickel and copper on Printed Circ	oduction to alkali of entropy and cations. Acid ba corrosion rate tham diagrams. A	12+3+6 free energies. se, oxidation and Control			
	-III: ATOMIC AND MOLECULAR STRUCTURE		10+3+6			
nanopa for ator the ene and the <b>Interm</b> Ionic,	inger equation. Particle in a box solution and their applications articles. Molecular orbitals of diatomic molecules and plots of the mic and molecular orbitals. Energy level diagrams of diatomic mole ergy level diagrams for transition metal ions and their magnetic prop e role of doping on band structures. <b>molecular forces and potential energy surfaces</b> dipolar and Vander waals interactions. Equations of state of rea al energy surfaces of $H_3$ , $H_2F$ and HCN and trajectories on these sur-	multicenter orbita ecules. Crystal fie perties. Band strue al es and critica	als. Equations eld theory and cture of solids			
	IV: SPECTROSCOPIC TECHNIQUES AND APPLICATION		7+3+6			
types of spectro molecu magnet	bles of spectroscopy and selection rules. Electronic spectroscopy of electronic transition and application. Fluorescence and its applications oscopy-types of vibrations, Instrumentation and applications. Rotational eles. Nuclear magnetic resonance spectroscopy-concept of cher tic resonance imaging. Diffraction and scattering.	ations in medicin ional spectroscop	e. Vibrational y of diatomic			
UNII-	-V: STEREOCHEMISTRY AND ORGANIC REACTIONS					

8+3+6

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds

#### Organic reactions and synthesis of a drug molecule

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization reactions and ring opening reactions. Synthesis of a commonly used drug molecule- Aspirin and paracetamol.

LECTURE	TUTORIAL	PRACTICAL	TOTAL
45	15	30	90

#### **TEXT BOOKS**

- Puri B.R. Sharma, L.R., Kalia K.K. Principles of Inorganic Chemistry, (23<sup>rd</sup>edition), New Delhi, Shoban Lal Nagin Chand & Co., 1993
- 2. Lee. J.D. Concise Inorganic Chemistry, UK, Black well science, 2006.
- 3. Trapp. C, Cady, M. Giunta. C, Atkins's Physical Chemistry, 10<sup>th</sup> Edition, Oxford publishers, 2014.
- 4. Glasstone S., Lewis D., Elements of Physical Chemistry, London, Mac Millan & Co. Ltd, 1983.
- 5. Morrison R.T. and Boyd R.N. Organic Chemistry (6th edition), New York, Allyn & Bacon Ltd., 1976.
- 6. Banwell. C.N, Fundamentals of Molecular Spectroscopy, (3<sup>th</sup> Edition), McGraw-Hill Book Company, Europe 1983.
- Bahl B.S. and Arun Bahl, Advanced Organic Chemistry, (4<sup>th</sup> edition), S./ Chand & Company Ltd. New Delhi, 1977.
- 8. P. S. Kalsi, Stereochemistry: Conformation and mechanism, (9<sup>th</sup> Edition), New Age International Publishers, 2017.

#### **REFERENCE BOOKS E RESOURCES -** MOOCs:

- 1. <u>http://www.mooc-list.com/course/chemistry-minor-saylororg</u>
- 2. https://www.canvas.net/courses/exploring-chemistry
- 3. http://freevideolectures.com/Course/2263/Engineering-Chemistry-I
- 4. http://freevideolectures.com/Course/3001/Chemistry-I
- 5. http://freevideolectures.com/Course/3167/Chemistry-II

6. <u>http://ocw.mit.edu/courses/chemistry/</u>

# Mapping of COs with POs

	<b>PO1</b>	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO
		2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	0	0	0	0	0	2	3	3	0	0	0	1	2
CO2	2	0	0	0	0	0	1	2	2	0	0	0	1	1
CO3	3	0	0	0	0	0	2	3	3	0	0	0	0	0
CO4	3	0	0	0	0	0	3	3	3	0	0	0	0	0
CO5	3	0	0	0	0	0	2	2	3	0	0	0	0	0
Total	14	0	0	0	0	0	10	13	14	0	0	0	2	3
Scaled	3	0	0	0	0	0	2	3	3	0	0	0	1	1
	1	1	1	1 5	1	6 10	) 、 2	11 1	15 \ 2		1	1		

 $1-5 \rightarrow 1, 6-10 \rightarrow 2, 11-15 \rightarrow 3$ 

0-No Relation, 1- Low Relation, 2-Medium Relation, 3-High Relation

COUI	RSE CO	ODE	COURSE NAME	L	Τ	Р	С
X	WP 205	5	WORKSHOP PRACTICES	1	0	2	3
С	Р	Α	WORKSHOP PRACTICES	L	Τ	Р	Η

1 2	2 0		1	0 4 5				
PREREQU	JISITE:							
	Course outcomes:	Dom	ain	Level				
CO1	Summarize the machining methods an		Understa	Ū.				
001	Practice machining operation.	Psychomo		response				
	Defining metal casting process, moulding		Rememb	6				
CO2	methods and relates Casting and Smith	y Psychomor	tor Perception	on				
	applications.							
	Plan basic carpentry and fitting operation		Applying					
CO:	and <b>Practice</b> carpentry and fitting Psychomotor Guided response							
	operations.	1 0	TT 1 (	1'				
CO4	Summarize metal joining operation an		Understa Cuided a	e				
	Practice welding operation.	Psychomot						
CO5	<b>Illustrate</b> the, electrical and electronic basics and <b>Makes</b> appropriate connections	cs Cognitive Psychomot	tor Understa					
05	basics and Makes appropriate connections.	Original	1011					
COURSE	CONTENT							
EXP.NO.	TITLE			CO RELATION				
1	Introduction to machining process			CO1				
2	Plain turning using lathe operation			CO1				
3	Introduction to CNC		CO1					
4	Demonstration of plain turning using CNC	2		CO1				
5	Study of metal casting operation			CO2				
6	Demonstration of moulding process			CO2				
7	Study of smithy operation			CO2				
8	Study of carpentry tools			CO3				
9	Half lap joint – Carpentry			CO3				
10	Mortise and Tenon joint – Carpentry			CO3				
11	Study of fitting tools			CO3				
12	Square fitting			CO3				
13	Triangular fitting			CO3				
14	Study of welding tools			CO4				
15	Square butt joint - welding		CO4					
16	Tee joint – Welding	CO4 CO5						
	17 Introduction to house wiring							
	18         One lamp controlled by one switch							
19	Two lamps controlled by single switch			CO5				
20	Staircase wiring			CO5				
		LECTURE	PRACTICAL	TOTAL				
		15	60	75				

TEXT BOOKS	
1. Workshop Technology I, II, III, by S K Hajra, Choudhary and A K Chaoudhary. Media	Promoters
and Publishers Pvt. Ltd., Bombay	
2. Workshop Technology by Manchanda Vol. I, II, III India Publishing House, Jalandhar.	
REFERENCES	

- 1. Manual on Workshop Practice by K Venkata Reddy, KL Narayana et al; MacMillan India
- 2. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New
- 3. Workshop Technology by B.S. Raghuwanshi, Dhanpat Rai and Co., New Delhi.
- 4. Workshop Technology by HS Bawa, Tata McGraw Hill Publishers, New Delhi.

# **E RESOURCES**

# 1. http://nptel.ac.in/courses/112107145/

	PO1	PO	PSO	PSO										
		2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	0	2	3	0	0	0	0	0	0	0	2	2
CO2	2	1	1	2	2	0	0	0	0	0	0	0	1	1
CO3	1	2	0	3	2	0	0	0	1	0	1	0	1	1
CO4	1	2	0	2	2	0	0	0	0	0	0	0	2	1
CO5	2	2	0	2	2	0	0	0	0	0	0	0	1	2
Total	9	10	1	11	11	0	0	0	14	0	1	0	7	7
Scaled	2	2	1	3	0	0	0	0	3	0	1	0	2	2

Mapping of COs with POs

 $1-5 \rightarrow 1, 6-10 \rightarrow 2, 11-15 \rightarrow 3$ 

0-No Relation, 1- Low Relation, 2-Medium Relation, 3-High Relation

#### **SEMESTER III**

COUI	RSE CODE	COURSE NAME		L	Т	Р	С
X	KEE 301	3	1	1	5		
<b>C:P:</b> <i>A</i>	A	L	Т	Р	СН		
3:1:0			3	1	2	6	
Cours	se Outcomes (2	<b>XEE 301):</b>	Domai	Lev	Level		
<b>CO1</b>	Apply netwo	rk theorems for the analysis of electrical circuits.	Cognit	Ap	Apply		
	Respond net	Psycho	Gu	Guided			
	circuits.			Res	sponse	<b>;</b>	

Ltd. Delhi

CO2	Comparing the transient and steady-state response of R, RL	Cognitive	Understand
	and RLC electrical circuits.	Psychomotor	Perception
	Describe the transient and steady-state response of RL and RC		
	electrical circuits.		
CO3	Analyze circuits in the sinusoidal steady-state (single-phase	Cognitive	Analyze
	and three-phase).	Psychomotor	Mechanism
	Construct and analyze of Single-phase transformer for its		
	Sinusoidal response		
<b>CO4</b>	Laplace transforms analysis of ac circuits.	Cognitive	Analyze
	Construct and analyze of RLC Series and parallel resonance	Psychomotor	Mechanism
	circuits.		
CO5	To Understand the concept of one port and two port network	Cognitive	Understanding
	functions.		
UNIT	- I: NETWORK THEOREMS		09+03
-	position theorem, Thevenin theorem, Norton theorem, Maxi	mum nower f	
· · · ·	rocity theorem, Compensation theorem. Analysis with depende	<u>+</u>	
	and Mesh Analysis. Concept of duality and dual networks.		voltage sources.
	f Experiments		
	ification of KVL and KCL		
	ification of Thevenin theorem		
3.Veri	ification of Norton theorem		
4.Veri	ification of Maximum power transfer theorem		
	- II: SOLUTION OF FIRST AND SECOND ORDER NETW	ORKS	08+03
Soluti	on of first and second order differential equations for Series	and parallel I	R-L. R-C. RL-C
	ts, initial and final conditions in network elements, forced and		
	v state and transient state response.		,
-	f Experiments		
	nsient analysis of Series RL, RC circuits		
	soidal analysis of Series RL, RC circuits		
UNIT	- III: SINUSOIDAL STEADY STATE ANALYSIS		08+03
	sentation of sine function as rotating phasor, phasor diagrams, in		
	t analysis, effective or RMS values, average power and compl		e-phase circuits.
	al coupled circuits, Dot Convention in coupled circuits, Ideal Tran	nsformer.	
	f Experiments		
	asurement of active power for star and delta connected balanced l	oads	
	ification of self, mutual inductance and coefficient of coupling	~~~	
UNIT	- IV: ELECTRICAL CIRCUIT ANALYSIS USING LAPLA	CE	08+03
	TRANSFORMS		
	w of Laplace Transform, Analysis of electrical circuits using l	÷	
-	s, convolution integral, inverse Laplace transform, transformed		
	fer function representation. Poles and Zeros. Frequency response	se (magnitude a	and phase plots),
	and parallel resonances		
	f Experiments		
	C Series and parallel Resonance		

# **UNIT- V: NETWORK FUNCTIONS AND TWO PORT NETWORKS**

12+03

Concepts of complex frequency, Transform impedance, Networks function of one port and two port networks, concepts of poles and zeros, property of driving point and transfer function. Two Port Networks, terminal pairs, Relationship of two port variables, impedance parameters, admittance parameters, transmission parameters and hybrid parameters, interconnections of two port networks.

LECTURE	TUTORIAL	PRACTICAL	TOTAL
45	15	30	90

#### **TEXTBOOKS**

- 1. M. E. Van Valkenburg, "Network Analysis", Prentice Hall, 2006.
- 2. D. Roy Choudhury, "Networks and Systems", New Age International Publications, 1998.
- 3. W. H. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", McGraw Hill Education, 2013.

#### REFERENCES

- 1. C. K. Alexander and M. N. O. Sadiku, "Electric Circuits", McGraw Hill Education, 2004.
- 2. K. V. V. Murthy and M. S. Kamath, "Basic Circuit Analysis", Jaico Publishers, 1999.

#### **E REFERENCES**

- 1. NPTEL: http://nptel.ac.in/courses/108102042/
- 2. MOODLE: http://moodle.cecs.pdx.edu/course/view.php?id=16

#### REFERENCES

- 1. Department Lab Manual
- 2. Sudhakar.A and Shyam Mohan.S.P, "Circuits and Networks Analysis and Synthesis", Fourth edition, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2010.

# Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3									1		1	1	1
CO 2	3									1		1	2	1
CO 3	3	2								1	1	2	3	1
CO 4	3	2			1					1	1	1	3	3
CO 5	3	2			1					1	1	1	2	2
Total	15	6	0	0	2	0	0	0	0	5	3	6	11	8
Scaled	3	2	0	0	1	0	0	0	0	1	1	2	3	2

0-No Relation	1 – Low Relation	2 – Medium Relation	3 – High Relation
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	JRSE CODE	COURSE NAME		L	Т	Р	C	
XEE 302				3	0	1	4	
$\frac{1}{\text{C:P: A = 3:1:0}}$		ANALOG ELECTRONICS	ANALOG FLECTRONICS			P	H	
				L 3	<u>Т</u> 0	2	5	
Cours	se Outcomes (X	EE 302):	Doma	-	Leve			
C01		characteristics of diode and analyze the	Cogni		-	rstand		
001	rectifier circuit		Cogin		Analyze			
recurrer circuit			Psych	Psychomotor		Guided Respons		
CO2	Understand the	characteristics of transistor.	Cogni			rstand	p 0 110 0	
001			0	Psychomotor		anism		
CO3	Understand the	concept of MOSFET and analyze the	Cogni			rstand		
000	circuits and its		-	omotor	Anal			
	encures and his		1 5 9 0 11	onnotor		anism		
CO4	Classify and ex	plain different types of amplifier	Cogni	tive		rstand		
	Clubbily und Ch	plain anterent types of amplifier		omotor		anism		
CO5	Recall and exp	lain linear and non-linear application of	Cogni			rstand		
	OP-AMP	and mean and non-mean application of	0	omotor	Mechanism			
UNIT	- I: DIODE CI	RCHITS	1 Sych	5110101	meet		9+9	
		V characteristics of a diode; review of h	alf-wave an	d full_w	ave rec	tifiere		
•		, clamping and clipping circuits.				, unicis,	Lenc	
	f Experiments	, cramping and enpping encurs.						
	· · · · · · · · · · · · · · · · · · ·	rectifier with and without filter.						
	•	ctifier circuits using with and without filte	r					
3 Cor	duct on experim							
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UNIT Struct biasin Small List o 4. Des	- II: BJT CIRC ure and I-V cha g circuits, curre signal equivaler f Experiments ign of BJT com	ent to test clipping and clamping circuits CUITS racteristics of a BJT; BJT as a switch. B ent mirror; common-emitter, common-b nt circuits, high-frequency equivalent circ mon emitter amplifier using voltage divid	JT as an ar ase and co uits.	mmon (	collecto	or amp	model lifiers	
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UNIT Struct biasin, Small List o 4. Des UNIT MOSI signal equiva List o 5.Plot UNIT	<ul> <li>II: BJT CIRC ure and I-V cha g circuits, curre signal equivaler</li> <li><b>f Experiments</b> ign of BJT com</li> <li>III: MOSFE</li> <li>FET structure at model and bias equivalent circuit.</li> <li><b>f Experiments</b></li> <li>the drain and tra</li> <li>IV: DIFFERE</li> </ul>	nent to test clipping and clamping circuits <b>CUITS</b> racteristics of a BJT; BJT as a switch. B ent mirror; common-emitter, common-b at circuits, high-frequency equivalent circuits mon emitter amplifier using voltage divide <b>T CIRCUITS</b> nd I-V characteristics. MOSFET as a switch ing circuits, common-source, common-g cuits - gain, input and output impedant ansfer characteristics of MOSFET.	JT as an ar ase and co uits. er bias with /itch. MOS ate and com ces, transco	and wit FET as mon-dra onductar	collecto hout fe an amp ain amp nce, hig	or amp edback blifier: blifiers gh free S	mode difiers 8+3 small ; smal quenc 8+3	
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UNIT Struct biasin, Small List o 4. Des UNIT MOSF signal signal equiva List o 5.Plot UNIT Differ operat curren List o 6. Cor	<ul> <li>II: BJT CIRC ure and I-V cha g circuits, curre signal equivaler f Experiments ign of BJT com - III: MOSFE FET structure ar model and bias equivalent circuit.</li> <li>f Experiments the drain and tra - IV: DIFFERE ential amplifier; ional amplifier, it, input offset cu f Experiments nduct experiments</li> </ul>	nent to test clipping and clamping circuits <b>CUITS</b> racteristics of a BJT; BJT as a switch. B ent mirror; common-emitter, common-b at circuits, high-frequency equivalent circuits mon emitter amplifier using voltage divide <b>T CIRCUITS</b> nd I-V characteristics. MOSFET as a switch ing circuits, common-source, common-g cuits - gain, input and output impedant ensfer characteristics of MOSFET. <b>ENTIAL, MULTI-STAGE AND OPER</b> power amplifier; direct coupled multi-sideal op-amp, non-idealities in an op- urrent, slew rate, gain bandwidth product)	JT as an ar ase and co uits. er bias with vitch. MOS ate and com ces, transco ATIONAL stage ampli- amp (Outpu	and wit FET as mon-dra onductar AMPL fier; inte it offset	hout fe an amp ain amp nce, hig	or amp edback plifier: plifiers gh free S ructure	model lifiers <b>8+3</b> small ; smal quenc <b>8+3</b> e of a	
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UNIT Struct biasin, Small List o 4. Des UNIT MOSH signal equiva List o 5.Plot UNIT Differ operat curren List o 6. Cor UNIT Idealiz instruu using	<ul> <li>II: BJT CIRC ure and I-V cha g circuits, curre signal equivaler f Experiments ign of BJT com - III: MOSFE FET structure ar model and bias equivalent circulant circuit.</li> <li>f Experiments the drain and tra - IV: DIFFERE ential amplifier, ional amplifier, it, input offset cu f Experiments nduct experiments - V: LINEAR A zed analysis of mentation ampli an op-amp, vol</li> </ul>	nent to test clipping and clamping circuits <b>CUITS</b> racteristics of a BJT; BJT as a switch. B ent mirror; common-emitter, common-b at circuits, high-frequency equivalent circuits mon emitter amplifier using voltage divid <b>T CIRCUITS</b> and I-V characteristics. MOSFET as a switch ing circuits, common-source, common-g cuits - gain, input and output impedant ansfer characteristics of MOSFET. <b>CNTIAL, MULTI-STAGE AND OPER</b> power amplifier; direct coupled multi- ideal op-amp, non-idealities in an op- ment, slew rate, gain bandwidth product) t on differential amplifier <b>ND NONLINEAR APPLICATIONS (</b> op-amp circuits. Inverting and non-inv fier, integrator, active filter, P, PI and PI Itage regulator, oscillators (Wien bridge	JT as an ar ase and co uits. er bias with vitch. MOS ate and corr ces, transco ATIONAL stage ampli- amp (Outpu DF OP-AM erting amp D controlle e and phase	and wit FET as mon-dra onductar AMPLI fier; inte it offset P lifier, di rs and le e shift).	collecto hout fe an amp ain amp nce, hig IFIER trnal st voltag	edback blifier: blifiers gh free S ructure ge, inp ial am compe og to	mode difiers 8+3 small ; small ; small ; sm	
UNIT Struct biasin, Small List o 4. Des UNIT MOSI signal equiva List o 5.Plot UNIT Differ operat curren List o 6. Cor UNIT Idealiz instruu using Conve	<ul> <li>II: BJT CIRC ure and I-V cha g circuits, curre signal equivaler f Experiments ign of BJT com</li> <li>III: MOSFE FET structure ar model and bias equivalent circuit.</li> <li>f Experiments the drain and tra - IV: DIFFERE ential amplifier; ional amplifier; ional amplifier, it, input offset cu f Experiments nduct experiment -V: LINEAR A zed analysis of mentation ampli an op-amp, voi ersion. Hysteret</li> </ul>	ent to test clipping and clamping circuits <b>CUITS</b> racteristics of a BJT; BJT as a switch. B ent mirror; common-emitter, common-b at circuits, high-frequency equivalent circuits mon emitter amplifier using voltage divid <b>T CIRCUITS</b> nd I-V characteristics. MOSFET as a switch gain, input and output impedant ensfer characteristics of MOSFET. <b>CNTIAL, MULTI-STAGE AND OPER</b> power amplifier; direct coupled multi-sideal op-amp, non-idealities in an op- mernt, slew rate, gain bandwidth product) t on differential amplifier <b>ND NONLINEAR APPLICATIONS (</b> op-amp circuits. Inverting and non-inv fier, integrator, active filter, P, PI and PI	JT as an ar ase and co uits. er bias with vitch. MOS ate and corr ces, transco ATIONAL stage ampli- amp (Outpu DF OP-AM erting amp D controlle e and phase	and wit FET as mon-dra onductar AMPLI fier; inte it offset P lifier, di rs and le e shift).	collecto hout fe an amp ain amp nce, hig IFIER trnal st voltag	edback blifier: blifiers gh free S ructure ge, inp ial am compe og to	mode lifiers <b>8+3</b> small ; small ; small quenc <b>8+3</b> e of a ut bia <b>9+1</b> plifier ensato Digita	

7.Design of Phase shift and Wien bridge oscillators using OP-AMP.

8. Conduct experiment on Inverting, Non inverting amplifier using OP-AMP.

9.Conduct experiment on astable and monostable multivibrator using OP-AMP.

10.Conduct experiment on integrator and differentiator circuit using OP-AMP.

11.Conduct experiment on Schmitt trigger circuit using OP-AMP.

LECTURE	PRACTICAL	TOTAL
45	30	75

# TEXTBOOKS

1. A. S. Sedra and K. C. Smith, "Microelectronic Circuits", New York, Oxford University Press, 1998.

2. J. V. Wait, L. P. Huelsman and G. A. Korn, "Introduction to Operational Amplifier theory and applications", McGraw Hill U. S., 1992.

3. J. Millman and A. Grabel, "Microelectronics", McGraw Hill Education, 1988.

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1. P. Horowitz and W. Hill, "The Art of Electronics", Cambridge University Press, 1989.

- 2. P. R. Gray, R. G. Meyer and S. Lewis, "Analysis and Design of Analog Integrated Circuits", John Wiley & Sons, 2001.
- 3. Department Lab Manual.

# **E REFERENCES**

1. <u>www.nptel.ac.in</u>.

# Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3									1		1	2	2
CO 2	3									1		1	2	2
CO 3	3	2								1	1	2	2	2
CO 4	2	2			1					1	1	1	2	2
CO 5	3	1			2					1	1	1	2	2
Total	14	5	0	0	3	0	0	0	0	5	3	6	10	10
Scaled	3	1	0	0	1	0	0	0	0	1	1	2	2	2

0 –No Relation 1 – Low Relation 2 – Medium Relation 3 – High Relation

COURS	E CODE	COURSE NAME	L	Т	Р	С		
XEE	2 303			3	1	1	5	
C:P: A	= 3:1:0	<b>ELECTRICAL MACHINES - I</b>			Т	Р	Η	
			3	1	2	6		
Course Outcomes (XEE 303):				Domain		el		
C01	Understa	nd the operation of DC machines.	Cognitive		Und	Understand		
			Psych	nomotor	Perc	Perception		
<b>CO2</b> Understand the winding concepts of DC machine.			Cogn	gnitive Understa		erstand		
			Psych	nomotor	Con	plex O	vert	

			Response
CO3	Understand the motoring and generating concepts of DC	Cognitive	Understand
	machine.	Psychomotor	Set
CO4	Analyse single phase and three phase transformers	Cognitive	Analyse
	circuits.	Psychomotor	Set
CO5	Understand the various loss in magnetic circuits	Cognitive Psychomotor	Understand Set

# UNIT -I: INTRODUCTION TO DC MACHINES

Basic construction of a DC machine, magnetic structure - stator yoke, stator poles, pole-faces or shoes, air gap and armature core, visualization of magnetic field produced by the field winding excitation with armature winding open, air gap flux density distribution, flux per pole, induced EMF in an armature coil. **List of Experiments** 

1. Study of D.C. Motor Starters.

#### **UNIT- II: DC MACHINES – ARMATURE AND WINDING**

Armature winding and commutation – Elementary armature coil and commutator, lap and wave windings, construction of commutator, linear commutation Derivation of back EMF equation, armature MMF wave, derivation of torque equation, armature reaction, air gap flux density distribution with armature reaction.

#### **UNIT- III: DC MACHINE - MOTORING AND GENERATION**

Armature circuit equation for motoring and generation, Types of field excitations – separately excited, shunt and series. Open circuit characteristic of separately excited DC generator, back EMF with armature reaction, voltage build-up in a shunt generator, critical field resistance and critical speed. V-I characteristics and torque-speed characteristics of separately excited, shunt and series motors. Speed control through armature voltage. Losses, load testing and back-to-back testing of DC machines

#### **List of Experiments**

- 2. Open Circuit Characteristics (OCC) and load Characteristics of D.C self-excited generator.
- 3. Load characteristics of D.C shunt generator
- 4. Load characteristics of D.C. shunt motor.
- 5. Load characteristics of D.C series motor.
- 6. Speed control of D.C shunt motor.

# **UNIT -IV: TRANSFORMERS AND TEST**

10+3+6

9+3+6

9+3+6

8+3+6

Principle, construction and operation of single-phase transformers, equivalent circuit, phasor diagram, voltage regulation, transformer - construction, types of connection and their comparative features, Parallel operation of single-phase and three-phase transformers, Phase conversion - Scott connection, three-phase to six-phase conversion, Tap-changing transformers losses and efficiency Testing - open circuit and short circuit tests, polarity test, back-to-back test- separation of hysteresis and eddy current losses

# **List of Experiments**

7.Load test on single-phase transformer.

8. Open circuit and short circuit tests on single phase transformer.

Autotransformers - construction, principle, applications and comparison with two winding transformer, Magnetizing current, effect of nonlinear B-H curve of magnetic core material, harmonics in magnetization current.

# **UNIT -V: AUTOTRANSFORMERS**

9+3+6

Autotransformers - construction, principle, applications and comparison with two winding transformer, Magnetizing current, effect of nonlinear B-H curve of magnetic core material, harmonics in magnetization current.

	LECTURE	TUTORIAL	PRACTICAL	TOTAL
	45	15	30	90
		10		
Course Outcomes (XEE 304):			Domain	Level

#### TEXTBOOKS

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.

2. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2004. **REFERENCES** 

1. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.

2. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.

3. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.

# Mapping of COs with POs

	PO	PO	PO	PO	РО	PO	PO	PO	PO	PO	РО	PO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	2	2	2	1				1			1	1	0
CO 2	3	-	2	1				1				1		1
CO 3	3			1				1			1			1
CO 4	3	2	2	2	1		1			1		1		1
CO 5	3			1						1				1
Total	15	4	6	7	2	0	1	2	1	2	1	3	1	4
Scaled	3	1	2	2	1	0	1	1	1	1	1	1	1	1

0 – No Relation 1 - Low Relation 2 - Medium Relation 3 - High Relation

Maxwell's e Force on a c materials, M UNIT -V: E Derivation c in Phasor fo	ifferential current element, Force between differential curren agnetization and permeability, Magnetic circuits, inductances <b>LECTROMAGNETIC WAVES</b> If Wave Equation, Uniform Plane Waves, Maxwell's equation m, Plane waves in free space and in a homogenous material. ane waves in lossy dielectrics, Propagation in good con <b>LECTURE</b> 45	and mutual i in Phasor for Wave equation ductors, Skin	nductances. 9+3 rm, Wave equatio on for a conductin n effect. Poyntin
Maxwell's e Force on a c materials, M UNIT -V: E Derivation o in Phasor for medium, Pl	agnetization and permeability, Magnetic circuits, inductances <b>LECTROMAGNETIC WAVES</b> If Wave Equation, Uniform Plane Waves, Maxwell's equation m, Plane waves in free space and in a homogenous material. ane waves in lossy dielectrics, Propagation in good con	and mutual i in Phasor for Wave equation ductors, Skin	nductances. 9+3 rm, Wave equatio on for a conductin n effect. Poyntin
Maxwell's e Force on a c <u>materials, M</u> UNIT -V: E Derivation o in Phasor fo medium, Pl	agnetization and permeability, Magnetic circuits, inductances <b>LECTROMAGNETIC WAVES</b> f Wave Equation, Uniform Plane Waves, Maxwell's equation m, Plane waves in free space and in a homogenous material.	and mutual i in Phasor for Wave equation	nductances. 9+3 rm, Wave equatio on for a conductin
Maxwell's e Force on a c materials, M UNIT -V: E Derivation c in Phasor fo	agnetization and permeability, Magnetic circuits, inductances <b>LECTROMAGNETIC WAVES</b> f Wave Equation, Uniform Plane Waves, Maxwell's equation m, Plane waves in free space and in a homogenous material.	and mutual i in Phasor for Wave equation	nductances. 9+3 rm, Wave equatio on for a conductin
Maxwell's e Force on a c materials, M UNIT -V: E Derivation c	agnetization and permeability, Magnetic circuits, inductances LECTROMAGNETIC WAVES f Wave Equation, Uniform Plane Waves, Maxwell's equation	and mutual i	nductances. 9+3 rm, Wave equatio
Maxwell's e Force on a c materials, M UNIT -V: E	agnetization and permeability, Magnetic circuits, inductances LECTROMAGNETIC WAVES	and mutual i	nductances.
Maxwell's e Force on a c materials, M	agnetization and permeability, Magnetic circuits, inductances		nductances.
Maxwell's e Force on a c			•
U			
	quations, Motional Electromotive forces. Boundary Condit is	1	· U
•	etic induction, Displacement current, Point form of Maxwe		-
	Law, Ampere Law, Magnetic flux and magnetic flux densit Steady magnetic fields produced by current carrying c		
EQUATIO		0 1	1 374 3 4
	STATIC MAGNETIC FIELDS, TIME VARYING FIELD	S AND MAX	XWELL'S 9+3
-	d Poisson's equations.		
	's equation, Laplace's equation, Solution of Laplace and Po	isson's equati	ion, Application of
<b>•</b>	ctric materials. Permittivity of dielectric materials, Capacita	· · · · · · · · · · · · · · · · · · ·	
	current density, Ohms Law in Point form, Continuity of c	urrent, Boun	dary conditions of
	CONDUCTORS, DIELECTRICS AND CAPACITANCE		9+3
Energy dens			Ustatic Ellergy all
<u> </u>	butions. Gauss law and its applications. Absolute Electric of potential differences for different configurations. Electric of	1 ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) (	
	aw, Electric field intensity, Electrical field due to point char	•	
	TATIC ELECTRIC FIELD		9+3
	rems of vectors. Conversion of a vector from one coordinate		•
• · · · · · · · · · · · · · · · · · · ·	n, partial differentiation, integration, vector operator del, gr	÷	
	ee orthogonal coordinate systems (rectangular, cylindrical		· · · ·
	EVIEW OF VECTOR CALCULUS ra-addition, subject traction, components of vectors, scalar and	d vector mul	tiplications triple
	configuration using boundary condition.	20 <b>5</b>	
CO5	Recall the concept of magnetization and magnetic field	Cognitive	Understanding
	using Maxwell's equation.	-	Understanding
<b>CO4</b>	laws and outline time varying electric and magnetic fields	Cognitive	Remembering
	Recall the magnetic field configuration using Different		
CO3	conditions, Poissons and Laplace equation.	Cognitive 3	Uhderstanding
	<b>3:0:0</b> ELECTROMAGNETIC FIELDS Define the knowledge of electrostatics using, boundary	L	T P H
	COURSE NAME To understand the concept of static electric field for simple configuration using gauss and Coulombs law. 3:0:0 ELECTROMAGNETIC FIELDS	Cognitive 3	Uhderstandin4g
	coordinate system.	0	Understanding
CO1 COURSE COREE 3	To understand the basics of vector and outline different	Cognitive	Remembering

2. A. Pramanik, "Electromagnetism - Theory and applications", PHI Learning Pvt. Ltd, New Delhi, 2009.

3. A. Pramanik, "Electromagnetism-Problems with solution", Prentice Hall India, 2012.4. G. W. Carter, "The electromagnetic field in its engineering aspects", Longmans, 1954.

# REFERENCES

- 1. W. J. Duffin, "Electricity and Magnetism", McGraw Hill Publication, 1980.
- 2. W. J. Duffin, "Advanced Electricity and Magnetism", McGraw Hill, 1968.
- 3. E. G. Cullwick, "The Fundamentals of Electromagnetism", Cambridge University Press, 1966.
- 4. B. D. Popovic, "Introductory Engineering Electromagnetics", Addison-Wesley Educational Publishers, International Edition, 1971.
- 5. W. Hayt, "Engineering Electromagnetics", McGraw Hill Education, 2012.

# REFERENCES

1. NPTEL: http://nptel.ac.in/courses

	PO 1	PO 2	PO 3	PO 4	РО 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	-	1	-	-	-	-	-	1	-	1	1	1
CO2	1	2	-	1	-	-	-	-	-	-	1	-	2	1
CO3	1	2	-	-	-	-	-	-	-	-	-	1	1	2
UNIT-	I: TRA	ANSM	ISSIO	N LIN	E PAF	RAME	TERS						0	9
CO4	1	3	-	-	-	-	-	-	-	-	-	-	2	2
CO5	1	2	1	-	-	-	-		-	-	-	1	1	1
Total	6	11	1	3	0	0	0	0	0	1	1	3	7	7
Scaled	2	3	1	1	0	0	0	0	0	1	1	1	2	2

Mapping of COs with POs

 $0 - No \ Relation \qquad 1 - Low \ Relation \qquad 2 - Medium \ Relation \ 3 - High \ Relation$ 

COU	RSE CODE	COURSE NAME		L	r	Г	Р	С
X	EE 305		3 0 0					3
<b>C:P:</b> <i>A</i>	4	TRANSMISSION AND DISTRIBUTION		L T P				Η
3:0:0			3 0 0				3	
Cours	e Outcomes (	XEE 305):	Dom	ain		Le	vel	
CO1	Distribution and three ph	major components of Transmission and Systems (TDS). <b>Classify</b> different types of single ase transmission line parameters.	Co	ognitive			derstan derstan	$\mathcal{O}$
CO2	Outline the and its perfo	types of transmission line efficiency calculations rmance	Co	gnitive		Un	derstan	ding
CO3	-	different types of insulators and <b>solve</b> for stress verhead lines.	Co	ognitive			derstan plying	ding
<b>CO4</b>	Interpret di	fferent type's underground cables.	Co	gnitive		Un	derstan	ding
CO5	Summarize distribution	the latest technologies in the field of systems.	Сс	ognitive		Un	derstan	ding

Structure of electric power system: Various levels such as generation, transmission and distribution; Resistance, Inductance and Capacitance calculations – Single-phase and three-phase lines – double circuit lines – effect of earth on transmission line capacitance. **UNIT- II: PERFORMANCE OF TRANSMISSION LINES** 09 Regulation and efficiency – Tuned power lines, Power flow through a transmission line – Power circle diagrams, Introduction to Transmission loss and Formation of corona – critical voltages – effect on line performance - travelling waveform phenomena. **UNIT- III: MECHANICAL DESIGN OF OVERHEAD LINES** 09 Line supports – Insulators, Voltage distribution in suspension insulators – Testing of insulators – string efficiency – Stress and sag calculation – effects of wind and ice loading. **UNIT -IV: UNDERGROUND CABLES** 09 Comparison with overhead line – Types of cables – insulation resistance – potential gradient capacitance of single-core and three-core cables. **UNIT- V: DISTRIBUTION SYSTEM** 09 General aspects - Kelvin's Law - A.C. distribution - Single-phase and three phase - Techniques of voltage control and power factor improvement - Introduction to Distribution loss - Recent trends in transmission and distribution systems LECTURE TUTORIAL TOTAL 45 0 45 TEXTBOOKS 1.D.P. Kothari and I.J. Nagrath, 'Power System Engineering', Tata McGraw-Hill, 2<sup>nd</sup> Edition, 2008. 2. B.R.Gupta, 'Power System Analysis and Design', S.Chand, New Delhi, 2003. 3. S.N. Singh, 'Electric Power Generation, Transmission and Distribution', Prentice Hall India Pvt. Ltd, 2002. REFERENCES 1. Luces M.Fualkenberry, Walter Coffer, 'Electrical Power Distribution and Transmission', Pearson Education, 1996. 2. Hadisaddak, 'Power System Analysis,' Tata McGraw Hill Publishing Company', 2003 3. Central Electricity Authority (CEA), 'Guidelines for Transmission System Planning', New Delhi 4. Tamil Nadu Electricity Board Handbook', 2012. **E REFERENCES** 1. NPTEL, Power System Generation, Transmission and Distribution Prof. D. P. Kothari Center for Energy Studies Indian Institute of Technology, Delhi. Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	3								1		2	2	1
CO2	1	3	1		1							1	3	1
CO3	1			1	1					1			2	1
<b>CO4</b>	1	2									1	1	2	1
CO5	1	2										1	2	1
Total	5	10	1	1	2	0	0	0	0	2	1	5	11	5
Scaling	2	3	1	1	1	0	0	0	0	1	1	2	3	2

0 - No Relation 1 - Low Relation 2 - Medium Relation 3 - High Relation

CO	OURSE CODE	COURSE NAME		C			
	XEE 401	MATHEMATICS – III		3	1	0	4
C:P	<b>P:</b> A = 3.5:2.5:2.5	(PROBABILITY AND STATISTI	CS)	L T P C			
				4			
Cours	se Outcomes (XPS	401):	Domain		L	.evel	
CO1	-	al probability, independent events; <b>find</b> d Moments of Discrete random variables es.	Cognitiv	e			tanding nbering
CO2	conditional density	function, Marginal density function, function and to <b>define</b> density function tribution functions normal, exponential utions.					nbering
CO3	and Normal and t	tistical parameters of Binomial, Poisson o find correlation, regression and Rank ient of two variables. as and Kurtosis.	Cognitiv Psychom		C	Unders Huided Lespor	-
CO4	<b>Explain</b> large same of proportion, sin	ple test for single proportion, difference ngle mean, difference of means and ard deviations with simple problems.	Cognitive Understar				
CO5	mean and correlati	nple test for single mean, difference of on coefficients, variance test, chi square	Cognitiv				standing
	test with simple pro	oblems.	Affective	e	R	eceiv	ing

# Learning Objectives

- 1. Appreciate the importance of probability and statistics in computing and research
- 2. Develop skills in presenting quantitative data using appropriate diagrams, tabulations and summaries
- 3. Use appropriate statistical method in the analysis of simple datasets.
- 4. Interpret and clearly present output from statistical analyses in a clear concise and understandable

manner

5. The main objective of this course is to provide students with the foundations of probabilities and statistical analysis mostly used in varied applications in engineering and science like disease modeling, climate prediction and computer networks etc.

UNIT - I: BASIC PROBABILITY	12
Probability spaces, conditional probability, independence; Discrete random variables, Independence	dent
random variables, the multinomial distribution, Poisson approximation to the binomial distribut	tion,
infinite sequences of Bernoulli trials, sums of independent random variables; Expectation	
Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebysh	
Inequality	
	12
DISTRIBUTIONS	
Continuous random variables and their properties, distribution functions and densities, norr	mal,
exponential and gamma densities. Bivariate distributions and their properties, distribution of su	ums
and quotients, conditional densities, Bayes' rule.	
UNIT - III: BASIC STATISTICS	12
Measures of Central tendency: Moments, skewness and Kurtosis - Probability distribution	ons:
Binomial, Poisson and Normal - evaluation of statistical parameters for these three distribution	ions,
Correlation and regression – Rank correlation	
UNIT- IV: APPLIED STATISTICS	12
Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas	and
more general curves. Test of significance: Large sample test for single proportion, difference	
more general carves. Test of significance. Dange sample test for single proportion, anterenet	e of
proportions, single mean, difference of means, and difference of standard deviations.	e of
	12 re of
proportions, single mean, difference of means, and difference of standard deviations.	12
proportions, single mean, difference of means, and difference of standard deviations. UNIT-V: SMALL SAMPLES	12
proportions, single mean, difference of means, and difference of standard deviations.         UNIT-V: SMALL SAMPLES         Test for single mean, difference of means and correlation coefficients, test for ratio of variance of variance of means and correlation coefficients, test for ratio of variance of var	<u>12</u> ces -

# Mapping of COs Vs GAs

#### **TEXTBOOKS**

- 1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 43<sup>rd</sup> Edition, 2015.
- 2. N.P. Bali and M. Goyal, "A text book of Engineering Mathematics", Laxmi Publications, 2010.
- 3. Veerarajan T., "Probability, Statistics and Random processes", Tata McGraw-Hill, New Delhi, 2010.

#### REFERENCES

- 1. P. G. Hoel, S. C. Port and C. J. Stone, "Introduction to Probability Theory", Universal Book Stall, 2003.
- 2. S. Ross, "A First Course in Probability", Pearson Education India, 2002.

3. W. Feller, "An Introduction to Probability Theory and its Applications", Vol. 1, Wiley, 1968.

4. E. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 2006.

ΕI	REFERI	ENCES										
	nptel											
		•		•			mar, De	epartme	nt of Ma	thematic	s, IIT Kha	aragpur.
r – L		nptel.ac	r		r	<b>* *</b> ′						
	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
CO 1	3	2	1						1	1		1
CO 2	3	2	1						1	1		1
CO 3	3	2	1	1					1	1		1
CO 4	3	2	1	1	1	1			1	1	1	1
CO 5	3	2	1	1	1	1	1		1	1	1	1
Total	15	10	5	3	2	2	1		5	5	2	5
Scaled	3	2	1	1	1	1	1		1	1	1	1

0 - No Relation, 1 - Low Relation, 2 - Medium Relation, 3 - High Relation

COURSE CODE	COURSE NAME	L	Т	Р	С
XEE 402	DIGITAL ELECTRONICS	3	0	1	4

C:P: A			L	Т	P	CH
2:1:0			3	0	2	5
Course	Outcomes (XEE 402):	Domain		Lev	<b>vel</b>	
CO1	To Understand numerical values in various number	Cognitive		Une	dersta	Inding
	systems and show number conversions between different	Psychomo	otor	Gui	ded	
	number Systems.			Res	pons	e
CO2	To Analyze Boolean functions and minimization	Cognitive		Ana	alyze	
	techniques using k –maps and postulates and theorems of	Psychomo	otor	Per	ceptio	on
	Boolean Algebra, minimization of Boolean functions using					
	basic laws.					
CO3	To Apply Logic gates and their applications and construct	Cognitive		Ap	•	
	the simple adders and subtractors using logic gates.	Psychomo	otor	Me	chani	sm
CO4	To Understand the process of Analog to Digital conversion	Cognitive				inding
	and its applications.	Psychomo	otor	Me	chani	sm
~		~				
CO5	To Understand the process of Digital to Analog conversion	Cognitive				inding
	and its applications.	Psychomo	otor	Me	chani	sm
						1
						<b>^ ^</b>
	I: FUNDAMENTALS OF DIGITAL SYSTEMS AND LO					
Digital s	signals, digital circuits, AND, OR, NOT, NAND, NOR and I	Exclusive-O	DR op	eratio		Boolea
Digital s algebra,	signals, digital circuits, AND, OR, NOT, NAND, NOR and I examples of IC gates, number systems-binary, signed binary,	Exclusive-C octal hexa	OR op decim	eratio al nu	mber,	Boolea binar
Digital s algebra, arithmet	signals, digital circuits, AND, OR, NOT, NAND, NOR and I examples of IC gates, number systems-binary, signed binary, tic, one's and two's complements arithmetic, codes, error	Exclusive-C octal hexa	OR op decim	eratio al nu	mber,	Boolea binar
Digital s algebra, arithmet characte	signals, digital circuits, AND, OR, NOT, NAND, NOR and I examples of IC gates, number systems-binary, signed binary, tic, one's and two's complements arithmetic, codes, error eristics of digital ICs, digital logic families.	Exclusive-C octal hexa	OR op decim	eratio al nu	mber,	Boolean binar
Digital s algebra, arithmet characte List of l	signals, digital circuits, AND, OR, NOT, NAND, NOR and I examples of IC gates, number systems-binary, signed binary, tic, one's and two's complements arithmetic, codes, error eristics of digital ICs, digital logic families. Experiments	Exclusive-C octal hexa	OR op decim	eratio al nu	mber,	Boolean binar
Digital s algebra, arithmet characte List of l 1.Verifie	signals, digital circuits, AND, OR, NOT, NAND, NOR and I examples of IC gates, number systems-binary, signed binary, tic, one's and two's complements arithmetic, codes, error eristics of digital ICs, digital logic families. <b>Experiments</b> cation and study of logic gates.	Exclusive-C octal hexa	OR op decim	eratio al nu	mber,	Boolean binar
Digital s algebra, arithmet characte <b>List of l</b> 1.Verifie 2. Binar	signals, digital circuits, AND, OR, NOT, NAND, NOR and I examples of IC gates, number systems-binary, signed binary, tic, one's and two's complements arithmetic, codes, error eristics of digital ICs, digital logic families. <b>Experiments</b> cation and study of logic gates. ry to Gray and Gray to binary code converters.	Exclusive-C octal hexa	OR op decim	eratio al nu	mber,	Boolean binar
Digital s algebra, arithmet characte <b>List of l</b> 1.Verifio 2. Binar 3.Excess	signals, digital circuits, AND, OR, NOT, NAND, NOR and I examples of IC gates, number systems-binary, signed binary, tic, one's and two's complements arithmetic, codes, error eristics of digital ICs, digital logic families. <b>Experiments</b> cation and study of logic gates. by to Gray and Gray to binary code converters. s -3 to BCD and vice-versa code converters.	Exclusive-C octal hexa	OR op decim	eratio al nu	mber,	Boolean binar codes
Digital s algebra, arithmet characte List of l 1.Verifie 2. Binar 3.Excess UNIT -	signals, digital circuits, AND, OR, NOT, NAND, NOR and I examples of IC gates, number systems-binary, signed binary, tic, one's and two's complements arithmetic, codes, error eristics of digital ICs, digital logic families. <b>Experiments</b> cation and study of logic gates. ry to Gray and Gray to binary code converters. s -3 to BCD and vice-versa code converters. <b>II: COMBINATIONAL DIGITAL CIRCUITS</b>	Exclusive- <b>(</b> octal hexa detecting	OR op decima and	eratic al nui corre	mber, cting	binary codes
Digital s algebra, arithmet characte <b>List of l</b> 1.Verifie 2. Binar 3.Excess UNIT - Standard using De-Mul	signals, digital circuits, AND, OR, NOT, NAND, NOR and I examples of IC gates, number systems-binary, signed binary, tic, one's and two's complements arithmetic, codes, error eristics of digital ICs, digital logic families. <b>Experiments</b> cation and study of logic gates. ry to Gray and Gray to binary code converters. s -3 to BCD and vice-versa code converters. <b>II: COMBINATIONAL DIGITAL CIRCUITS</b> d representation for logic functions, K-map representation, an K-map, minimization of logical functions. Don't tiplexer/Decoders, Adders, Subtractors, ALU, elementary A	Exclusive-C octal hexac detecting d simplific care con ALU desig	DR op decima and and and and ition n, poj	eratic al nur corre of log ns, pular	mber, cting gic fu Mult MSI	9+6 soolear binar codes 9+6 nction iplexer chips
Digital s algebra, arithmet characte <b>List of I</b> 1.Verific 2. Binar 3.Excess <b>UNIT -</b> Standard using De-Muli digital c	signals, digital circuits, AND, OR, NOT, NAND, NOR and I examples of IC gates, number systems-binary, signed binary, tic, one's and two's complements arithmetic, codes, error eristics of digital ICs, digital logic families. <b>Experiments</b> cation and study of logic gates. by to Gray and Gray to binary code converters. s -3 to BCD and vice-versa code converters. <b>II: COMBINATIONAL DIGITAL CIRCUITS</b> d representation for logic functions, K-map representation, an K-map, minimization of logical functions. Don't	Exclusive-C octal hexac detecting d simplific care con ALU desig	DR op decima and and and and ition n, poj	eratic al nur corre of log ns, pular	mber, cting gic fu Mult MSI	soolean binary codes 9+6 nction iplexen chips
Digital s algebra, arithmet characte List of J 1.Verifio 2. Binar 3.Excess UNIT - Standard using De-Mult digital c of funct	signals, digital circuits, AND, OR, NOT, NAND, NOR and I examples of IC gates, number systems-binary, signed binary, tic, one's and two's complements arithmetic, codes, error eristics of digital ICs, digital logic families. <b>Experiments</b> cation and study of logic gates. by to Gray and Gray to binary code converters. s -3 to BCD and vice-versa code converters. <b>II: COMBINATIONAL DIGITAL CIRCUITS</b> d representation for logic functions, K-map representation, an K-map, minimization of logical functions. Don't tiplexer/Decoders, Adders, Subtractors, ALU, elementary A comparator, parity checker/generator, code converters, priority ion realization.	Exclusive-C octal hexac detecting d simplific care con ALU desig	DR op decima and and and and ition n, poj	eratic al nur corre of log ns, pular	mber, cting gic fu Mult MSI	9+6 soolear binar codes 9+6 nction iplexer chips
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Digital s algebra, arithmet characte List of I 1. Verifie 2. Binar 3. Excess UNIT - Standard using De-Muli digital c of functi List of I 3. Imple 4. Imple UNIT - A 1-bit r flip-flop design u List of I 5.Design	signals, digital circuits, AND, OR, NOT, NAND, NOR and I examples of IC gates, number systems-binary, signed binary, tic, one's and two's complements arithmetic, codes, error eristics of digital ICs, digital logic families. <b>Experiments</b> cation and study of logic gates. y to Gray and Gray to binary code converters. s -3 to BCD and vice-versa code converters. <b>II: COMBINATIONAL DIGITAL CIRCUITS</b> d representation for logic functions, K-map representation, an K-map, minimization of logical functions. Don't tiplexer/Decoders, Adders, Subtractors, ALU, elementary <i>A</i> comparator, parity checker/generator, code converters, priority ion realization. <b>Experiments</b> ementation and verification of Multiplexers and Demultiplexer ementation and verification of Encoders and Decoders using lo <b>III: SEQUENTIAL CIRCUITS AND SYSTEMS</b> memory, the circuit properties of Bistable latch, JK, SR, D and os, shift registers, applications of shift registers, Asynchronot using flip flops, special counter IC's, applications of counters. <b>Experiments</b> n and verify operation of Half / Full adder.	Exclusive-C octal hexac detecting d simplific care con ALU desig y encoders, using logic gic gates.	DR op decima and of ation of ndition n, pop decoor c gates	of log of log of log os, ap	mber, cting gic fu Mult Q-M	9+6 soolea binar codes 9+6 nction iplexen chips metho
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Digital to analog converters: weighted resistor/converter, R-2R Ladder DAC, specifications for D/A converters, examples of DAC ICs, sample and hold circuit, analog to digital converters: quantization and encoding, parallel comparator ADC, successive approximation ADC, specifications of ADC, example of ADC ICs.

#### **List of Experiments**

8. Verification of state tables of RS, JK, T and D flip flops using NAND and NOR gates.

UNIT-V: SEMICONDUCTOR MEMORIES AND PROGRAMMABLE LOGIC DEVICES

Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, ROM, RAM, content addressable memory (CAM), charge de coupled device memory (CCD), commonly used memory chips, ROM as a PLD, PLA, PAL, CPLDS, and FPGA.

9+3

# **List of Experiments**

9. Shift registers and Counters.

LECTURE	TUTORIAL	PRACTICAL	TOTAL
45	0	30	75

# **TEXTBOOKS**

1. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.

2. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.

3. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.

# REFERENCES

- 5. Taub and Schilling, 'Digital Integrated Circuits', McGraw Hill, 2002.
- 6. Samuel C. Lee "Digital Circuits and Logic Designs" Prentice Hall of India; 2000.
- 7. Fletcher, W.I., 'An Engineering Approach to Digital Design', Prentice Hall of India, 2002.
- 8. Anand Kumar, Fundamental of Digital circuits, PHI 2003.

# **E REFERENCES**

- 1. NPTEL, Digital Logic Circuits, Prof. S.Srinivasan, IIT Madras.
- 2. NPTEL, Digital Logic Circuits, Prof. D. Roychoudhury, IIT Kharagpur.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	2	1	3	-	-	1	1	1	-	1	-	2	2	1
CO 2	3	2	1	-	-	2	0	2	1	-	-	2	1	2

CO 3	2	2	1	-	-	1	2	2	1	1	-	1	2	2
<b>CO 4</b>	2	2	3	-	-	1	1	1	-	-	1	1	1	2
<b>CO 5</b>	3	2	2	-	-	0	1	1	1	1	1	2	2	2
Total	12	9	10	I	-	5	5	7	3	3	2	8	8	9
Scaled	3	2	2	0	0	1	1	2	1	1	1	2	2	2

 $0 - No \ Relation \qquad 1 - Low \ Relation \qquad 2 - Medium \ Relation \qquad 3 - High \ Relation$ 

COU	RSE CODE	COURSE NAME		L	Т	Р	С
X	<b>EE 403</b>			3	0	1	4
<b>C:P:</b> <i>A</i>	A	POWER ELECTRONICS		L	Т	Р	Н
2:1:0				3	0	2	5
Cours	se Outcomes (	XEE 403):	Dom	ain		Leve	el
CO1	To Understan	nd the structure, operation and characteristics of	Cognitiv	'e	Uno	derstai	nding
	power switch	ing devices.	Psychom	notor	Res	ponse	
CO2	Determine th	ne operation, characteristics and performance	Cognitiv	'e	Uno	derstar	nding
	parameters o	f controlled rectifiers.	Psychon	notor	Me	chanis	m
CO3	Analysis the	operation of DC - DC choppers.	Cognitiv	'e	Ana	alyzing	2

			ů.	23		75
		45	0	30	1	
	<u> </u>	ECTURE	TUTORIA	L PRACTIC	AL T	OTAL
	ini project: Design of basic power con	werter circui	ts.			
	igle phase cycloconverter.					
	of Experiments gle phase AC voltage controller using	SCR / TRIA	LC C			
	converters.					
	lown cycloconverter – Single pha	se to singl	e phase and	Single phase	to Three	e phase
	e-phase and three phase AC voltage					
UNIT	<b>C - V:AC VOLTAGE CONTROLL</b>	ERS				9+6
8.Seri	es Inverter/ Parallel Inverter					
	gle phase IGBT PWM inverter.					
	f Experiments					
-	ar sinusoidal modulation and unipolar niques- Current Source Inverters.	sinusoidal r	nodulation, N	Iodulation Index	( <b>-</b>	PWM
0	e phase, Three phase voltage source					
UNIT	<b>C – IV: INVERTERS</b>					9+6
Load List o 5.BU( 6.IGB	s of Choppers, Class A to E, step-up a commutated choppers –Introduction t of Experiments CK- BOOST converter using MOSFE T based choppers	o Resonant o		Analysis of Vo.	ltage, Cur	
	<b>C – III: DC TO DC CHOPPERS</b>				. ~	9+6
		ui K, KL 10a	u			0.6
	of Experiments gle phase fully controlled rectifier wit	th R RI loa	ł			
highly	y inductive load.	rince phase	iun onugo u			
-	e phase half-wave and full-wave thyr R-load and highly inductive load –					
	<b>C – II: THYRISTOR RECTIFIERS</b>					9+3
	racteristics of IGBT					0.2
	racteristics of MOSFET					
	racteristics of SCR					
	es, SCR, TRIAC, power BJT, power M <b>f Experiments</b>	MOSFET and	IGBI. Ingg	ering and Com	nutation C	ircuits.
	w on Semiconductor devices – I-V					
UNII	<b>C – I: POWER SWITCHING DEVI</b>	CES				9+9
	controllers.	ana		Psychomotor	Mechar	T
CO5	To Understand the concept of vario	ous types of	AC voltage	Cognitive	Underst	U
04	suitable PWM techniques.	inventers a	iu inici uic	Psychomotor	Mechar	
CO4	Analysis the operation of various	inverters a	nd infer the	Psychomotor Cognitive	Mechar Analyzi	

2009.

2. Singh, M.D and Kanchandani, 'Power Electronics', Tata McGraw Hill & Hill publication Company Ltd New Delhi, 2009.

## REFERENCES

- 1. Dubey, G.K., Doradia, S.R., Joshi, A. and Sinha, R.M., 'Thyristorised Power Controllers', Wiley Eastern Limited, 1986.
- 2. Lander, W., 'Power Electronics', McGraw Hill and Company, Third Edition, 2009.
- 3. Sen.P.C., 'Power Electronics', Tata McGraw-Hill Publishing Co. Ltd., New Delhi, 2005.
- 4. Joseph Vithayathil, 'Power Electronics', McGraw-Hill New York, 1996.
- 5. Erickson, R.W and Maksimovic, D., 'Fundamentals of Power Electronics', Springer Science & Business Media, 2007.
- 6. Umanand, L., 'Power Electronics: Essentials and Applications', Wiley India, 2009.
- 7. Department Laboratory Manual

#### **E REFERENCES**

- 1. Lecture Series on Power Electronics by Prof. B.G. Fernandes, Department of Electrical Engineering, IIT Bombay.
- 2. <u>http://www.nptel.ac.in/courses/108105066/PDF/L-1(SSG)(PE)%20((EE)NPTEL).pdf</u>
- 3. Bimbhra, P.S, 'Power Electronics', Khanna Publishers, 2007.
- 4. Ned Mohan, Tore M. Undeland and William P.Robbins, 'Power Electronics: Converters, Applications and Design', New Jersey, John Wiley and Sons, 2007.

	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	<b>PS01</b>	PSO2
CO 1	3	2	1	0	0	1	3	0	0	0	0	1	3	1
CO 2	2	1	2	1	0	0	1	0	0	0	0	0	2	2
CO 3	3	1	1	0	0	0	0	0	0	0	0	0	1	2
<b>CO 4</b>	1	3	2	0	0	1	0	0	0	0	0	0	2	1
CO 5	1	2	3	1	3	0	1	1	0	0	0	0	3	2

Total	10	9	9	2	3	2	5	1	0	0	0	1	11	8
Scaled	2	2	2	1	1	1	1	1	0	0	0	1	3	2

# $0 - No \ Relation \qquad 1 - Low \ Relation \qquad 2 - Medium \ Relation \ 3 - High \ Relation$

CO	URSE CODE	COURSE NAME		L	Т	Р	С
	XEE 404			3	1	1	5
C:	P: A = 2:1:0	<b>ELECTRICAL MACHINES</b> – I	II	L	T         P           1         2           Le		Н
				3	1	2	6
Cours	e Outcomes (XE	E 404):	Domain			Leve	el
CO1	To Understand	the fundamentals of different types of slots	Cognitive	1	Unde	rstand	ling
	and windings us	ed for AC machines.	Psychomotor	• ]	Mech	anisn	1
CO2	To Understand	the concepts of pulsating and revolving	Cognitive			rstand	0
	magnetic fields.		Psychomotor			anisn	
CO3		the operation of induction machines, ttorque	Cognitive			rstand	
	slip characteristi	cs, equivalent circuit and its phasor diagram.	Psychomotor	•	Mech	anisn	1
CO4		the different types of starting, braking and	Cognitive			rstand	0
		for induction motors. React the generator	Psychomotor	• 1	Mech	anisn	1
	I '	f-excitation and doubly-fed Induction					
005	machines.		<u> </u>				
CO5		the operation of single-phase induction	Cognitive			rstanc anisn	0
	motors and its p	erformance parameters.	Psychomotor	-	viech	amsn	1
UNIT	– I: FUNDAME	NTALS OF AC MACHINE WINDINGS	ı			9-	+3+12
List of 1.Load 2.Load 3.Load 4.Load	f Experiments d test on three pha d test on three pha d test of a three-pl d test on single-ph	ase induction motor.					
UNIT	- II: PULSATI	NG AND REVOLVING MAGNETIC FIEL	DS			9	+3+6
produc displac three-p List of 5.No l	ced by a single wi ced windings– W phase balanced cu f Experiments oad and blocked b	Ids –Alternating current in windings with spinding – Fixed current and alternating current. indings spatially shifted by 90° – Three windingreents) – Revolving magnetic field.	Pulsating field	ls pro	oduce	d by s	spatially
		ON MACHINES				1	2+3+3
		-Types of rotors (squirrel cage and slip-rin		-		racter	

# <u>UNIT – IV: SINGLE PHASE INDUCTION MO</u>TORS

Constructional details of single-phase induction motor – Double revolving field theory and operation – Equivalent circuit – Determination of parameters – Split-phase starting methods and applications. **List of Experiments** 

8.OCC and load characteristics of three phase alternator

9.V and inverted V curves of three phase synchronous motor.

# **UNIT – V: SYNCHRONOUS MACHINES**

Constructional details – Cylindrical rotor synchronous machine– EMF equation –Equivalent circuit – Phasor diagram–Armature reaction–Voltage regulation– V-curves. Salient pole machine – Two reaction theory –Phasor diagram –Power angle characteristics. Synchronizing and parallel operation. (Basic operation of synchronous motors)

# List of Experiments

10.Study of induction motor starters.

LECTURE	TUTORIAL	PRACTICAL	TOTAL
45	15	30	90

#### TEXTBOOKS

- 1. I. J. Nagrath and D. P. Kothari, 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, 2010.
- 2. M. G. Say, 'Performance and Design of AC Machines', CBS Publishers, 2002.
- 3. P. S. Bimbhra, 'Electrical Machinery', Khanna Publishers, 2011.
- 4. B.L.Theraja, 'A Textbook of Electrical Technology', Vol. I & II, M/s S.Chand, Delhi, 2013.

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- 1. A. E. Fitzgerald, Charles Kingsley, Stephen.D.Umans, 'Electric Machinery', Tata McGraw Hill publishing Company Ltd, 2013.
- 2. A. S. Langsdorf, 'Alternating Current Machines', Tata McGraw Hill publishing Company Ltd, 1984.
- 3. P. C. Sen, "Principles of Electric Machines and Power Electronics", John Wiley & Sons, 2007.
- 4. J.B. Gupta, 'Theory and Performance of Electrical Machines', S.K.Kataria and Sons, 2002.
- 5. DeshPande M.V., 'Electrical Machines', PHI Learning Pvt Ltd., New Delhi 2011.
- 6. A. G. Warren, 'Problems in Electrical Engineering', Parker and Smith Solutions, Newyork, 1940.
- 7. K. Murugesh Kumar, 'Electric Machines', Vikas Publishing House Pvt Ltd, 2002.
- 8. Department Laboratory Manual.

**E REFERENCES** 

6+3+6

9+3+3

1. http://freevideolectures.com/Course/2335/Basic-Electrical-Technology35-38,

Prof. L. Umanand, IISc Bangalore.

# Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	<b>PS01</b>	PSO2
CO 1	3	2	2	2	1	0	0	0	0	0	0	2	2	1
CO 2	3	2	2	2	1	0	0	0	0	0	0	1	2	1
CO 3	3	2	2	2	1	0	0	0	0	0	0	1	1	1
CO 4	2	2	1	3	2	0	0	0	0	0	0	1	1	1
CO 5	3	0	0	0	1	0	0	0	0	0	0	1	1	1
Total	14	8	7	9	6	0	0	0	0	0	0	6	7	5

0-No Relation 1 - Low Relation 2 - Medium Relation 3 - High Relation

COURSE CODE	COURSE NAME	L	Т	Р	С
XUM 405		3	0	0	3
<b>C:P:</b> A = 2:0:1		L	Т	Р	Н
		3	0	0	3

	ENTREPRENEURSHIP DEVELOP	MENT		
Cours	se Outcomes (XUM 405):	Domain		Level
CO1	<b>Recognise</b> and <b>describe</b> the personal traits of an	Cognitive	Unders	stand
	entrepreneur.	Affective	Receiv	ing
CO2	<i>Determine</i> the new venture ideas and <i>analyze</i> the feasibility report.	Cognitive	Unders Analyz	
<b>CO3</b>	<i>Develop</i> the business plan and <i>analyze</i> the plan as an individual or in team.	Cognitive Affective	Receiv Analyz	-
CO4	<b>Describe</b> various parameters to be taken into consideration for launching and managing small business.	Cognitive	Unders	stand
CO5	<b>Describe</b> Technological management and Intellectual Property Rights	Cognitive	Unders	stand
UNIT				0
Defini Entrep	ition of Entrepreneurship; competencies and traits of preneurship Development; Role of Family and Society; Achieve	÷		
Defini Entrep a caree <b>UNIT</b> Ideatio Feasib	ition of Entrepreneurship; competencies and traits of preneurship Development; Role of Family and Society; Achieve er and national development. <b>'-II: NEW PRODUCT DEVELOPMENT AND VENTURE</b> on to Concept development; Sources and Criteria for Select pility Report; Project Profile; processes involved in starting	ment Motivation CREATION tion of Product;	; Entrepro market	s affecting eneurship a 9 assessment
Defini Entrep a caree <b>UNIT</b> Ideatio Feasib Owner	ition of Entrepreneurship; competencies and traits of preneurship Development; Role of Family and Society; Achieve er and national development. <b>- II: NEW PRODUCT DEVELOPMENT AND VENTURE</b> on to Concept development; Sources and Criteria for Selec bility Report; Project Profile; processes involved in starting rship; Case Study.	ment Motivation CREATION tion of Product;	; Entrepro market	s affecting eneurship a 9 assessment
Defini Entrep a caree <b>UNIT</b> Ideatio Feasib Owner <b>UNIT</b> Financ	ition of Entrepreneurship; competencies and traits of preneurship Development; Role of Family and Society; Achieve er and national development. <b>'-II: NEW PRODUCT DEVELOPMENT AND VENTURE</b> on to Concept development; Sources and Criteria for Select pility Report; Project Profile; processes involved in starting	ment Motivation CREATION tion of Product; g a new ventur usiness plan prej	; Entrepro market e; legal paration;	s affecting eneurship a 9 assessment formalities 9
Defini Entrep a caree <b>UNIT</b> Ideatio Feasib Owner <b>UNIT</b> Financ Financ	<ul> <li>ition of Entrepreneurship; competencies and traits of preneurship Development; Role of Family and Society; Achieve er and national development.</li> <li><b>- II: NEW PRODUCT DEVELOPMENT AND VENTURE</b> on to Concept development; Sources and Criteria for Selective Dility Report; Project Profile; processes involved in starting rship; Case Study.</li> <li><b>- III: ENTREPRENEURIAL FINANCE</b> cial forecasting for a new venture; Finance mobilization; But and the starting for a new venture; Finance mobilization; But and the starting for a new venture; Finance mobilization; But and the starting for a new venture; Finance mobilization; But and the starting for a new venture; Finance mobilization; But and the starting for a new venture; Finance mobilization; But and the starting for a new venture; Finance mobilization; But and the starting for the starting f</li></ul>	ment Motivation CREATION tion of Product; g a new ventur usiness plan prep in start-up promo	; Entrepro market e; legal paration;	s affecting eneurship a 9 assessment formalities 9
Defini Entrep a caree UNIT Ideatio Feasib Owner UNIT Financ Financ UNIT Opera	<ul> <li>ition of Entrepreneurship; competencies and traits of preneurship Development; Role of Family and Society; Achieve er and national development.</li> <li><b>- II: NEW PRODUCT DEVELOPMENT AND VENTURE</b> on to Concept development; Sources and Criteria for Select oility Report; Project Profile; processes involved in starting rship; Case Study.</li> <li><b>- III: ENTREPRENEURIAL FINANCE</b> cial forecasting for a new venture; Finance mobilization; Bucing, Angel Investors and Venture Capital; Government support</li> </ul>	ment Motivation CREATION tion of Product; g a new ventur usiness plan prej in start-up promo NGEMENT ties - Product Lau	; Entrepro market e; legal paration; otion.	s affecting eneurship a 9 assessment formalities 9 Sources o 9 Incubation
Defini Entrep a caree <b>UNIT</b> Ideatio Feasib Owner <b>UNIT</b> Financ Financ Financ <b>UNIT</b> Opera Monit	<ul> <li>ition of Entrepreneurship; competencies and traits of preneurship Development; Role of Family and Society; Achieve er and national development.</li> <li><b>- II: NEW PRODUCT DEVELOPMENT AND VENTURE</b> on to Concept development; Sources and Criteria for Select on to Concept development; processes involved in starting rship; Case Study.</li> <li><b>- III: ENTREPRENEURIAL FINANCE</b> cial forecasting for a new venture; Finance mobilization; Bucing, Angel Investors and Venture Capital; Government support <b>C – IV: LAUNCHING OF SMALL BUSINESS AND ITS MA</b> tions Planning - Market and Channel Selection - Growth Strateger</li> </ul>	ment Motivation CREATION tion of Product; g a new ventur usiness plan pre- in start-up promo NGEMENT ties - Product Lau habilitation of Bu	; Entrepro market e; legal paration; otion.	s affecting eneurship a 9 assessment formalities 9 Sources o 9 Incubation
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	GA 1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
CO 1	0	0	0	0	0	0	0	0	3	3	3	1
CO 2	0	0	1	2	3	2	1	1	1	2	3	0
CO 3	0	0	0	0	0	1	0	2	3	3	0	2
CO 4	0	0	0	0	0	1	1	2	3	0	3	3

CO 5	0	0	0	0	0	1	1	3	0	0	0	3
Total	0	0	1	2	3	5	3	8	10	8	9	9
Scaled	0	0	1	1	1	2	1	2	3	2	2	2

 $0 - No \ Relation \qquad 1 - Low \ Relation \qquad 2 - Medium \ Relation \ 3 - High \ Relation$ 

	URSE ODE	COURSE NAME	L	Т	Р	С
XE	E 406		2	1	0	3
C:P: A		SIGNALS AND SYSTEMS	L	Т	Р	_
3:0:0			2	1	0	3
Course	Outcomes	(XEE 406):	Dom	ain	]	Level
CO1	Understan	d the concepts of continuous time and discrete time	Cogn	itive	Une	derstand
	systems.					
CO2	Analyse s	ystems in complex frequency domain.	Cogn	itive	A	nalyse
CO3	Learn abo	ut Fourier transformation techniques	Cogn	itive	Rem	embering
CO4	Learn abo	ut Laplace transformation techniques	Cogn	itive	Rem	embering
CO5	Learn abo	ut Z- transformation techniques	Cogn	itive	Rem	embering
UNIT -I: INTRODUCTION TO SIGNALS AND SYSTEMS						

The z-Transform for discr sequences, z-domain analy Reconstruction: ideal inte between continuous and di	ete time signals and system ysis. The Sampling Theorem repolator, zero-order hold, screte time systems. Introdu- tion, filtering, feedback con <b>LECTURE</b>	m and its implications. Sp first-order hold. Aliasing action to the applications of	bectra of sample and its effects	ed signals s. Relation em theory
<b>UNIT -V: Z- TRANSFO</b> The z-Transform for discr sequences, z-domain analy Reconstruction: ideal inter between continuous and di	ysis. The Sampling Theorem rpolator, zero-order hold, screte time systems. Introdu	m and its implications. Sp first-order hold. Aliasing action to the applications of	bectra of sample and its effects	ystems and ed signals s. Relation
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<b>UNIT -V: Z- TRANSFO</b> The z-Transform for discr sequences, z-domain analy	ysis. The Sampling Theorem	m and its implications. Sp	bectra of sample	stems and ed signals
UNIT -V: Z- TRANSFO The z-Transform for discr		· · ·		stems and
UNIT -V: Z- TRANSFO	ete time signals and system	is, system functions, poles	and zeros of sy	
				12
system behaviour. Applica	RMS AND SAMPLING R	ECONSTRUCTION		
•			1	
÷	and signals, Laplace dom	•		<b>.</b>
	ansform for continuous tim	ne signals and systems, sy	stem functions.	
<b>UNIT- IV: LAPLACE TI</b>	RANSFORMS			06
	Form (DFT). Application to s			
	r Transform, convolution/m onse, Fourier domain duality			
	on of periodic signals, Wa			
UNIT -III: FOURIER TH				09
	of a frequency response and	its Relation to the impulse	response.	0.0
• •	ti-output representation. Sta			c inputs to
	ons and difference equations		· · · · · · · · · · · · · · · · · · ·	-
	Characterization of causality		• •	
	response, convolution, inpu			
<b>UNIT- II: BEHAVIOUR</b>	OF CONTINUOUS AND	<b>DISCRETE-TIME LTI S</b>	SYSTEMS	09
properties: linearity: additi	vity and homogeneity, shift-	invariance, causality, stabi	lity, reliability.	Examples.
· · · · · · · · · · · · · · · · · · ·	s and discrete time signals,	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	
importance: the unit step.			· · · · · ·	-
	· · · · ·		-	-
importance: the unit step,	olute integrability, determin the unit impulse, the sinu		er. Some special	l signa

# TEXTBOOKS

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and Applications", Pearson, 2006.

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2. M. J. Robert "Fundamentals of Signals and Systems", McGraw Hill Education, 2007.

3. B. P. Lathi, "Linear Systems and Signals", Oxford University Press, 2009.

	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	2	2	2	1				1			1	1	0
CO 2	3	3	2	1		3		1				2		1
CO 3	3			1		3		1			1			1
<b>CO 4</b>	3	2	2	2	1		1			2		2		1
CO 5	3			1						2				1
Total	15	7	6	7	2	6	1	2	1	4	1	5	1	4
Scaled	3	2	2	2	1	2	1	1	1	1	1	1	1	1

–No Relation 1 – Low Relation 2 – Medium Relation 3 – High

COUNDE	CODE COURSE NAME		T	Т	Р	(
-	POWER SYSTEMS-I		L		1	
XEF	E 501 (APPARATUS AND MODELLING	G)	3	1	1	5
C:P: A		3)	L	Т	Р	H
3:1:0				-	2	
	utcomes (XEE 501):	Domain	L       T         3       1         Level       Understa         Applying         Analysin         Or       Analysin         Complex         Or       Understa         Perceptic         Understa         Perceptic         dance matrice         nes and cable         of symmetrical and unsymmetrical         v studies, and         per phase and         pase – introdu         us impedance		<u> </u>	
CO1	<b>Demonstrate</b> the per phase analysis of power system	Cognitive	31LT31LevelUnderstandApplyingAnalysing ComplexUnderstand Evaluating PerceptionUnderstand Evaluating Perceptionance matrices es and cables of symmetrial and unsymmetrial and unsymmetrial <b< td=""><th>nding</th><td>5</td></b<>	nding	5	
CO2	<b>Develop</b> the model of various components of power system and <b>Construct</b> the Y Bus and Z Bus for a power system.	Cognitive				
CO3	<b>Analyse</b> the power system network with symmetrical and unsymmetrical faults. <b>Calibrate</b> the fault current in a power system.	Cognitive psychomotor		ex tanding ing		
CO4	<b>Summarize</b> the power flow equation. <b>Assess</b> the voltage profile of a power system by performing the load flow analysis and <b>Identify</b> the line loss and line flow.	Cognitive psychomotor				
CO5	<b>Classify</b> and <b>determine</b> the stability of power system. <b>Detect</b> the transient behaviour of power system when it is subjected to a fault.	Cognitive psychomotor	Eva	Complex Understan Evaluating Perception Understan Evaluating Perception ce matrices and cables symmetric and unsymmetric udies, and		5
faults. Use s		-		-		
LINIT	Γ - I: INTRODUCTION			31LT31LevelUnderstanApplyingAnalysing ComplexUnderstan Evaluating PerceptionUnderstan Evaluating PerceptionInce matrices s and cables of symmetric and unsymmetric and unsymmetric studies, and9- er phase ana se - introduc12 s impedance	13	
Need for Single line	system analysis in planning and operation of modern power diagram - Per unit representation and Per unit calculations of Deregulation.	• •	-	ise an	alysi	
	: MODELLING OF POWER SYSTEM COMPONENTS	1		1	2+3-	F <b>6</b>
UNIT -II:						•
Primitive formation different p List of Ex 1. Formati	network and its matrices – bus incidence matrix – bus adm – Z – Bus building algorithm - Modelling of generator, load power system studies. <b>Experiments</b> ion of Bus Admittance Matrix. tion of Bus Impedance Matrix using building Algorithm		-			

symmetrical components -	sequence imped	ances – sequence	e networks Unsym	metrical fault analysis: L-
G, L-L and L-L-G faults.		-	-	-
List of Experiments				
3. Symmetrical Fault Analysi	<b>S.</b>			
4. Unsymmetrical Fault Analy	ysis.			
<b>UNIT- IV: POWER FLOW</b>	' ANALYSIS			9+3+9
Need for Power Flow Analy	ysis – bus classi	ification – deriva	ation of power flow	w equation – solution by
Gauss-Seidel, Newton-Raphs	son and Fast Dec	coupled Power Fl	low methods – com	parison of three methods
List of Experiments		1		1
5. Solution of power flow using	ng Gauss-Seidel	Method.		
6. Solution of power flow using	0			
7. Solution of power flow using	•		lethod.	
UNIT -V: STABILITY ANA	ALYSIS			9+3+3
Types of stability - Swing equ	uption in state or	ace form equal	araa critarian sta	bility analysis of single
clearing angle and time. Cau system – methods of improvin List of Experiments	ses of voltage in ng power system	nstability – voltaį 1 stability.	ge stability proxim	
machine connected to infinite clearing angle and time. Cau system – methods of improvin <b>List of Experiments</b> 9. Transient Stability Analysia	ses of voltage in ng power system s of Single-Macl	nstability – voltaș 1 stability. hine Infinite Bus	ge stability proxim System	ity indices for two-bus
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clearing angle and time. Cau system – methods of improvin List of Experiments 9. Transient Stability Analysi TEXT BOOKS 1. J. Grainger and W. D. St	s of Single-Macl LECTURE 45 tevenson, "Powe	nstability – voltaș n stability. hine Infinite Bus TUTORIAL 15	ge stability proxim System PRACTICAL 30	ity indices for two-bus TOTAL 90
clearing angle and time. Cau system – methods of improvin List of Experiments 9. Transient Stability Analysis TEXT BOOKS 1. J. Grainger and W. D. St edition (December 28, 201	s of Single-Macl LECTURE 45 tevenson, "Powe	nstability – voltag n stability. hine Infinite Bus TUTORIAL 15 er System Analy	ge stability proxim System PRACTICAL 30 rsis", McGraw-Hill	ity indices for two-bus TOTAL 90 Education; 2nd
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<ul> <li>clearing angle and time. Cau system – methods of improvin</li> <li>List of Experiments</li> <li>9. Transient Stability Analysi</li> <li>TEXT BOOKS</li> <li>1. J. Grainger and W. D. Stredition (December 28, 201</li> <li>2. O. I. Elgerd, "Electric Ener</li> <li>3. A. R. Bergen and V. Vittal</li> </ul>	s of Single-Macl s of Single-Macl LECTURE 45 tevenson, "Power 15) rgy Systems The	nstability – voltag n stability. hine Infinite Bus TUTORIAL 15 er System Analy ory", McGraw Hi	ge stability proxim System PRACTICAL 30 rsis", McGraw-Hill ill Education, 1st Ju	ity indices for two-bus TOTAL 90 Education; 2nd ily 2017.
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<ul> <li>clearing angle and time. Cau system – methods of improvin List of Experiments</li> <li>9. Transient Stability Analysis</li> <li>TEXT BOOKS</li> <li>1. J. Grainger and W. D. St edition (December 28, 201</li> <li>2. O. I. Elgerd, "Electric Ener</li> <li>3. A. R. Bergen and V. Vittal REFERENCES</li> <li>1. D. P. Kothari and I. J. 4th Edition (29 June 2011)</li> <li>2. B. M. Weedy, B. J. Cor</li> </ul>	ses of voltage in ng power system s of Single-Macl LECTURE 45 tevenson, "Power 15) rgy Systems The l, "Power System J. Nagrath, "M ) 'y, N. Jenkins, J	nstability – voltage stability. hine Infinite Bus TUTORIAL 15 er System Analy ory", McGraw Hi n Analysis", Pears todern Power Sy J. Ekanayake and	ge stability proxim           System           PRACTICAL           30           rsis", McGraw-Hill           ill Education, 1st Ju           son Education Inc.,           rstem Analysis", N	ity indices for two-bus TOTAL 90 Education; 2nd hly 2017. 2 <sup>nd</sup> Edition, 2009. fcGraw Hill Education,
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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3									1		1	3	2

CO 2	3									1		1	3	2
CO 3	3	2								1	1	2	3	2
CO 4	3	2			1					1	1	1	3	2
CO 5	3	2			1					1	1	1	3	2
Total	15	6	0	0	2	0	0	0	0	5	3	6	15	10
Scaled	3	1	0	0	0	0	0	0	0	1	1	1	3	2

0 –No Relation 1 – Low Relation 2 – Medium Relation 3 – High Relation

<b>RSE CODE</b>	COURSE NAME		L	Т	Р	С
EE 502			3	0	1	4
4	CONTROL SYSTEMS		L	Т	Р	Η
			3	0	2	5
se Outcomes	(XEE 502):	Domain		Level		
Identify the	e basic elements, derive the transfer function and	Cognitive		Unde	rstand	ling
		Psychomotor				
the transfer	function of DC motors and DC generators.	-				
Explain the	Cognitive		Unde	rstand	ling	
	EE 502 A Se Outcomes Identify the Compute th the transfer f	EE 502	EE 502       CONTROL SYSTEMS         A       Domain         See Outcomes (XEE 502):       Domain         Identify the basic elements, derive the transfer function and Construct the overall gain of the control system and Construct the transfer function of DC motors and DC generators.       Construct	EE 502       3         A       CONTROL SYSTEMS         Be Outcomes (XEE 502):       Domain         Identify the basic elements, derive the transfer function and Cognitive the overall gain of the control system and Construct the transfer function of DC motors and DC generators.       Cognitive Psychomotor	EE 502       3       0         A       CONTROL SYSTEMS       1       T         3       0       0       0         ce Outcomes (XEE 502):       Domain       Level         Identify the basic elements, derive the transfer function and Construct the overall gain of the control system and Construct the transfer function of DC motors and DC generators.       Construct       Under the system of the control system and Construct	EE 502       3       0       1         A       CONTROL SYSTEMS       IL       T       P         3       0       2         Se Outcomes (XEE 502):       Domain       Level         Identify the basic elements, derive the transfer function and Construct       Cognitive Psychomotor       Understand         Compute the overall gain of the control system and Construct       Psychomotor       Understand

<b>Learning Objectives:</b> Control Systems is the engineering discipline that applies control theory systems with desired behaviours. To make students understand the concept of system represe	
stability analysis and state –space analysis, to design the compensator in time and frequency	domain, to
design the PID compensator	
	)+9
Basic elements in control systems - Open and closed loop systems - Principles of feedback	x, Transfer
function Block diagram reduction techniques - Signal flow graphs. Mason gain formula, Mo	odelling of
electric systems translation and rotational mechanical systems.	
List of Experiments	
1. Transfer function and modelling of separately excited DC Generator.	
2. Transfer function and modelling of Armature & field-controlled DC Motor.	
3. Transfer function of AC Servomotor	
UNIT – II: TIME RESPONSE ANALYSIS	)+9
Time response – Time domain specifications - Standard test signals. Time response of first a	nd second
order systems for standard test inputs. Error coefficients - Generalized error series - Steady state	e error
List of Experiments	
4. Analysis of Synchro Transmitter and Receiver.	
5. Performance of DC Stepper Motor	
6. Digital simulation of I order and II order system by using Scilab.	
	9+6
	-
UNIT - III: FREQUENCY-RESPONSE ANALYSIS	-
UNIT - III: FREQUENCY-RESPONSE ANALYSIS       9         Frequency domain specification – Bode plot – Polar plot – Determination of closed loop response – CorRelation between frequency domain and time domain specifications       9         List of Experiments       9	-
UNIT - III: FREQUENCY-RESPONSE ANALYSIS         Frequency domain specification – Bode plot – Polar plot – Determination of closed loop response – CorRelation between frequency domain and time domain specifications         List of Experiments         7. Frequency response of Lag, Lead & Lag – Lead networks.	-
UNIT - III: FREQUENCY-RESPONSE ANALYSIS         Frequency domain specification – Bode plot – Polar plot – Determination of closed loop response – CorRelation between frequency domain and time domain specifications         List of Experiments         7. Frequency response of Lag, Lead & Lag – Lead networks.         8. Determination of Phase margin and Gain margin of the Bode plot using Scilab.	oonse from
UNIT - III: FREQUENCY-RESPONSE ANALYSIS       9         Frequency domain specification – Bode plot – Polar plot – Determination of closed loop response – CorRelation between frequency domain and time domain specifications       9         List of Experiments       7. Frequency response of Lag, Lead & Lag – Lead networks.       8. Determination of Phase margin and Gain margin of the Bode plot using Scilab.         UNIT – IV: STABILITY ANALYSIS AND CONTROLLER DESIGN	ponse from 9
UNIT - III: FREQUENCY-RESPONSE ANALYSIS         Frequency domain specification – Bode plot – Polar plot – Determination of closed loop response – CorRelation between frequency domain and time domain specifications         List of Experiments         7. Frequency response of Lag, Lead & Lag – Lead networks.         8. Determination of Phase margin and Gain margin of the Bode plot using Scilab.	9 Root locus design of
UNIT - III: FREQUENCY-RESPONSE ANALYSIS       9         Frequency domain specification – Bode plot – Polar plot – Determination of closed loop response – CorRelation between frequency domain and time domain specifications       9         List of Experiments       7. Frequency response of Lag, Lead & Lag – Lead networks.       8. Determination of Phase margin and Gain margin of the Bode plot using Scilab.         UNIT – IV: STABILITY ANALYSIS AND CONTROLLER DESIGN       Characteristics equation – Location of roots in S plane for stability –Routh Hurwitz criterion – construction – Effect of pole, zero addition –Nyquist stability criterion. Introduction to Proportional, Integral and Derivative Controllers- Lead and Lag compensator- Analog a	9 Root locus design of
UNIT - III: FREQUENCY-RESPONSE ANALYSIS       9         Frequency domain specification – Bode plot – Polar plot – Determination of closed loop response – CorRelation between frequency domain and time domain specifications       9         List of Experiments       7. Frequency response of Lag, Lead & Lag – Lead networks.       8. Determination of Phase margin and Gain margin of the Bode plot using Scilab.       9         UNIT - IV: STABILITY ANALYSIS AND CONTROLLER DESIGN       Characteristics equation – Location of roots in S plane for stability –Routh Hurwitz criterion – construction – Effect of pole, zero addition –Nyquist stability criterion. Introduction to Proportional, Integral and Derivative Controllers- Lead and Lag compensator- Analog a implementation of controllers.         UNIT - V: STATE VARIABLE ANALYSIS         Concepts of state variables. State space model. Diagonalization of State Matrix. Solution	9 Root locus design of nd Digital 9+6 n of state
UNIT - III: FREQUENCY-RESPONSE ANALYSIS       9         Frequency domain specification – Bode plot – Polar plot – Determination of closed loop response open loop response – CorRelation between frequency domain and time domain specifications       9         List of Experiments       7. Frequency response of Lag, Lead & Lag – Lead networks.       8. Determination of Phase margin and Gain margin of the Bode plot using Scilab.       9         UNIT – IV: STABILITY ANALYSIS AND CONTROLLER DESIGN       Characteristics equation – Location of roots in S plane for stability –Routh Hurwitz criterion – construction – Effect of pole, zero addition –Nyquist stability criterion. Introduction to Proportional, Integral and Derivative Controllers- Lead and Lag compensator- Analog a implementation of controllers.         UNIT – V: STATE VARIABLE ANALYSIS	9 Root locus design of nd Digital 9+6 n of state
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UNIT - III: FREQUENCY-RESPONSE ANALYSIS       9         Frequency domain specification – Bode plot – Polar plot – Determination of closed loop response – CorRelation between frequency domain and time domain specifications       9         List of Experiments       7. Frequency response of Lag, Lead & Lag – Lead networks.       8. Determination of Phase margin and Gain margin of the Bode plot using Scilab.       9         UNIT - IV: STABILITY ANALYSIS AND CONTROLLER DESIGN       Characteristics equation – Location of roots in S plane for stability –Routh Hurwitz criterion – construction – Effect of pole, zero addition –Nyquist stability criterion. Introduction to Proportional, Integral and Derivative Controllers- Lead and Lag compensator- Analog a implementation of controllers.         UNIT - V: STATE VARIABLE ANALYSIS         Concepts of state variables. State space model. Diagonalization of State Matrix. Solution	9 Root locus design of nd Digital 9+6 n of state

#### static and dynamic error coefficients. Psychomotor Set **Describe** the frequency domain specifications and show the Cognitive Remembering **CO3** response of frequency response. Psychomotor Understanding Set **Determine** the stability of the systems and **Design** the suitable Cognitive Understanding **CO4** compensator and controller for the given performance criteria of Psychomotor Design the control system Perception Describe State transition matrix. Explain State space model Cognitive Remembering **CO5** and construct and verify the canonical state model and

forms State Space representation of continuous time system. Transfer function from state variable representation –. Concept of controllability and observability.

# List of Experiments

- 9. Transfer function and modeling of Ward Leonard speed control system applied to DC motor.
- 10.DC Position using feedback Control system.

LECTURE	TUTORIAL	PRACTICAL	TOTAL
45	0	30	75

# TEXTBOOKS

1. I.J. Nagrath & M. Gopal, 'Control Systems Engineering', New Age International Publishers Pvt Ltd; Sixth edition (1 September, 2018)

- 2. Norman S. Nise, "Control System Engineering" Seventh edition, John Wiley & Sons, Inc, 2015.
- 3. M. Gopal, "Control Systems, Principles & Design", Tata McGraw Hill, New Delhi, 2002.
- 4. Richard C. Dorf & Robert H. Bishop, "Modern Control Systems", Addison–Wesley, 2012.

# REFERENCES

- 1. B.C. Kuo, 'Automatic Control Systems', Prentice Hall of India Ltd., New Delhi, 2014.
- 2. K. Ogata, 'Modern Control Engineering', 4th edition, Pearson Education, New Delhi, 2003 / PHI.
- 3. N. Bandyopadhyay, 'Control Engineering Theory and Practice', Prentice Hall of India, 2009

4. John J.D'azzo & Constantine H.Houpis, 'Linear control system analysis and design', Tata McGrow-Hill, Inc., 2013

# **E - REFERENCES**

1. NTPEL, Control Systems Engineering (Web Course), Prof. M. Gopal, IIT Kharagpur.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2	1			1	1	1			1		
CO2	2	3	1		2	1	1	1	1	1		2	2	1
CO3	3	3	3	2			1		3				2	2
<b>CO4</b>	1	2	2	3	2	2	1	1	2	1	1	2	1	2
CO5	2	1	1	1	2	1	1	1	2	1		1	2	2
Total	10	10	9	7	4	4	5	4	9	3	1	6	7	7
Scaled	2	2	2	2	1	1	1	1	2	1	1	2	2	2

# Mapping of COs with POs

0 – No Relation 1 - Low Relation 2 - Medium Relation 3 - High Relation

**	RSE CODE	COURSE NAME		L	Т	P	С
X	EE 503	MICROPROCESSORS AND		3	0	1	4
C:P: A		MICROCONTROLLERS		L	Т	Р	Η
3:1:0				3	0	2	5
	e Outcomes (X	(FF 503):	Domain	-	Lev	 e]	-
Course		EE 505).	Domani		LU		
CO1	To understan	d the fundamentals of microprocessors,	Cognitive		Und	erstai	nding
		ers and embedded systems	008		0110		
		d the architecture, Timing diagrams and	Cognitive		Und	orator	nding
	Execution cyc		Cognitive		Ullu	ersta	lung
	-		<b>TT 1</b>		11		
	To understand	Cognitive Psychomot			erstai	nding	
	• -	o understand the basic concepts of	or	Set			
	programming		Affective		Resp	pondi	ng
<b>CO4</b>	To understand	interfacing design of peripherals like I/O,	Cognitive		Und	erstai	nding
	A/D, D/A, time	er etc.	Psychomot	or	Set		
			Affective		Resp	oondi	ng
CO5	To understand	Cognitive		Und	erstai	nding	
	with external of		Psychomot	or	Set		U
			Affective			oondi	ng
Loonni	ing Outcome	Able to de assembly lenguage progra		intor			0
		S: Able to do assembly language program $A/D$ , $D/A$ times at a and to downloss systems with the system of the sy	-				
<u> </u>		A/D, D/A, timer etc. and to develop systems u ENTALS OF MICROPROCESSORS	ising differen	nt mie	crocol		ers.
		dicroprocessor Architecture. 8-bit Micro	processor	and	Mior	9	rollor
		arison of 8-bit microcontrollers, 16-bit	*				
		ded system and its characteristics, Role of					
		of the 8051 family.		ronei			uuuu
-		ARCHITECTURE				9	)
		um, CPU, ALU, address, data and control b	us, working	regi	sters.	SFR	s, Cloc
Interna			· · ·	<u> </u>			
	ESET circuits,	Stack and Stack Pointer, Program Counter			•		
and RE		Stack and Stack Pointer, Program Counte emory, Timing diagrams and Execution C	-				
and RE Data ar	nd Program Mo		-			9	+12
and RE Data ar UNIT-	nd Program Me III: INSTRU	emory, Timing diagrams and Execution C	ycles.	mmec	diate a		
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and RE Data ar UNIT- Address Registe address	nd Program Mo III: INSTRU ssing modes: Ir er addressing, sing, Bit inhere	emory, Timing diagrams and Execution C CTION SET AND PROGRAMMING introduction, Instruction syntax, Data types, S Direct addressing, Indirect addressing, ent addressing, bit direct addressing. 8051 In	bycles. ubroutines In Relative astruction set	addre t, Inst	essing tructio	ddres , inc on tin	ssing, lexed nings.
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and RE Data an <b>UNIT</b> - Address Register address Data t Subrou program <b>List of</b>	nd Program Mo III: INSTRU ssing modes: In er addressing, sing, Bit inhere ransfer instruc- tine instructions. Assemblers <b>Experiments</b>	emory, Timing diagrams and Execution C CTION SET AND PROGRAMMING atroduction, Instruction syntax, Data types, S Direct addressing, Indirect addressing, ent addressing, bit direct addressing. 8051 In ctions, Arithmetic instructions, Logical in ns, Bit manipulation instruction. Assembly s and compilers. Programming and Debuggin	bycles. ubroutines I Relative astruction senstructions, language p og tools.	addre t, Inst Bran rogra	essing tructio ch in ms, C	nddres , inc on tin astruc C lang	ssing, dexed nings. tions, guage
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and RE Data ar <b>UNIT</b> - Address Register address Data t Subrou program <b>List of</b> 1. Simj mul 2. Prog	nd Program Mo <b>III: INSTRU</b> using modes: In er addressing, sing, Bit inhered ransfer instruc- tine instruction ms. Assemblered <b>Experiments</b> ple arithmetic tiplication / div gramming with	emory, Timing diagrams and Execution C CTION SET AND PROGRAMMING atroduction, Instruction syntax, Data types, S Direct addressing, Indirect addressing, ent addressing, bit direct addressing. 8051 In ctions, Arithmetic instructions, Logical in ns, Bit manipulation instruction. Assembly s and compilers. Programming and Debuggin operations with 8085 Microprocessors: Mul- vision. n control instructions: Increment / Decreme	ycles. ubroutines In Relative astruction senstructions, language p og tools. ti precision	addre t, Inst Bran rogra addit	essing tructic ch in ms, C ion /	iddres , inc on tin istruc 2 lang subtra	ssing, lexed nings. tions, guage action /
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and RE Data ar <b>UNIT</b> - Address Register address Data t Subrou prograf List of 1. Simp mul 2. Prog Max 3. Der Cor	nd Program Ma <b>III: INSTRU</b> ssing modes: Ir er addressing, sing, Bit inhere ransfer instruction ms. Assemblere <b>Experiments</b> ple arithmetic tiplication / div gramming with ximum / Minin monstration o nditional jumps	emory, Timing diagrams and Execution C CTION SET AND PROGRAMMING ntroduction, Instruction syntax, Data types, S Direct addressing, Indirect addressing, ent addressing, bit direct addressing. 8051 In ctions, Arithmetic instructions, Logical in ns, Bit manipulation instruction. Assembly s and compilers. Programming and Debuggin operations with 8085 Microprocessors: Mul- vision. n control instructions: Increment / Decreme num of numbers, Rotate instructions. f basic instructions with 8051 Micro co s, looping b. Calling subroutines. c. Stack par-	ycles. ubroutines In Relative astruction senstructions, language p og tools. ti precision nt, Ascendin	addre t, Inst Bran rogra addit ng / I ecutio	essing tructic ch in ms, C ion / Desce	iddres , inc on tim struc 2 lang subtra nding	ssing, lexed nings. tions, guage action / g order.
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and RE Data ar UNIT- Address Register address Data t Subrou progran List of 1. Simp mul 2. Prog May 3. Der Cor 4. Desi UNIT	nd Program Me III: INSTRU ssing modes: Ir er addressing, sing, Bit inhere ransfer instruction ms. Assemblere <b>Experiments</b> ple arithmetic tiplication / div gramming with ximum / Minin monstration on ditional jumps gn program for -IV: MEMOR	emory, Timing diagrams and Execution C CTION SET AND PROGRAMMING ntroduction, Instruction syntax, Data types, S Direct addressing, Indirect addressing, ent addressing, bit direct addressing. 8051 In ctions, Arithmetic instructions, Logical in ns, Bit manipulation instruction. Assembly s and compilers. Programming and Debuggin operations with 8085 Microprocessors: Mul- vision. n control instructions: Increment / Decreme num of numbers, Rotate instructions. f basic instructions with 8051 Micro co s, looping b. Calling subroutines. c. Stack par-	ycles. ubroutines In Relative astruction senstructions, language p og tools. ti precision nt, Ascendin ontroller ex ameter testir	addre t, Inst Bran rogra addit ng / 1 ecutiong	essing tructic ch in ms, C ion / Desce on, in	nddres , inc on tim istruc lang subtra nding nclud	ssing, lexed nings. tions, guage action g order ing: a

#### List of Experiments

5. Interfacing Converters of 8-bit D/A and A/D.

# UNIT -V: EXTERNAL COMMUNICATION INTERFACE AND APPLICATIONS 9+15

Synchronous and Asynchronous Communication. RS232, SPI, I2C.Introduction and interfacing to protocols like Blue-tooth and Zig-bee LED, LCD and keyboard interfacing. Stepper motor interfacing, DC Motor interfacing, sensor interfacing.

# List of Experiments

- 6. Interfacing of Keyboard with 8085
- 7. Interfacing of seven segment display with 8085.
- 8. Serial communication, I/O Port operations.
- 9. Design and implementation of Traffic Light control.
- 10. Design and implementation of Stepper motor control

LECTURE	PRACTICAL	TOTAL
45	30	75

# **TEXTBOOKS**

- 1. M.A.Mazidi, J.G.Mazidi and R.D.McKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", Pearson Education, 2007.
- 2. K.J. Ayala, "8051 Microcontroller", Delmar Cengage Learning, 2004.
- 3. R. Kamal, "Embedded System", McGraw Hill Education, Third Edition, 2017.
  - 4. R.S. Gaonkar, "Microprocessor Architecture: Programming and Applications with the 8085", Penram International Publishing, 6<sup>th</sup> Edition, 2013

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- 1. D.A.Patterson and J.H.Hennessy, "Computer Organization and Design: The Hardware /Software interface", Morgan Kaufman Publishers, 5<sup>th</sup> Edition, 2013.
- 2. D.V.Hall, "Microprocessors & Interfacing", McGraw Hill Higher Education, 2005.

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BANG/notused/Microprocessors%20and%20Microcontrollers-/Learning%20Material%20-%20Microprocessors%20and%20microcontrollers.pdf

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	1	0	2	0	0	0	0	0	0	1	1	0	1	1

CO 2	1	2	1	3	1	0	0	0	2	1	2	1	1	1
CO 3	0	0	0	0	0	1	2	0	1	2	0	0	1	1
CO 4	1	1	2	2	1	0	0	0	2	1	2	1	0	1
CO 5	1	2	2	1	0	0	3	0	3	2	1	0	0	1
Total	4	5	7	6	2	1	5	0	8	7	6	2	3	5
Scaled	1	1	2	1	1	1	1	0	2	2	1	1	1	1

	<b>RSE CODE</b>		COURSE NA	AME		L	Т	P	С		
XUM 5(	)6	CO	NSTITUTION	OF INDI	A	3	0	0	3		
C:P: A						L	Т	P	Η		
3:0:0						3	0	0	3		
Course	Outcomes:				Doma	in		L	evel		
CO1	<b>Understand</b> the	e Constitutiona	al History	1	Cognitive Und				derstanding		
CO2	<b>Understand</b> the	e Powers and H	Functions		Cognitive	Understanding					
CO3	<b>Understand</b> the	e Legislature			Affective		Re	mem	bering		
CO4	<b>Understand</b> the	e Judiciary			Affective		Re	mem	bering		
CO5	O5 <i>Understand</i> the Centre State relations Cognitive Understanding								anding		
UNIT-I	UNIT-I								9		
Duties- I U <b>NIT-II</b> Fhe Uni	on Executive- T	es of State Pol he President of	of India (powers	s and fun					9		
Council UNIT-II	of Ministers-Prin	ne Minister- Po	owers and Funct	ions.					9		
UNIT-I	V	_	nt Committees o					k Sat	9		
UNIT-I The Uni Advisory UNIT-V	V on Judiciary- Po / Jurisdiction- Ju	owers of the S dicial review.	Supreme Court-	Original	Jurisdictic	on- Ap	pellate	k Sat	bha. 9 isdictio	ons-	
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CO 1	2	0	0	1	0	0	0	0	0	0	0	0	0	0
CO 2	2	0	0	1	0	0	0	0	0	0	0	0	0	0
CO 3	2	0	0	1	0	0	0	0	1	0	0	0	0	0
CO 4	2	0	0	1	0	0	0	1	1	0	0	0	0	0
CO 5	2	2	0	1	0	0	0	1	1	0	0	0	0	0
Total	10	2	0	5	0	0	0	2	3	0	0	0	0	0
Scaled	2	1	0	1	0	0	0	1	1	0	0	0	0	0

0 –No Relation 1 – Low Relation 2 – Medium Relation 3 – High Relation

# SEMESTER VI

COURSE CODE	COURSE NAME		L	Т	P	С
XUM 601	ECONOMICS FOR ENGINEE	RS	3	0	0	3
C:P: A			L	Т	Р	Η
3:0:0			3	0	0	3
Course Outcomes:		Domain		Level		

CO1	Understand the concents of economics in engineering	Comitivo	Domo	mboring
	<b>Understand</b> the concepts of economics in engineering.	Cognitive		mbering
CO2	Interpret Break-even analysis.	Cognitive		standing
CO3	<i>Illustrate</i> value engineering procedure.	Cognitive		standing
CO4	Understand and analyze replacement problem.	Cognitive		standing
CO5	<i>Explain</i> depreciation.	Cognitive	Under	standing
UNIT	I: INTRODUCTION TO ECONOMICS			8
Engine elemer	In an economy, Law of supply and demand, Concept bering efficiency, Economic efficiency, Scope of engineering that of costs, preparation of cost sheet and estimation, Ma ost, Opportunity cost	ng economics-	- types o	of costing
UNIT	II: BREAK-EVEN ANALYSIS & SOCIAL COST BE	NEFIT ANA	LYSIS	12
Marg	in of Safety, Profit, Cost & Quantity Analysis-Product Mix	decisions and	d CVP a	analysis,
-	/Volume Ratio (P/V Ratio), Application of Marginal costi			5
Socia	<b>I Cost Benefit Analysis</b> : compare different project alternative and external effects; Monetizing effects; Result of a soc	tives, Calculat	te direct	
UNIT	III: VALUE ENGINEERING & COST ACCOUNTI	NG		10
Value	engineering - Function, aims, Value engineering proce	edure - Make	or buy	decision
Busine	ss operating costs, Business overhead costs, Equipment op	erating costs		
UNIT	IV: REPLACEMENT ANALYSIS			7
Replac	ement analysis –Types of replacement problem, determ	ination of eco	onomic	life of an
-	Replacement of an asset with a new asset.			
	V: DEPRECIATION			8
<u> </u>				
	eiation- Introduction, Straight line method of depreciation	n, declining ba	alance i	
deprec	iation-Sum of the years digits method of depreciation, Annuity method of depreciation, service output method	-	fund n	
deprec	• • •	hod of deprec	fund m iation.	
deprec deprec	iation, Annuity method of depreciation, service output method between the service output method of depreciation, service output method between the service output method of depreciation, service output method between the service output method of depreciation, service output method between the service output method of depreciation, service output method between the service output method of depreciation, service output method between the service output method of depreciation, service output method between the serv	hod of deprec	fund m iation.	nethod of
deprec deprec TEXT	iation, Annuity method of depreciation, service output method LECTUR 45 BOOKS	hod of deprec E TUTORI 0	fund n iation.	TOTAL 45
deprec deprec TEXT 1. 1	iation, Annuity method of depreciation, service output method between the service output method of depreciation, service output method between the service output method of depreciation, service output method between the service output method of depreciation, service output method between the service output method of depreciation, service output method between the service output method of depreciation, service output method between the service output method of depreciation, service output method between the serv	hod of deprec E TUTORI 0	fund n iation.	TOTAL 45
deprec deprec TEXT 1. 1 Pul 2. S.F	iation, Annuity method of depreciation, service output method LECTUR 45 BOOKS Sp Gupta, Ajay Sharma & Satish Ahuja, "Cost Ac	hod of deprec E TUTORI 0 counting", V	fund n iation. AL K Gl	TOTAL 45 obal

3. Panneer Selvam, R, "Engineering Economics", Prentice Hall of India Ltd, New Delhi, 2001.

4. William G.Sullivan, James A.Bontadelli & Elin M.Wicks, "Engineering Economy", Prentice Hall International, New York, 2001.

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1. Luke M Froeb / Brian T Mccann, "Managerial Economics - A problem solving

approach" Thomson learning 2007

- 2. Truett & Truett, "Managerial economics- Analysis, problems & cases "Wiley India 8th edition 2004.
- 3. Chan S.Park, "Contemporary Engineering Economics", Prentice Hall of India, 2002.
- 4. Donald.G. Newman, Jerome.P.Lavelle, "Engineering Economics and analysis" Engg. Press, Texas, 2002

# **E REFERENCES**

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COUR	SE CODE		<b>COURSE</b>	NAMF	3		L	Τ	Р	С			
X	EE 602	POWER SY	STEMS-II ( CONTR	•	RATION	AND	3	1 1					
C:P: A	<b>x</b> = 3:1:0		L T							Η			
							3	1	2	6			
Course	e Outcomes (2	XEE 602):					Domain		Level				
	Explain pow reserve requir	•	ad characte	eristics	and ge	eneration	Cognitive	e	Understan	ding			
		and <b>Apply</b> the nower system for fi			edge to m	nodel and	Cognitive	ve Understanding Applying					
	system voltag	lamental aspects ge and <b>Select</b> the erating condition	suitable vol	+			Cognitive	e	Applying				
	Formulate ed and its solution	conomic dispatch	and unit	com	ımitment	problem	Cognitive	e	Creating				
	<b>Apply</b> comoperation and	nputer control	methods	for	power	system	Cognitive	e	Applying				

Load Frequency Control (LFC). To provide a solid foundation in mathematical and engineering fundamentals required to control the governing system in Turbine models. To provide the knowledge of Hydrothermal scheduling, reactive power control.

#### **UNIT - I: INTRODUCTION**

**9+3** 

12+3+9

An overview of power system operation and control - system load variation - load characteristics - load curves and load-duration curve - load factor - diversity factor - Reserve requirements: Installed reserves, spinning reserves, cold reserves, hot reserves - Importance of load forecasting - quadratic and exponential curve fitting techniques for forecasting – plant level and system level controls.

# **UNIT - II: REAL POWER - FREQUENCY CONTROL**

Basics of speed governing mechanism and modelling - speed-load characteristics – load sharing between two synchronous machines in parallel - concept of control area - LFC control of a single-area system: static and dynamic analysis of uncontrolled and controlled cases - two-area system: modelling - static analysis of uncontrolled case - tie line with frequency bias control - state variable model.

# **List of Experiments**

- 1. Simulink model of single area load frequency control with PI controller.
- 2. Simulink model of single area load frequency control without PI controller.
- 3. Simulink model for two area load frequency control.

# UNIT - III: REACTIVE POWER-VOLTAGE CONTROL

9+3+6

Generation and absorption of				
Ocheration and absorption of	reactive power	r - basics of re	active power control - exci	tation systems-
modelling - static and dynamic	analysis - stabi	lity compensatio	n - methods of voltage control	ol: tap-changing
transformer, injection reactive	•	• •	<b>-</b>	1 0 0
List of Experiments		,	5	0
4. Modelling of reactive power	compensation u	sing STATCOM	in MATLAB.	
5. Modelling of reactive power	· · · · · · · · · · · · · · · · · · ·			
<i>8</i> <b>1 1</b>	I I I I I I I I I I I I I I I I I I I	8		
UNIT -IV: UNIT COMMIT	MENT AND EC	CONOMIC DIS	РАТСН	12+3+9
Formulation of economic dis	spatch problem	– I/O cost cha	aracterization – incremental	cost curve -
coordination equations with	out and with los	s (No derivation	n of loss coefficients) - solu	ution by direct
method and $\lambda$ -iteration method		•		•
dynamic programming.			1 1 2	
List of Experiments				
6. MATLAB program to find	optimum loading	g of generators w	with penalty factor.	
7. MATLAB program to find	· · · · · · · · · · · · · · · · · ·	0 0	÷ •	
8. MATLAB program to find		0 0	0 0	
UNIT- V: COMPUTER CON		· ·		9+3
Need for computer control of	· ·	÷		•
monitoring - data acquisition a	· · · · · · · · · · · · · · · · · · ·			
network topology - state estin		- Contingency	Analysis - state transition di	lagram showing
various state transitions and con		TUTODIAL		
				TOTAL
	LECTURE	TUTORIAL	PRACTICAL	TOTAL
	LECTURE 45	15	PRACTICAL 30	<u>TOTAL</u> 90
TEXT BOOKS	45	15	30	90
	45	15	30	90
TEXT BOOKS	45 ergy Systems the	15	30	90
<b>TEXT BOOKS</b> 1. Olle.I.Elgerd, 'Electric Ene Ltd., New Delhi, 34th reprint, 2	<b>45</b> ergy Systems the 2010.	15 eory - An introd	30 uction', Tata McGraw Hill	90 Education Pvt.
<b>TEXT BOOKS</b> 1. Olle.I.Elgerd, 'Electric Ene	<b>45</b> ergy Systems the 2010.	15 eory - An introd	30 uction', Tata McGraw Hill	90 Education Pvt.
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<b>TEXT BOOKS</b> 1. Olle.I.Elgerd, 'Electric Ene Ltd., New Delhi, 34th reprint, 2 2. Allen. J. Wood and Bruce	<b>45</b> ergy Systems the 2010. F. Wollenberg,	15 eory - An introd 'Power Generati	30 uction', Tata McGraw Hill	90 Education Pvt. John Wiley &

# REFERENCES

1. Nagrath I.J. and Kothari D.P., 'Modern Power System Analysis', Tata McGraw-Hill, Fourth Edition, 2011.

Hadi Saadat, 'Power System Analysis', Tata McGraw Hill Education Pvt. Ltd., New Delhi, 21<sup>st</sup>reprint, 2010.

3. Abhijit Chakrabarti, Sunita Halder, 'Power System Analysis Operation and Control', PHI learning Pvt. Ltd., New Delhi, Third Edition, 2010.

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2. NPTEL : http://nptel.ac.in/courses/108104052/

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	1	2	-	-	-	-	1	-	-	2	1
CO2	2	3	2	2	2	-	-	-	1	1	1	-	2	-
CO3	2	2	2	2	3	-	-	-	-	-	1	1	2	-
CO4	2	2	3	3	2	-	-	-	-	1	-	-	1	-
CO5	1	2	2	2	2	-	-	-	-	-	-	1	1	1
Total	10	12	10	10	11	0	0	0	1	3	2	2	8	2
Scaled	2	3	2	1	3	0	0	0	1	1	1	1	2	1

–No Relation 1 – Low Relation 2 – Medium Relation 3 – High Relation

CC	<b>DURSE CODE</b>	COURSE NAME		L	Т	P	С
XUM	606	DISASTER MANAGEMENT		3	0	0	3
C:P: A				L	Т	Р	Н
3:0:0				3	0	0	3
Cours	e Outcomes:		Domain Leve		1		
CO1	Understanding the disaster preparedne	concepts of application of types of	Cognitive			Application	

UNIT Implic prepar UNIT Seismi	ation of development planning – Financial arrangements – edness – Community based disaster management– Emergend - V: SEISMICITY ic waves – Earthquakes and faults – measures of an earth damage – Tsunamis and earthquakes LECTURE	cy response.	vement – Disaste	
UNIT Implic prepar UNIT Seismi	edness – Community based disaster management– Emergend - V: SEISMICITY ic waves – Earthquakes and faults – measures of an earth	cy response.	vement – Disaste	
UNIT Implic prepar UNIT	edness – Community based disaster management– Emergend - V: SEISMICITY	cy response.	vement – Disaste	
UNIT Implic prepar	edness – Community based disaster management– Emergend	-	vement – Disaste	
UNIT Implic		-	-	
UNIT	ation of development planning – Financial arrangements –	Areas of improv	-	
	- IV: DEVELOPMENT PLANNING ON DISASTER		9	
	ation network – risk reduction by public awareness		action abusic	
Trigge	r mechanism – constitution of trigger mechanism – risk	reduction by edu	ucation – disaste	
	- III: AWARENESS OF RISK REDUCTION		9	
	e sensing and GIS - Case study	6 6		
	ets – video teleconferencing. Trigger mechanism – Remote			
	on support system and other systems – Geographic info	-	•	
	cation of various technologies: Data bases – RDBMS – M			
	- II: APPLICATION OF TECHNOLOGY IN DISASTE	· · · · · · · · · · · · · · · · · · ·	• •	
	ative to dominant approach – disaster-development linkages		<b>U</b>	
	k sharing – Disaster and development: Development p	•		
	uction – Disaster preparedness – Goals and objectives of ISI	DR Programme- I	-	
	NIT- I: INTRODUCTION		9	
CO5	Have a keen knowledge on essentials of risk reduction	Cognitive	Application	
CO4	On completion of this course, the students will be able to perform drill essential for disaster mitigation	Cognitive	Application	
	waves occurring globally			
CO3	Have a good understanding of importance of seismic	Cognitive	Analyze	
	understand planning essentials of disaster.	Cogintive		
	On completion of this course the students will be able to	Cognitive	Analyze	

# TEXTBOOKS

- 1. Siddhartha Gautam and K Leelakrishna Rao, "Disaster Management Programmes and Policies", Vista International Pub House, 2012,
- 2. Arun Kumar, "Global Disaster Management", SBS Publishers, 2008

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- 1. Encyclopaedia of Disaster Management, Neha Publishers & Distributors, 2008
- Pradeep Sahni, Madhavi Malalgoda and Ariyabandu, "Disaster risk reduction in South Asia", PHI, 2002
- 3. Amita Sinvhal, "Understanding earthquake disasters" TMH, 2010.

4. Pardeep Sahni, Alka Dhameja and Uma Medury, "Disaster mitigation: Experiences and reflections", PHI, 2000

## **E REFERENCES**

## Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1		1	1					1			1	1	2	2
CO 2			2		3						2	2	2	2
CO 3						2	2				1	1		1
CO 4		2	2		1	1	1	2	1	1	3	1	1	
CO 5						2	3	3		2	1	1	2	2
Total	0	3	5	0	4	5	6	6	1	3	8	6	7	7
Scaled	0	1	1	0	1	1	1	1	1	1	2	1	2	2

0 –No Relation 1 – Low Relation 2 – Medium Relation 3 – High Relation

SUB	8. CO	ODE	SUB NAME		L	Т	Р	С	
X	EE '	702	MICDODDOCESSODS AND		3	0	1	4	
С	Р	Α	MICROPROCESSORS AND MICROCONTROLLERS		L	Т	Р	Н	
3	1	0	MICKOCONTROLLERS		3	0	2	5	
Cou	rse	Outcor	nes (XEE 702)	Domai	n	]	Level		
C			<i>lerstand</i> the architecture and basic concepts of nicroprocessor.	Cogniti	ve	Understanding			
C	02	and s extern	<i>derstand</i> the memory organization, flags, stack, pecial function registers, I/O ports, connecting al memory, counters and timers, serial data I/O, upts present in 8051 microcontroller.	Cogniti	ve	Unde	erstan	ding	

CO3	to <i>dev</i> basic	<i>inderstand</i> the 8051 Microcontroller instructions <i>pelop and show</i> assembly language programs for logical and arithmetic operations, by using jump all instructions.	Cognitive Psychomotor	Unders Applyi Set	standing ing
CO4	progra	<i>entify</i> timer and counter programming, Interrupt amming and <i>show</i> the I/O interfacing techniques 8051 microcontroller.	Cognitive Psychomotor	Applyi Set	ing
CO5	micro speed	<i>sign</i> and <i>test</i> assembly language program in 8051 controller for <i>displaying</i> Waveform generation, control of DC motor, Stepper motor control, segments LED display	Cognitive Psychomotor	Creatin Mecha	0
UNIT I		INTEL 8085 PROCESSOR			09
Architect based sin		nstruction format addressing modes – Basic timing ograms.	; diagram – inpu	ut/outpu	t – 8085
UNIT I	Ι	8051 MICROCONTROLLER ARCHITECTU	RE		12
		re, memory organization, flags, stack, and special rnal memory, counters and timers, serial data I/O,		ers,	I/O ports -
UNIT II	Ι	8051 MICROCONTROLLER INSTR ADDRESSING MODES	UCTIONS	AND	21
		instructions - addressing modes, moving data, log p and call instructions – subroutines - Interrupts an	· · · · · · · · · · · · · · · · · · ·	arithme	tic
UNIT I	V	MICROCONTROLLER PROGRAM INTERFACING BASICS	MING	AND	18
		programming - Assembly Language Programming S 232 and RS 485, Interrupt programming	g, timer and cou	nter pro	gramming,

UNIT	ΓV	INTERFACING PERIPHERALS AND MICROCONTROLLER APPLICATIONS	9+6
Serial	and paral	lel I/O (8251 and 8255), Programmable DMA controller, Programmabl	e interrupt
		Z/DAC interfacing. Programming concepts Regarding Waveform generat	tion, speed
		notor, Stepper motor control, seven segments LED display.	- /
1.	•	rithmetic operations: Multi precision addition / subtraction / multiplication	1/
	division.		
2.	Program	ming with control instructions: Increment / Decrement, Ascending / Desce	ending
	order, M	aximum / Minimum of numbers, Rotate instructions.	
3.	Design p	program for code conversions.	
4.	Interfacio	ng of Keyboard with 8085.	
5.	Interfacio	ng of Keyboard with 8051.	
6.	Interfacio	ng of seven segment display with 8085.	
7.	Interfacio	ng of seven segment display with 8051.	
8.	Interfacio	ng of 8 bit D/A and A/D Converters.	
9.	Serial co	ommunication, I/O Port operations.	
10.	Demonst	tration of basic instructions with 8051 Micro controller execution, includin	ng:
	a. Cond	litional jumps, looping	
	b. Calli	ng subroutines.	
	c. Stack	x parameter testing	
11.	Design a	nd implementation of Traffic Light control.	
12.	Design a	nd implementation of Stepper motor control.	

Lecture = 45; Lab = 30; Total = 75 Hours

#### TEXT BOOKS

- 1. Ramesh .S. Gaonkar, 'Microprocessor architecture, Programming and its applications with the 8085' Penram International Publications (India), 4thEdition,2000
- 2. N.Senthilkumar, M.Saravanan, S.Jeevananthan'Microprocessors and microcontroller', Oxford university press, 2010
- 3. Kenneth Ayala, 'The 8051 Microcontroller', Cengage Learning Publications, 3rd Edition, 2007.
- 4. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay 'The 8051 Microcontroller and Embedded Systems using Assembly and C', Prentice Hall Publications, 2nd Edition, 2008.

#### **REFERENCE BOOKS**

- 1. Ray A. K., Bhurchandi K. M., 'Advanced Microprocessor and Peripherals', Tata McGraw-Hill Publications, 3 r d E d i t i o n , 2013.
- 2. Sencer Yeralan, Helen Emery, 'Programming and interfacing the 8051 Microcontroller', Addison-Wesley Publications, 1st Edition, 2000.
- 3. Krishna Kant, 'Microprocessors and Microcontrollers, Architecture, Programming and System Design-8085, 8086, 8051, 8096', Prentice Hall India Ltd Publications, 1st Edition, 2010.
- 4. Douglas. V. Hall Microprocessors and Interfacing Tata McGraw Hill- Revised 2nd edition, 2006

**E-REFERENCES:** 

1. NTPEL, Microprocessor (Web Course), Prof. S.P.Da, IIT Kharagpur.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	2	-	-	-	-	-	-	1	1	-	1	1
CO2	1	2	1	3	1	-	-	-	2	1	2	1	1	1
CO3	-	-	-	-	-	1	2	-	1	2	-	-	1	1
CO4	1	1	2	2	1	-	-	-	2	1	2	1	-	1
CO5	1	2	2	1	-	-	3	-	3	2	1	-	-	1
Total	4	5	5	6	2	1	5	-	8	7	6	2	3	5
Scaling	1	1	1	1	1	1	1	-	1	1	1	1	1	1

#### Mapping of COs with POs

0-No relation1 - Low relation2 - Medium relation3 - High Relation

SUI	B.C	COD	E	SUB NAME		L	Т	P	C
X	EE	603	3			3	1	1	5
С	P		A	MEASUREMENT AND INSTRUMENTAT	ION	L	Т	Р	H
3	1		0			3	2	2	7
Cou	irs	e Ou	utco	omes (XEE703)	Doma	in	L	evel	
CO		mea	run asur	nents. <b>Design</b> of bridge circuits for the ement of unknown parameters.	Cogniti	ve	Reme	mberi	ing
CO	2			<i>n</i> the construction and working of different types cating and integrating instruments.	Cogniti	ve	Under	stand	ing
CO	3			<i>be</i> the operation of A/D and D/A converters and <i>orm</i> its characteristics.	Cogniti	ve	Reme	mberi	ing
CO	4	Inst	run	<i>n</i> the construction and operation of recording nents. <b>Carryout</b> calibration test for measuring nents.	Cogniti	ve	Under	stand	ing
CO	5	Exp	olai	<i>n</i> the different types of transducers.	Cogniti	ve	Reme	mberi	ing
UN	IT	I	INT	RODUCTION				09-	+06
Fun	ctio	onal	ele	ments of an instrument - errors in measurement - st	atic and	dyna	mic		
char	ract	eris	tics	statistical evaluation of measurement data - standa	rd and ca	alibra	ation		
UN	IT	2	EL	ECTRICAL AND ELECTRONIC INSTRUMEN	NTS			0	9
Volt Exte	tme end run	eter ing nent	– A Vo trai	<ul> <li>Multirange ammeter – Extension of ammet</li> <li>Analog Electromechanical instruments-Galvanome</li> <li>Itmeter range – Transistor voltmeter – Dual slop</li> <li>nsformer – Magnetic measurement- instruments for</li> </ul>	eter- mul e integra	ltiran ating	ige vol type ]	tmete DVM	er –
UN	IT	3	SIG	NAL CONDITIONING CIRCUITS				09+	18
Brid Brid instr Wag	lge lge run gne	cir – nent r's ]	cuit Hay atio Eart	s – Wheatstone's bridge – Maxwell's Bridge - y's Bridge – Schering Bridge –De saulty brid n amplifier – filter circuits, data acquisition s h (Ground) connection- Earthing techniques.	ge- diff	erent	tial an	npflie analy:	r – zer-
				DRAGE AND DISPLAY DEVICES				09+	
stor	age	osc	cillo	uction – Block diagrams of Oscilloscope – simplescope – digital CRO – X-Y recorder – magnetic reED, LCD and Dot matrix displays – Data logger-Vi	corder –	strip	o chart		
UN	IT	5 '	TR	ANSDUCERS				09	
tran Loa	sdu d c	icers	s – tran	of transducers – selection of transducers – resisti piezo electric transducers – optical and digital t sducers for measurement of displacement, temper eration, torque, speed, Smart Sensors.	ransduce	ers. p	H elec	ctrode	es –

- 1. Study of Voltmeter , Ammeter and Wattmeter Range Extension.
- 2. Characteristics of Thermal Transducers (Thermocouples).
- 3. Measurement of Pressure using LVDT.

#### 4. AC Bridges:

- a) Maxwell Inductance Bridge
- b) Anderson Bridge
- 5. Wheatstone bridge.
- 6. Instrumentation Amplifiers.
- 7. A/D and D/A converters.
- 8. Calibration of Single phase and Three phase Energy meter.
- 9. Calibration of Current Transformer and potential transformer.
- 10. Measurement of Three phase power and power factor by two watt meter method.

#### Lecture = 45; Tutorial = 30; Practical = 30; Total = 105 Hours

#### **TEXT BOOKS**

- 1. Sawhney A.K 'A Course in Electrical & Electronic Measurements and Instrumentation' Dhanpat Rai and Sons,2007.
- 2. Doebeling, E.O., 'Measurement Systems Application and Design', McGraw Hill Publishing Company.
- 3. H.S. Kalsi, 'Electronic Instrumentation', Tata Mc Graw Hill Co., 1995.
- 4. B Gupta, 'A course in Electronic and Electrical Measurement', S.K.Kataria & sons,Delhi-2003

#### **REFERENCES BOOKS**

- **1.** Golding E.W and Wills F.E 'Measurements and Measuring Instruments' Sir Isaac Pitman and Sons(P) Ltd, 1997.
- **2.** Moorthy, D.V.S., 'Transducers and Instrumentation', Prentice Hall of India Pvt. Ltd., 1995
- **3.** Dalley, J.W., Riley, W.F. and Meconnel, K.G., 'Instrumentation for Engineering Measurement', John Wiley & Sons, 1993

#### **E REFERENCES**

1. NPTEL, Measurements and Instruments, Prof.T.Anjaneyulu, Department of EEE, Indian Institute of Technology, Delhi.

# Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	1			1		1	1			3			2	3
CO 2	1	1										1	2	3
CO 3	1		1		1			2		1			2	2
CO 4	1	2										1	2	2
CO 5									1		1	1	2	3
Total	4	3	1	1	1	1	1	2	1	4	1	3	10	13
Scaling	1	3	1	1	1	1	1	1	1	1	1	1	2	3

0 –No relation 1 – Low relation 2 – Medium relation 3 – High Relation

SUB	. COD	E	SUB		L	Т	P	С
XI	J <b>M 706</b>		NAME		3	0	0	3
C	<b>P</b>	Α	CYBER SECURITY		L	T	P	H
3	0	0			3	0	0	3
Cours	e Outco	omes (	XUM706)	Doma	ain	]	Level	
CO1	To lea attack		basic concepts of networks and cyber-	Cogni	tive	Reme	embe	ering
CO2			e concepts of system vulnerability scanning ning tools	Cogni	tive	Remo	embe	ring
CO3			d the network defense mechanisms and the detect and quarantine network attacks.	Cogni	tive	Reme	embe	ering
CO4	To lea	rn the	different tools for scanning.	Cogni	tive	Rem	embe	ering
CO5		•	he types of cybercrimes, cyber laws and investigations.	Cogni	tive	Remo	embe	ring
UNIT	I	INTR	ODUCTION					09
Inform Securit authen Concep and IP	ation S y in tication ots in I V6. Fui	System mobile servi nternet nctions	Distributed Information Systems: Role of Treats and attacks, Classification of The and Wireless Computing-Security Cha ce Security, Security Implication for Or and World Wide Web: Brief review of Inte of various networking components-routers, Internet attion Techniques.	reats and llenges ganizatio ernet Pro	d asse in M ons, L otocols	essing Iobile aptops 5 TCP/I	Dam Dev sec IP, II	ages ices, urity
UNIT	- I		EMS VULNERABILITY SCANNING					09
Check, Netwo Datapi tools. I	Traffi rks Vu pe, Fpi Networ	c Prob Inerab pe, W k Sniff	rability scanning, Open Port / Service Ide e, Vulnerability Probe, Vulnerability Exan ility Scanning - Netcat, Socat, understandi inRelay, Network Reconnaissance – Nmay ers and Injection tools – Tcpdump and Windu Hping Kismet.	nples, O ing Port p, THC	penV and	AS, M Service	etasp s too	oloit. ols -
UNIT	III	NETV	<b>VORK DEFENCE TOOLS</b>					09
Protect Addres	s a Ne s Tran	etwork, slation	et Filters: Firewall Basics, Packet Filter Packet Characteristic to Filter, Stateless V (NAT) and Port Forwarding, the basic of V Firewall, Snort: Introduction Detection System	's Statefu irtual Pri	ul Fire vate N	ewalls,	Netv	work

#### UNIT IV TOOLS FOR SCANNING

Scanning for web vulnerabilities tools: Metasploit tool, Nikto, W3af, HTTP utilities - Curl, OpenSSL and Stunnel, Application Inspection tools – Zed Attack Proxy, Sqlmap. DVWA, Webgoat, Password Cracking and Brute-Force Tools – John the Ripper, L0htcrack, Pwdump, THC-Hydra.

#### UNIT V INTRODUCTION TO CYBER CRIME AND LAW

Cyber Crimes, Types of Cybercrime, Hacking, Attack vectors, Cyberspace and Criminal Behavior, Clarification of Terms, Traditional Problems Associated with Computer Crime, Introduction to Incident Response, Digital Forensics, Computer Language, Network Language, Realms of the Cyber world, A Brief History of the Internet, Recognizing and Defining Computer Crime, Contemporary Crimes, Computers as Targets, Contaminants and Destruction of Data, Indian IT ACT 2000.

Introduction to Cyber Crime Investigation: Password Cracking, Key loggers and Spyware, Virus and Worms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer Overflow, Attack on wireless Networks

Lecture = 45; Tutorial = 0; Total = 45 Hours

09

09

#### **TEXT BOOKS**

- Nina Godbole, "Information Systems Security: Security Management, Metrics, Frameworks and Best Practices, w/cd", Wiley Publications, 2008, ISBN 10: 8126516925, ISBN 13 : 9788126516926
- Thomas J. Mowbray, "Cybersecurity: Managing Systems, Conducting Testing and Investigating Intrusions", Wiley Publications, 2013, Kindle Edition, ISBN 10: 812654919X, ISBN 13: 9788126549191
- 3. D.S. Yadav, "Foundations of Information Technology", New Age International publishers, 3<sup>rd</sup> Edition, 2006, ISBN-10: 8122417620, ISBN-13: 978-8122417623.

#### **REFERENCE BOOKS**

- 1. Mike Shema, "Anti-Hacker Tool Kit", McGraw Hill Education, 4<sup>th</sup> edition, 2014,
- 2. Nina Godbole, Sunit Belapure, "Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley publications, 2013, ISBN 10 : 8126521791, ISBN 13 : 9788126521791.
- 3. Corey Schou, Daniel Shoemaker, "Information Assurance for the Enterprise: A Roadmap to Information Security (McGraw-Hill Information Assurance & Security)", Tata McGraw Hill, 2013, ISBN-10: 0072255242, ISBN-13: 978-0072255249.
- 4. Vivek Sood, "Cyber Laws Simplified", McGraw Hill Education (INDIA) Private Limited in 2001, ISBN-10: 0070435065, ISBN-13: 978-0070435063.
- 5. Steven M.Furnell, "Computer Insecurity", Springer Publisher, 2005 Edition.

#### **E REFERENCES**

- 1. https://www.cryptool.org/en/
- 2. https://www.metasploit.com/
- 3. <u>http://sectools.org/tool/hydra/</u>
- 4. <u>http://www.hping.org/</u>
- 5. http://www.winpcap.org/windump/install/
- 6. <u>http://www.tcpdump.org/</u>
- 7. https://www.wireshark.org/
- 8. https://ettercap.github.io/ettercap/
- 9. https://www.concise-courses.com/hacking-tools/top-ten/
- 10. https://www.cirt.net/Nikto2
- 11. <u>http://sqlmap.org/</u>

#### Mapping COs versus POs

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA1 0	GA1 1	GA 12
CO1	3	3	3	2	1	1	1	1	1	0	0	1
CO2	2	1	1	1	1	1	1	1	1	0	0	1
CO3	2	2	2	1	1	1	1	1	1	0	0	1
CO4	1	1	1	1	0	0	0	0	0	0	0	1
CO5	1	1	1	2	2	1	1	2	2	0	0	1
Total	9	8	8	7	5	4	4	5	5	0	0	5
Origin al	9	8	8	7	5	4	4	5	5	0	0	5
Scaled to 0,1,2,3 scale	2	2	2	2	1	1	1	1	1	0	0	1

0-No relation1 - Low relation2 - Medium relation3 - High Relation

SUE	<b>B.</b> C	OD	E	SUBJECT NAME		L	Т	Р	C
X	GS7	08				0	0	0	0
С	P	)	Α	CAREER DEVELOPMENT SKILLS		L	Τ	Р	Н
1.8	0.	8	0.4			2	0	2	4
Cour	se C	Juto	come	s (XCD 708)	L	Domai	n	L	evel
CO				<i>ge</i> on a career related communication and the different formats of CV	Cog	gnitive	•	Remen	nbering
CO			-	how to face an interview and to learn how to for an interview	Psy	chom	otor	Set	
CO	)3	Cor	nmur	<i>ticates</i> with the group of people in discussion	Affe	ective		Respo	nding
UNI	Τİ								10
	/ and rs	d re		rence between resume and CV; characteristics of , use of graphics in resume and CV; forms and fu					elements
etique	ette	and	l dres	ps for various types of interviews. Types of ques s code in interview, interview mistakes, teleph uestions. Planning for the interview.				• •	uage,
UNI									10
Mock	t inte	ervi	ews -	workshop on CV writing – Group Discussion					
				Lecture = 20; Worksl	hop =	= 10; '	Fotal	$= 30 \mathrm{H}$	lours

<b>TEXT BOOKS</b>
-------------------

- 1. Paul McGee, How To Write a CV That Really Works: A Concise, Clear and Comprehensive Guide to Writing an Effective CV, Hachette UK, 2014
- 2. Mary Ellen Guffey, Dana Loewy Essentials of Business Communication, , Cengage Learning, 2012
- 3. Michael Spiropoulos, Interview Skills that win the job: Simple techniques for answering all the tough questions, Allen & Unwin, 2005
- 4. William L. Fleisher, Effective Interviewing and Interrogation Techniques, , Nathan J. Gordon, Academic Press, 2010.

#### **REFERENCE WEBSITES**

- 1. http://www.utsa.edu/careercenter/PDFs/Interviewing/Types%20of%20Interviews.pdf
- 2. <u>http://www.amu.apus.edu/career-services/interviewing/types.htm</u>
- 3. http://www.careerthinker.com/interviewing/types-of-interview/

SU	<b>В.</b> С	ODE	SUB NAME	L	Т	P	С	
	E5 1		ELECTRIC VEHICLES AND POWER		3	0	0	3
С	Р	Α	MANAGEMENT		L	Т	Р	Η
3	0	0			3	2	0	5
Cou	irse (	Outcon	nes (E51)	Doma	nin		Leve	1
C	01	Expla: genera	in power system load characteristics and tion reserve requirements.	Cogni	tive	Unde	rstand	ling
С	02		<b>nstrate</b> and <b>Apply</b> the mathematical knowledge lel and analysis of power system for frequency l.	Cognit	tive	Unde Apply		ling
С	03	effect	<b>fy</b> fundamental aspects of reactive power and its on system voltage and <b>Select</b> the suitable voltage l method for the system operating condition.	Cogni	tive	Apply	ying	
С	04		<b>late</b> economic dispatch and unit commitment m and its solution.	Cogni	tive	Creat	ing	
С	05		computer control methods for power system on and control.	Cogni	tive	Apply	ying	
	UNI	ГΙ	INTRODUCTION				0	9+06
load reser and	curv rves,	ves and spinnir nential	power system operation and control - system load load-duration curve - load factor - diversity factor ag reserves, cold reserves, hot reserves - Importanc curve fitting techniques for forecasting – plant leve <b>REAL POWER - FREQUENCY CONTROL</b>	- Reserve e of load	ve requ foreca	uirement asting -	nts: In quad ntrols	nstallec Iratic
			-	1 1	· · .	•		
betw area	veen syst leling	two syn em: sta	governing mechanism and modeling - speed-lo achronous machines in parallel - concept of contr tic and dynamic analysis of uncontrolled and cor c analysis of uncontrolled case - tie line with freq	ol area - trolled c	LFC ases -	control two-	of a area	single- system
J	JNIT	III	<b>REACTIVE POWER-VOLTAGE CONTRO</b>	L			0	9+06
– mo char	odeli 1ging	ng - sta	absorption of reactive power - basics of reactive po tic and dynamic analysis - stability compensation ormer, injection reactive power - SVC (TCR + T	- method	ls of v	oltage	contr	ol: tap

#### UNIT IV UNIT COMMITMENT AND ECONOMIC DISPATCH

**09+06** 

Formulation of economic dispatch problem – I/O cost characterization – incremental cost curve - coordination equations without and with loss (No derivation of loss coefficients) - solution by direct method and  $\lambda$ -iteration method - statement of unit commitment problem – priority-listmethod - forward dynamic programming.

#### UNIT V COMPUTER CONTROL OF POWER SYSTEMS

**09+06** 

Need for computer control of power systems - concept of energy control centre – functions - system monitoring - data acquisition and control - system hardware configuration – SCADA and EMS functions - network topology - state estimation – WLSE - Contingency Analysis - state transition diagram showing various state transitions and control strategies.

#### Lecture = 45; Tutorial = 30; Lab = 0; Total =75 Hours

#### TEXT BOOKS

- 1. Olle.I.Elgerd, 'Electric Energy Systems theory An introduction', Tata McGraw Hill Education Pvt. Ltd., New Delhi, 34th reprint, 2010.
- 2. Allen. J. Wood and Bruce F. Wollenberg, 'Power Generation, Operation and Control', John Wiley & Sons, Inc., 2003.
- 3. Kundur P., 'Power System Stability and Control, Tata McGraw Hill, New Delhi, 5th reprint, 2008.

#### **REFERENCE BOOKS:**

- 1. Nagrath I.J. and Kothari D.P., 'Modern Power System Analysis', Tata McGraw-Hill, Fourth Edition, 2011.
- 2. Hadi Saadat, 'Power System Analysis', Tata McGraw Hill Education Pvt. Ltd., New Delhi, 21<sup>st</sup>reprint, 2010.
- 3. Abhijit Chakrabarti, Sunita Halder, 'Power System Analysis Operation and Control', PHI learning Pvt. Ltd., New Delhi, Third Edition, 2010.

#### **E-REFERENCES:**

1. NPTEL : <u>http://nptel.ac.in/courses/108104052/</u>

CO/ PO/PSO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	3	3	1	1	2	-	-	-	-	1	-	-	2	1
CO2	2	3	2	2	2	-	-	-	1	1	1	-	2	-
CO3	2	2	2	2	3	-	-	-	-	-	1	1	2	-
CO4	2	2	3	3	2	-	-	-	-	1	-	-	1	-
CO5	1	2	2	2	2	-	-	-	-	-	-	1	1	1
Total	10	12	10	10	11	0	0	0	1	3	2	2	8	2
Scaling	2	3	2	1	3	0	0	0	1	1	1	1	2	1

# Mapping COs versus PO, PSO

 $0 - No\ relation 1 - Low\ relation 2 - Medium\ relation 3 - High\ Relation$ 

SUB CODE		SUB NAME		L	Τ	P	С		
E61			-	3	0	0	3		
_	4	HIGH VOLTAGE ENGINEERING		L	Т	P	Η		
3 0	0			3	0	0	3		
Course O	utcome	s (E61)	Domain		L	evel			
CO1	Illustr	<i>in</i> the different causes of overvoltage and <i>ate</i> overvoltage control due to switching. <i>classify</i> rious methods for protection of lightning bltage							
CO2	Explai liquid of insu	Cognitive	-	Under	standi	ing			
CO3		o define <b>and</b> <i>Classify</i> the different methods to te the various types of high voltages and high ts.	Cognitive		Under	standi	ing		
CO4	•	<i>fy</i> and <i>analyze</i> the different techniques used to re the various types of high voltages and high ts.	Cognitive		dersta alyzin	C	5		
CO5	test th System	and <i>Illustrate</i> the different testing methods to be various high voltage components of power in and <i>define</i> the International, Indian standards sulation co-ordination.	Cognitive		memb dersta	-			
UNIT I	01	<b>VER VOLTAGES IN ELECTRICAL POWER</b>	SYSTEMS				<b>09</b>		
due to swi protection transmission	tching s of on lines	overvoltage-Lightning phenomena and its effects urge-power frequency overvoltage-control of over against overvoltage – Becoleys lattice diagram.	voltage due to	swit	ching -				
conduction	reakdov and br	ECTRICAL BREAKDOWN IN GASES, SOLI vn in uniform and non-uniform fields - corona disc eakdown in pure and commercial liquids - Breakd rics-Applications of insulating materials.	harges - Vacu	um b	reakdo		09		
UNIT III		ENERATION OF HIGH VOLTAGES AND HIG	GH CURREN	TS			09		
Generation	n of Hig	h DC, AC, impulse voltages and currents. Tripping	g and control of	of im	pulse g	genera	ators.		
UNIT IV		EASUREMENT OF HIGH VOLTAGES AND I		-		-	09		
voltages- I	ent of H Measure	High direct current voltages – measurement of voltagement of High currents: direct, alternating and imposin high voltage measurement.	ages: alternation			ılse			

#### UNIT V HIGH VOLTAGE TESTING OF ELECTRICAL APPARATUS

High voltage testing of electrical power apparatus – power frequency, impulse voltage and DC testing – International and Indian Standards-Insulation co-ordination.

#### Lecture = 45; Tutorial = 00; Total = 45 Hours

09

#### TEXT BOOKS

- 1. E. Kuffel and M. Abdullah, 'High Voltage Engineering', Pergamon press, Oxford, 2010.
- 2. M.S. Naidu and V. Kamaraju, 'High Voltage Engineering', Tata McGraw Hill,4<sup>th</sup>Edition, 2004.
- 3. E. Kuffel and W.S. Zaengl, 'High Voltage Engineering Fundamentals', Pergamon Press, Oxford, London, 2012
- 4. August F.Metraux. "Some problems and actual limits of test techniques at extra high voltages", Haefely publications EIS 14.

#### **REFERENCE BOOKS**

- 1. C.L.Wadhwa, 'High Voltage Engineering', New Age International (P) Ltd, 2<sup>nd</sup> Edition2006.
- 2. Ravindra Arora, Wolfgang Mosch, "High Voltage Insulation Engineering", New Age International (P) Limited, 2011.
- 3. Chinnappa, K.M., Need for next higher voltage level in India", National seminar on high voltage AC and Dc Transmission, New Delhi.

#### **E REFERENCES**

- 1. Web Content http://www.library.dce.edu/e-resources/books/ee/
- 2. NPTEL-High Voltage Engineering, C.L. Wadhwa -IIT Madras.

CO/ PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5		<b>PO</b> 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	-	-	1	-	1	-	-	-	2	2	2
CO2	3	2	-	-	-	-	-	-	-	-	-	1	1	2
CO3	2	2	-	-	1	1	-	1	-	-	-	1	1	1
CO4	2	2	-	-	-	-	1	-	-	-	-	1	2	2
CO5	2	2	-	2	-	1	-	-	-	-	-	2	2	2
Total	12	10	2	2	1	3	1	2	0	0	0	7	8	9
Scaling	3	2	1	1	1	1	1	2	0	0	0	2	2	2

#### Mapping COs versus PO, PSO

0 –No relation 1 – Low relation 2 – Medium relation 3 – High Relation

#### SEMESTER I

CC	OURSE CODE	COURSE NAME		L	Τ	P	•	С			
	PMA 101	CALCULUS AND LINEAR ALGER	BRA	3	1	0		4			
<b>C:P:</b>	A = 3:0:0.5			L	Τ	P	•	Н			
PREF	REQUISITE: Differ	entiation and Integration		3	1	0		4			
Cours	se Outcomes (PMA	101):	Dom	ain	Leve	el					
CO1Apply orthogonal transformation to reduce quadratic form to canonical forms.CognitiveRe Ap											
CO2	<b>Apply</b> power series sequences and series.	Cogn Psych	itive nomot	or	Guic Resp	len lec	nbering l nse				
CO3		e of composite functions and implicit neorem and Jacobian	Cogn Psycł	itive 10mot	or	Rem Guic Resp	lec				
CO4	expansion, by fin- without constraints	tions of two variables by Taylors ding maxima and minima with and using Lagrangian Method. Directional nt, Curl and Divergence.	Cogn Affec				ers	nbering standing ing			
CO5	<b>Apply</b> Differential Curvature and to in	and Integral calculus to notions of proper integrals.	Cogn	itive		App	lyi	ng			
UNIT	- I: MATRICES							12			
vector Skew- Transf	s - Cayley-Hamiltor Symmetric and Orth formation of Quadrat	Eigen values and Eigen vectors -Proper Theorem – Diagonalisation of Matrice ogonal Quadratic form – canonical form ic form to Canonical form (Orthogonal of	s – Re - Nati	al Ma	trice	es: S	yn	nmetric - form and			
	- II: SEQUENCES							12			
Tests	of convergence: Con	l examples-Series: Types and converge nparison test, Integral test and D'Alem series- Parseval's Theorem.			-						
UNIT	- III: MULTIVAR	ABLE CALCULUS: PARTIAL DIFF	EREN	TIA	ΓΙΟ	N		12			
		artial differentiation – Total Derivativ					nti	ation of			
-	osite Functions: Ch em- Jacobian.	ange of Variables – Differentiation of	an Im	plicit	Fun	nctio	n -	Euler's			
		RIABLE CALCULUS: MAXIMA A	ND N	IININ	ſΑ	ANI	)	12			
	FOR CALCULUS		- 120 - 19.				-				
		tion of Two variables- Maxima, Minima	a of fu	Inction	ns of	f two	) V	ariables:			
		ints - Lagrange's Method of Undeterm									
	atives - Gradient, Div			1							
UNIT	- V: DIFFERENT	IAL AND INTEGRAL CALCULUS						12			
<b>D</b> 1	Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions										

and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

Tevolutions.			
	LECTURE	TUTORIAL	TOTAL
	45	15	60
TEXTBOOKS			
1. Ramana B.V., "Higher Engineering Mathematics	", Tata McGra	w Hill New Dell	ni, 11th
Reprint, 2015. (Unit I, Unit III and Unit IV).			
2. N.P. Bali and Manish Goyal, "A text book of Eng	gineering Math	ematics", Laxmi	
Publications, Reprint, 2014. (Unit II).			
3. B.S. Grewal, "Higher Engineering Mathematics"	, Khanna Publi	shers, 40 <sup>th</sup> Editio	on,
2010. (Unit V).			
REFERENCES			
	1.1	n oth E 11.1 E	
1. G.B. Thomas and R.L. Finney, "Calculus and An	alytic geometr	y", 9 <sup>th</sup> Edition, P	earson,
Reprint, 2002.			
2. Veerarajan T., "Engineering Mathematics for firs	t year", Tata M	IcGraw-Hill, Ne	w Delhi,
2008.			
3. D. Poole, "Linear Algebra: A Modern Introduction	on", 2 <sup>nd</sup> Edition	, Brooks/Cole, 2	005.
4. Erwin Kreyszig, "Advanced Engineering Mathem	natics", 9 <sup>th</sup> Edi	tion, John Wiley	& Sons,
2006.		•	

	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	<b>PO8</b>	PO9	PO10	PO11	PO12
CO 1	3	2			2					1		2
CO 2	3	2								1		1
CO 3	3	2								1		1
CO 4	3	2								1		1
CO 5	3	2			1					1		2
	15	10	0	0	3	0	0	0	0	5	0	7
Scaled Value	3	2			1					1		
			1	$-5 \rightarrow 1$	6-	$-10 \rightarrow 2$	. 11	$-15 \rightarrow$	. 3		•	

Mapping of COs with POs

0 - No Relation, 1 - Low Relation, 2- Medium Relation, 3- High Relation

COUDC			т	T	Ъ						
	SE CODE	COURSE NAME		T 1	P	C					
$\frac{PA}{C:P:A} =$	P 102	APPLIED PHYSICS FOR ENGINEERS	3 L	1 T	0 P	4 H					
	QUISITE:	Basic Physics in HSC level	<u>L</u> 3	1	<b>1</b> 0	4					
	Dutcomes (I		_	nain		vel					
CO1	elasticity	he basics of mechanics, <b>explain</b> the principles of and <b>determine</b> its significance in engineering d technological advances.	Cog	gnitive		member					
CO2	CO2 Illustrate the laws of electrostatics, magneto-statics and electromagnetic induction; use and locate basic applications of electromagnetic induction to technology.										
CO3	measureme application	d the fundamental phenomena in optics by ent and <b>describe</b> the working principle and of various lasers and fiber optics.		gnitive	Ap	derstand oply					
CO4	principles	energy bands in solids, <b>discuss</b> and <b>use</b> physics of latest technology using semiconductor devices.		gnitive	An	derstand alyze					
CO5	-	nowledge on particle duality and solve Schrodinger	Cog	gnitive		derstand					
TINIT		or simple potential.				ply					
		ICS OF SOLIDS Newton's laws of motion - work and energy - impulse				9+3					
Moment, Experime	couple and ental determ	Strain - Hooke's law - Stress strain diagram - Class torque - Torsion pendulum - Applications of torsion p ination of Young's modulus: Uniform bending and nor ROMAGNETIC THEORY	endu	lum - B	ending o nding.						
constant, Lenz's la plane, cir of plane,	internal fie w - Maxwe cularly and circularly ar	s - Electrostatic field and potential of a dipole; Die ld - Clausius Mossotti Equation - Laws of magneti Il's equation - Plane electromagnetic waves; their tran elliptically polarized light - quarter and half wave pland elliptically polarized light. <b>S, LASERS AND FIBRE OPTICS</b>	sm - nsver	Amperesse natur	e's Farac e - expro tion and	lay's law; ession for					
			nofer-	tive in 1							
power of Introduct Fibre Og angle - T	f a prism- ion - Popula <b>ptics:</b> Princi ypes of optic	Optical instrument: Spectrometer - Determination of a Interference of light in thin films: air wedge - lation inversion -Pumping - Laser action - Nd-YAG la ple and propagation of light in optical fibre - Nume cal fibre - Fibre optic communication system (Block d ONDUCTOR PHYSICS	Diffra ser - erical	ction: CO <sub>2</sub> las apertur	grating. ser – Ap re and a	LASER: plications					
Semicon semicono Extrinsic Diodes a	ductors: En luctors - Co semiconduc and Transis	hergy bands in solids - Energy band diagram of go oncept of Fermi level - Intrinsic semiconductors - etors - P type and N type semiconductors - Hall effect. <b>tors</b> : P-N junction diode - Forward bias and reverse full wave rectifier using P N junction diodes - PNF	Conc bias	cept of - Recti	rs, insul holes -	ators and doping - action of					

different configurations - Advantages of common emitter configuration - working of NPN transistor as an amplifier in common emitter configuration.

#### **UNIT- V: QUANTUM PHYSICS**

9+3

Introduction to quantum physics, black body radiation, Compton effect, de Broglie hypothesis, wave – particle duality, uncertainty principle, Schrodinger wave equation (Time dependent and Time independent), particle in a box, Extension to three dimension - Degeneracy.

#### **TEXT BOOKS**

- 1. Gaur R. K. and Gupta S. L., "Engineering Physics", Dhanpat Rai Publications, 2009.
- 2. Avadhanulu M. N. "Engineering Physics" (Volume I and II), S. Chand & Company Ltd., New Delhi, 2010.

#### **REFERENCE BOOKS**

- 1. Palanisamy P. K., "Engineering Physics", Scitech Publications (India) Pvt. Ltd, Chennai.
- 2. Arumugam M., "Engineering Physics" (Volume I and II), Anuradha Publishers, 2010.
- 3. Senthil Kumar G., " Engineering Physics", 2nd Enlarged Revised Edition, VRB Publishers, Chennai, 2011.

4. Mani P., "Engineering Physics", Dhanam Publications, Chennai, 2007.

#### **E RESOURCES**

NPTEL, Engineering Physics, Prof. M. K. Srivastava, Department of Physics, IIT, Roorkee.

#### **REFERENCE BOOKS**

- 1. Samir Kumar Ghosh, "A text book of Advanced Practical Physics", New Central Agency (P) Ltd, 2008.
- 2. Arora C.L., "Practical Physics", S. Chand & Company Ltd., New Delhi, 2013.
- 3. UmayalSundari AR., "Applied Physics Laboratory Manual", PMU Press, Thanjavur, 2012.

LECTURE	TUTORIAL	PRACTICAL	TOTAL
45	15	0	60

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	2	2	1					1			1	3	2
CO 2	3		1		1							1	3	3
CO 3	3	2	2	2	1				1			1		
CO 4	3	2	2	2	1				1			1	2	3
CO 5	3		2									1		
Total	15	6	9	6	4				3			5	8	8
Scaled	3	2	2	2	1				1			1	2	2

## Mapping of COs with POs

 $1-5 \rightarrow 1, 6-10 \rightarrow 2, 11-15 \rightarrow 3$ 

0-No Relation, 1-Low Relation, 2-Medium Relation, 3-High Relation

COU	JRSE CODE	COURSE NAME	L	Τ	Р	С	
]	PAC 103	APPLIED CHEMISTRY FOR ENGINEERS	3	1	0	4	
PRER	REQUISITES	Nil	L	Т	Р	Η	
<b>C:P:</b> <i>A</i>	A = 3:0:0		3	1	0	4	
Cours	e Outcomes (P	AC 103):	Dom	ain	Level		
CO1	electron affi	periodic properties such as ionization energy, nity, oxidation states and electro negativity. various water quality parameters like hardness and	Cogn	itive	Ren	nember	
CO2	Explain and	<b>Measure</b> microscopic chemistry in terms of eular orbitals and intermolecular forces.	Cogn	itive	Und	lerstand	
CO3	<b>Interpret</b> but and kinetic co	k properties and processes using thermodynamic nsiderations.	Cogn	itive	App	bly	
CO4	,	<b>istrate</b> and <b>Discuss</b> the chemical reactions that are nthesis of molecules.	Cogn	itive		nember lyze	
CO5	electromagnet	<b>asure</b> and <b>Distinguish</b> the ranges of the tic spectrum used for exciting different molecular in various spectroscopic techniques	Cogn	itive	Ren App	nember bly	
UNIT		C PROPERTIES AND WATER CHEMISTRY			9+3		
the pe affinity hard s	priodic table, el y and electrone soft acids and tion and explan	ge, penetration of orbitals, variations of s, p, d and f ectronic configurations, atomic and ionic sizes, i gativity, polarizability, oxidation states, coordinatio bases, molecular geometries. <b>Water Chemistry</b> ation of hardness, determination of hardness by EI	onizati on num -Water	on ene ibers a <sup>·</sup> quali	ergies, nd geo ty par	electron ometries, ameters-	

UNIT – II: USE OF FREE ENERGY IN CHEMICAL EQUILIBRIA

9+3

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Corrosion-Types, factors affecting corrosion rate and Control methods. Use of free energy considerations in metallurgy through Ellingham diagrams. Advantages of electroless plating, electroless plating of nickel and copper on Printed Circuit Board (PCB).

UNIT-III: ATOMIC A	ND MOLECULAR STRUC	URE	9+3
nanoparticles. Molecular Equations for atomic and field theory and the energy Band structure of solids ar <b>Intermolecular forces an</b> Ionic, dipolar and Vander	ticle in a box solution and the orbitals of diatomic molecular molecular orbitals. Energy 1 gy level diagrams for transit and the role of doping on band <b>d potential energy surfaces</b> waals interactions. Equations of H <sub>3</sub> , H <sub>2</sub> F and HCN and traje	iles and plots of the vel diagrams of diaton on metal ions and the tructures. of state of real gases a	e multicenter orbitals. mic molecules. Crystal ir magnetic properties. and critical phenomena.
	SCOPIC TECHNIQUES AN		9+3
types of electronic trans	v and selection rules. Electro sition and application. Fluc v-types of vibrations Ins	escence and its appl	lications in medicine.
types of electronic trans Vibrational spectroscopy spectroscopy of diatomic shift and applications-mag	sition and application. Fluc r-types of vibrations, Ins molecules. Nuclear magnetic netic resonance imaging. Dif	escence and its appl rumentation and ap resonance spectroscop raction and scattering.	lications in medicine. plications. Rotational by-concept of chemical
types of electronic trans Vibrational spectroscopy spectroscopy of diatomic shift and applications-mag <b>UNIT – V: STEREOCH</b>	sition and application. Fluc y-types of vibrations, Ins molecules. Nuclear magnetic netic resonance imaging. Dif EMISTRY AND ORGANIC	escence and its appl rumentation and ap resonance spectroscop raction and scattering. <b>REACTIONS</b>	lications in medicine. plications. Rotational by-concept of chemical 9+3
types of electronic trans Vibrational spectroscopy spectroscopy of diatomic shift and applications-mag <b>UNIT – V: STEREOCH</b> Representations of 3 dime symmetry and chirality, conformational analysis. Is <b>Organic reactions and sy</b> Introduction to reaction	sition and application. Fluc r-types of vibrations, Ins molecules. Nuclear magnetic netic resonance imaging. Dif	escence and its appl rumentation and ap resonance spectroscop raction and scattering. <b>REACTIONS</b> somers and stereoisom optical activity, absolu- compounds ddition, elimination,	lications in medicine. plications. Rotational by-concept of chemical 9+3 ers, configurations and ute configurations and oxidation, reduction,
types of electronic trans Vibrational spectroscopy spectroscopy of diatomic shift and applications-mag <b>UNIT – V: STEREOCH</b> Representations of 3 dime symmetry and chirality, conformational analysis. In <b>Organic reactions and sy</b> Introduction to reaction cyclization reactions and	sition and application. Fluc types of vibrations, Ins molecules. Nuclear magnetic netic resonance imaging. Dif <b>EMISTRY AND ORGANIC</b> nsional structures, structural enantiomers, diastereomers, somerism in transitional meta <b>nthesis of a drug molecule</b> s involving substitution, a	escence and its appl rumentation and ap resonance spectroscop raction and scattering. <b>REACTIONS</b> somers and stereoisom optical activity, absolu- compounds ddition, elimination, thesis of a commonly	lications in medicine. plications. Rotational by-concept of chemical 9+3 ers, configurations and ute configurations and oxidation, reduction,

#### TEXT BOOKS

9. Puri B.R. Sharma, L.R., Kalia K.K. Principles of Inorganic Chemistry, (23rd

edition), New Delhi, Shoban Lal Nagin Chand & Co., 1993

10. Lee. J.D. Concise Inorganic Chemistry, UK, Black well science, 2006.

11. Trapp. C, Cady, M. Giunta. C, Atkins's Physical Chemistry, 10th Edition, Oxford publishers, 2014.

12. Glasstone S., Lewis D., Elements of Physical Chemistry, London, Mac Millan & Co. Ltd, 1983.

13. Morrison R.T. and Boyd R.N. Organic Chemistry (6th edition), New York, Allyn

& Bacon Ltd., 1976.

14. Banwell. C.N, Fundamentals of Molecular Spectroscopy, (3<sup>th</sup> Edition), McGraw-Hill Book Company, Europe 1983.

15. Bahl B.S. and Arun Bahl, Advanced Organic Chemistry, (4th edition), S./ Chand & Company Ltd.

New Delhi, 1977.

16. P. S. Kalsi, Stereochemistry: Conformation and mechanism, (9<sup>th</sup> Edition), New Age International Publishers, 2017.

#### **REFERENCE BOOKS**

1. Puri B R Sharma L R and Madan S Pathania, "Principles of Physical Chemistry", Vishal

publishing Co., Edition 2004

2. Kuriocose, J C and Rajaram, J, "Engineering Chemistry", Volume I/II, Tata McGraw-Hill Publishing Co. Ltd. New Delhi, 2000

#### **E RESOURCES - MOOCS:**

- 7. http://www.mooc-list.com/course/chemistry-minor-saylororg
- 8. <u>https://www.canvas.net/courses/exploring-chemistry</u>
- 9. http://freevideolectures.com/Course/2263/Engineering-Chemistry-I
- 10. http://freevideolectures.com/Course/3001/Chemistry-I
- 11. http://freevideolectures.com/Course/3167/Chemistry-II
- 12. http://ocw.mit.edu/courses/chemistry/

#### **REFERENCE BOOKS**

- 1. Mendham, Denney R.C. Barnes J.D and Thomas N.J.K., "Vogel's Textbook of Quantitative Chemical Analysis", 6th Edition, Pearson Education, 2004.
- 2. Garland, C. W.; Nibler, J. W.; Shoemaker, D. P. "Experiments in Physical Chemistry", 8th Ed.; McGraw-Hill: New York, 2003.

#### E RESOURCES - MOOCS:

1.http://freevideolectures.com/Course/2380/Chemistry-Laboratory-Techniques

- 2. http://freevideolectures.com/Course/2941/Chemistry-1A-General-Chemistry-Fall-2011
- 3.http://ocw.mit.edu/courses/chemistry/5-301-chemistry-laboratory-techniques

	<b>PO1</b>	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO
		2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	0	0	0	0	0	2	3	3	0	0	0	1	2
CO2	2	0	0	0	0	0	1	2	2	0	0	0	1	1
CO3	3	0	0	0	0	0	2	3	3	0	0	0	0	0
CO4	3	0	0	0	0	0	3	3	3	0	0	0	0	0
CO5	3	0	0	0	0	0	2	2	3	0	0	0	0	0
Total	14	0	0	0	0	0	10	13	14	0	0	0	2	3
Scaled	3	0	0	0	0	0	2	3	3	0	0	0	1	1
	•			1 - 5	$5 \rightarrow 1$ ,	6 – 10	$\rightarrow 2,$	11 – 1	$5 \rightarrow 3$					

Mapping of COs with POs

0-No Relation, 1- Low Relation, 2-Medium Relation, 3-High Relation

	COURSE CODE COURSE NAME							
ŀ	PEE 104			3	T 1	<u>Р</u> 1	<u>C</u> 5	
C:P	: A = 3:1:0	ELECTRICAL CIRCUIT ANALYS	SIS	L	T	Р	H	
				3	1	2	6	
Cours	se Outcomes (1	PEE 104):	Domain		Leve	el		
CO1	,	rk theorems for the analysis of electrical	Cognitive		App			
	circuits.	,	Psychomo	tor				
	Respond netv	work theorems for the analysis of electrical			Resp	Response		
	circuits.							
CO2		ne transient and steady-state response of R,	Cognitive		Und	erstand	ł	
		electrical circuits.	Psychomo	tor	Perc	eption		
		transient and steady-state response of RL and						
	RC electrical							
CO3		uits in the sinusoidal steady-state (single-	Cognitive		Ana	•		
	phase and thr	<b>1</b>	Psychomo	tor	Mec	hanisn	n	
		analyze of Single-phase transformer for its						
<u>CO4</u>	Sinusoidal res	*	Comitivo		<b>A</b> m a 1			
CO4		forms analysis of ac circuits. and analyze of RLC Series and parallel	Cognitive Psychomo	tor	Ana	iyze hanisn	•	
	resonance cire		Psycholic		Mec	namsn	1	
CO5		nd the concept of one port and two port	Cognitive		Und	erstand	lina	
005	network funct		Coginuve		Onu	cistan	ing	
	network rune	10115.						
UNIT	- I: NETWO	<b>RK THEOREMS</b>				9+3+	6	
		em, Thevenin theorem, Norton theorem, Ma	-					
-	•	, Compensation theorem. Analysis with deper	ident currei	nt and	volta	ge sou	rces	
		lysis. Concept of duality and dual networks.						
	)f Experiment	8						
			tion					
		L and KCL using hardware and Digital simulat						
2.Veri	fication of The	L and KCL using hardware and Digital simulate evenin theorem by hardware and Digital simulate evening the simulated evening the simulate	tion					
2.Veri 3.Veri	fication of The fication of Nor	L and KCL using hardware and Digital simulate evenin theorem by hardware and Digital simulate ton theorem by hardware and Digital simulation	tion on	mulat				
2.Veri 3.Veri 4.Veri	fication of The fication of Non fication of Ma	L and KCL using hardware and Digital simulate evenin theorem by hardware and Digital simulate ton theorem by hardware and Digital simulation ximum power transfer theorem by hardware an	tion on d Digital si		on	<b>0</b> _2	6	
2.Veri 3.Veri 4.Veri UNIT	fication of The fication of Non fication of Ma - II: SOLUTI	L and KCL using hardware and Digital simulate evenin theorem by hardware and Digital simulate ton theorem by hardware and Digital simulation ximum power transfer theorem by hardware and ION OF FIRST AND SECOND ORDER NE	tion on d Digital si TWORKS			9+3+		
2.Veri 3.Veri 4.Veri UNIT Solution	fication of The fication of Nor fication of Ma - II: SOLUTI on of first and	L and KCL using hardware and Digital simulate even in theorem by hardware and Digital simulate ton theorem by hardware and Digital simulation <u>ximum power transfer theorem by hardware and</u> <b>CON OF FIRST AND SECOND ORDER NE</b> al second order differential equations for Ser	tion on <u>d Digital si</u> TWORKS ies and par	allel	R-L, ]	R-C, I	RL-C	
2.Veri 3.Veri 4.Veri UNIT Solutio circuit	fication of The fication of Non fication of Ma - II: SOLUTI on of first and ts, initial and f	L and KCL using hardware and Digital simulate even in theorem by hardware and Digital simulate ton theorem by hardware and Digital simulation ximum power transfer theorem by hardware and <b>ION OF FIRST AND SECOND ORDER NE</b> I second order differential equations for Ser- final conditions in network elements, forced a	tion on <u>d Digital si</u> TWORKS ies and par	allel	R-L, ]	R-C, I	RL-(	
2.Veri 3.Veri 4.Veri UNIT Solution circuit steady	fication of The fication of Nor fication of Ma - II: SOLUTI on of first and s, initial and for state and trans	L and KCL using hardware and Digital simulation even in theorem by hardware and Digital simulation ton theorem by hardware and Digital simulation ximum power transfer theorem by hardware and <b>ON OF FIRST AND SECOND ORDER NE</b> d second order differential equations for Ser- final conditions in network elements, forced a sient state response.	tion on <u>d Digital si</u> TWORKS ies and par	allel	R-L, ]	R-C, I	RL-C	
2.Veri 3.Veri 4.Veri UNIT Solution circuit steady List O	fication of The fication of Nor fication of Ma - II: SOLUTI on of first and ts, initial and for state and trans of Experiment	L and KCL using hardware and Digital simulate evenin theorem by hardware and Digital simulation ton theorem by hardware and Digital simulation ximum power transfer theorem by hardware and <b>ON OF FIRST AND SECOND ORDER NE</b> d second order differential equations for Ser- final conditions in network elements, forced a sient state response. <b>S</b>	tion on <u>d Digital si</u> <b>TWORKS</b> ies and par and free res	allel sponse	R-L, ]	R-C, I	RL-C	
2.Veri 3.Veri 4.Veri UNIT Solution circuit steady List C 5.Tran	fication of The fication of Non fication of Ma - II: SOLUTI on of first and state and trans of Experiment signt analysis	L and KCL using hardware and Digital simulate even in theorem by hardware and Digital simulate ton theorem by hardware and Digital simulation ximum power transfer theorem by hardware an <b>ION OF FIRST AND SECOND ORDER NE</b> It second order differential equations for Ser- final conditions in network elements, forced a sient state response. <b>s</b> of Series RL, RC circuits by hardware and Dig	tion on <u>d Digital si</u> <b>TWORKS</b> ies and par and free res	allel ponse	R-L, ]	R-C, I	RL-C	
2.Veri 3.Veri 4.Veri UNIT Solution circuit steady List C 5.Tran 6.Sinu	fication of The fication of Nor fication of Ma - II: SOLUTI on of first and state and trans of Experiment asient analysis isoidal analysis	L and KCL using hardware and Digital simulation even in theorem by hardware and Digital simulation ton theorem by hardware and Digital simulation ximum power transfer theorem by hardware and <b>ON OF FIRST AND SECOND ORDER NE</b> d second order differential equations for Ser- final conditions in network elements, forced a sign state response. <b>s</b> of Series RL, RC circuits by hardware and Dig- a of Series RL, RC circuits by hardware and Dig- s of Series RL, RC circuits by hardware and Dig-	tion on <u>d Digital si</u> <b>TWORKS</b> ies and par and free res	allel ponse	R-L, ]	R-C, I e const	RL-C	
2.Veri 3.Veri 4.Veri UNIT Solution circuit steady List O 5.Tran 6.Sinu UNIT	fication of The fication of Nor fication of Ma - II: SOLUTI on of first and state and trans of Experiment asient analysis - III: SINUSC	L and KCL using hardware and Digital simulate evenin theorem by hardware and Digital simulation ton theorem by hardware and Digital simulation ximum power transfer theorem by hardware and <b>ON OF FIRST AND SECOND ORDER NE</b> d second order differential equations for Ser- final conditions in network elements, forced a sient state response. <b>S</b> of Series RL, RC circuits by hardware and Dig of Series RL, RC circuits by hardware and Dig of Series RL, RC circuits by hardware and Dig <b>DIDAL STEADY STATE ANALYSIS</b>	tion on <u>d Digital si</u> <b>TWORKS</b> ies and par and free res ital simulat gital simula	callel sponse ion tion	R-L, 1	R-C, I const 9+3+	RL-C ants	
2.Veri 3.Veri 4.Veri UNIT Solutio circuit steady List O 5.Tran 6.Sinu UNIT Repres	fication of The fication of Non fication of Ma - II: SOLUTI on of first and state and trans of Experiment asient analysis isoidal analysis - III: SINUSC sentation of sir	L and KCL using hardware and Digital simulate even in theorem by hardware and Digital simulation to theorem by hardware and Digital simulation ximum power transfer theorem by hardware and <b>ON OF FIRST AND SECOND ORDER NE</b> d second order differential equations for Ser- inal conditions in network elements, forced a sient state response. <b>S</b> of Series RL, RC circuits by hardware and Dig of Series RL, RC circuits by hardware and Dig of Series RL, RC circuits by hardware and Dig <b>DIDAL STEADY STATE ANALYSIS</b> he function as rotating phasor, phasor diagrams	tion on d Digital si <b>TWORKS</b> ies and par and free res ital simulat gital simula , impedance	allel sponse ion tion	R-L, 1 e, time admit	R-C, I const 9+3+ tances	RL-C ants 6 , AC	
2.Veri 3.Veri 4.Veri UNIT Solution circuit steady List O 5.Tran 6.Sinu UNIT Represe circuit	fication of The fication of Nor fication of Ma - II: SOLUTI on of first and state and trans of Experiment asient analysis - III: SINUSC sentation of sir t analysis, effe	L and KCL using hardware and Digital simulation even in theorem by hardware and Digital simulation ton theorem by hardware and Digital simulation ximum power transfer theorem by hardware and <b>ON OF FIRST AND SECOND ORDER NE</b> d second order differential equations for Ser- final conditions in network elements, forced a sient state response. <b>s</b> of Series RL, RC circuits by hardware and Dig of Series RL, RC circuits by hardware and Dig of Series RL, RC circuits by hardware and Dig <b>DIAL STEADY STATE ANALYSIS</b> he function as rotating phasor, phasor diagrams ctive or RMS values, average power and com-	tion on d Digital si <b>TWORKS</b> ies and par and free res ital simulat gital simulat gital simulat	callel sponse tion es and c. Three	R-L, 1 e, time admit	R-C, I const 9+3+ tances	RL-C ants 6 , AC	
2.Veri 3.Veri 4.Veri 5.Veri Solution circuit steady List O 5.Tran 6.Sinu UNIT Represe circuit Mutua	fication of The fication of Nor fication of Ma - II: SOLUTI on of first and state and trans of Experiment asient analysis - III: SINUSC sentation of sir t analysis, effe al coupled circu	L and KCL using hardware and Digital simulation even in theorem by hardware and Digital simulation to theorem by hardware and Digital simulation ximum power transfer theorem by hardware and <b>ON OF FIRST AND SECOND ORDER NE</b> d second order differential equations for Ser- final conditions in network elements, forced a sient state response. <b>s</b> of Series RL, RC circuits by hardware and Dig of Series RL, RC circuits by hardware and Dig <b>DIDAL STEADY STATE ANALYSIS</b> be function as rotating phasor, phasor diagrams ctive or RMS values, average power and com- nits, Dot Convention in coupled circuits, Ideal T	tion on d Digital si <b>TWORKS</b> ies and par and free res ital simulat gital simulat gital simulat	callel sponse tion es and c. Three	R-L, 1 e, time admit	R-C, I const 9+3+ tances	RL-C ants 6 , AC	
2.Veri 3.Veri 4.Veri VNIT Solutio circuit steady List O 5.Tran 6.Sinu UNIT Repres circuit Mutua List O	fication of The fication of Nor fication of Ma - II: SOLUTI on of first and s, initial and f state and trans of Experiment asient analysis - III: SINUSC sentation of sir t analysis, effe al coupled circu of Experiment	L and KCL using hardware and Digital simulation even in theorem by hardware and Digital simulation to theorem by hardware and Digital simulation ximum power transfer theorem by hardware and <b>ON OF FIRST AND SECOND ORDER NE</b> d second order differential equations for Ser- final conditions in network elements, forced a sient state response. <b>s</b> of Series RL, RC circuits by hardware and Dig of Series RL, RC circuits by hardware and Dig <b>DIDAL STEADY STATE ANALYSIS</b> be function as rotating phasor, phasor diagrams ctive or RMS values, average power and com- nits, Dot Convention in coupled circuits, Ideal T	tion on <u>d Digital si</u> <b>TWORKS</b> ies and par and free res ital simulat gital simulat , impedance plex power Fransformer	callel sponse tion es and c. Three	R-L, 1 e, time admit	R-C, I const 9+3+ tances	RL-C ants 6 , AC	

#### simulation **UNIT – IV: ELECTRICAL CIRCUIT ANALYSIS USING LAPLACE** 9+3+6 TRANSFORMS Review of Laplace Transform, Analysis of electrical circuits using Laplace Transform for standard inputs, convolution integral, inverse Laplace transform, transformed network with initial conditions. Transfer function representation. Poles and Zeros. Frequency response (magnitude and phase plots), series and parallel resonances **List Of Experiments** 9.RLC Series and parallel Resonance by hardware and Digital simulation **UNIT - V: NETWORK FUNCTIONS AND TWO PORT NETWORKS** 9+3+6 Concepts of complex frequency, Transform impedance, Networks function of one port and two port networks, concepts of poles and zeros, property of driving point and transfer function. Two Port Networks, terminal pairs, Relationship of two port variables, impedance parameters, admittance parameters, transmission parameters and hybrid parameters, interconnections of two port networks. LECTURE TUTORIAL PRACTICAL TOTAL 45 30 90 15 TEXTBOOKS M. E. Van Valkenburg, "Network Analysis", Prentice Hall, 2006. 1. 2. D. Roy Choudhury, "Networks and Systems", New Age International Publications, 1998. 3. W. H. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", McGraw Hill Education, 2013. **REFERENCES** 1. C. K. Alexander and M. N. O. Sadiku, "Electric Circuits", McGraw Hill Education, 2004. 2. K. V. V. Murthy and M. S. Kamath, "Basic Circuit Analysis", Jaico Publishers, 1999. **E REFERENCES** 1. NPTEL :http://nptel.ac.in/courses/108102042/

2. MOODLE : <u>http://moodle.cecs.pdx.edu/course/view.php?id=16</u>

#### REFERENCES

- 1. Department Lab Manual
- 2. Sudhakar.A and ShyamMohan.S.P, "Circuits and Networks Analysis and Synthesis", Fourth edition, Tata McGraw Hill Publishing Company Ltd., NewDelhi, 2010.

	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3									1		1	1	1
CO 2	3									1		1	2	1
CO 3	3	2								1	1	2	3	1
CO 4	3	2			1					1	1	1	3	3
CO 5	3	2			1					1	1	1	2	2
	15	6	0	0	2	0	0	0	0	5	3	6	11	8

Mapping of COs with POs

 $0 - No \ Relation \qquad 1 - Low \ Relation \qquad 2 - Medium \ Relation \qquad 3 - High \ Relation$ 

## **SEMESTER II**

COURS	E CODE	COURSE NAME		L	Т	P	C				
PMA 20	1	CALCULUS ODDINADY DIFFEDEN	ТТАТ	3	1	0	4				
C P	Α	CALCULUS, ORDINARY DIFFEREN EQUATIONS AND COMPLEX VARI		L	Т	P	Η				
3 0	0			3	1	0	4				
		athematics I (Calculus and Linear Algebra			T						
	E OUTCOM		DOMAI			LEVEL					
CO1	and volume	and triple integrals and to find line, surface of an integral by Applying Greens, Gauss and Stokes theorem.	Cognitiv	e	Applying Remembering						
CO2		order differential equations of different types olvable for p, y, x and Clairaut's type.	e	Ap	plying	2					
CO3	Solve Secon	nd order ordinary differential equations with fficients using various methods.	Cognitiv	e	Rei	nemb	bering				
CO4	Use CR equipment of the term of te	uations to verify analytic functions and to onic functions and harmonic conjugate. mapping of translation and rotation. Mobius	Cognitiv	e			nding bering				
CO5	integrals inv Cauchy inte	hy residue theorem to evaluate contour volving sine and cosine function and to state gral formula, Liouvilles theorem. ies, zeros of analytic functions, singularities, ries.	Cognitiv	e	Ap	plying	5				
UNIT – I	I: MULTIVA	<b>RIABLE CALCULUS (INTEGRATION)</b>	1			12					
		Double integrals (Cartesian) - change of order	of integra	tion in	n dou	ble ir	ntegrals -				
Change of	of variables (	Cartesian to polar) - Triple integrals (Cartes	ian), Scala	ar line	e inte	grals	- vector				
line integ	grals - scalar	surface integrals - vector surface integrals	- Theorem	ns of	Gree	en, G	auss and				
Stokes.											
		RDER ORDINARY DIFFERENTIAL EQU				12					
		noulli's equations - Euler's equations - Equations solvable for y- equations solvable for x an				ree: e	equations				
UNIT –I	II: ORDINA	<b>RY DIFFERENTIAL EQUATIONS OF H</b>	IGHER C	ORDE	RS	12					
paramete	ers - Cauchy-H	differential equations with variable coeff Euler equation- Power series solutions- Legen eir properties.									
		EX VARIABLE – DIFFERENTIATION				12					
		y-Riemann equations- analytic functions-har analytic functions (exponential, trigonometri									
• •	•	Mobius transformations and their properties.	-			-	-				
UNIT - V: COMPLEX VARIABLE – INTEGRATION							12				
Contour integrals - Cauchy-Goursat theorem (without proof) - Cauchy Integral formula (wit											
proof)-Li	iouville's theo	orem (without proof)- Taylor's series- zeros o	of analytic	funct	ions-	sing	ularities-				
		idues- Cauchy Residue theorem (without pro-									
involving	g sine and cos	ine- Evaluation of certain improper integrals u									
		LECTURE	TU	ΓORI	AL	TO	TAL				

	45	15	60
Text Book:			
1. B.S. Grewal, "Higher Engineering Mathematics", Kl	nanna Publishers,	40th <sup>th</sup> Edition, 2	2008.
Reference Books:			
1.G.B. Thomas and R.L. Finney, "Calculus and Analyt	ic geometry", 9 <sup>th</sup> I	Edition, Pearson	1,
Reprint, 2002.			
2. Erwin kreyszig, "Advanced Engineering Mathematic	s", 9 <sup>th</sup> Edition, Jo	hn Wiley & Sor	ns, 2006.
3.W. E. Boyce and R. C. DiPrima, "Elementary Differe	ntial Equations an	nd Boundary Va	lue
Problems", 9 <sup>th</sup> Edn. Wiley India, 2009.			
4. S. L. Ross, "Differential Equations", 3 <sup>rd</sup> Ed., Wiley I	ndia, 1984.		
5.E. A. Coddington, "An Introduction to Ordinary Diffe 1995.	erential Equations	", Prentice Hall	India,
6. E. L. Ince, "Ordinary Differential Equations", Dover	Publications, 195	58.	
7.J. W. Brown and R. V. Churchill, "Complex Variable Hill, 2004.	es and Application	s", 7 <sup>th</sup> Ed., McO	Graw
8. N.P. Bali and Manish Goyal, "A text book of Engine	ering Mathematic	s", Laxmi	
Publications, Reprint, 2008.			

# Mapping of COs with GAs

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
CO 1	3	2			2					1		2
CO 2	3	1								1		1
CO 3	3	1								1		1
<b>CO 4</b>	3	2								1		1
CO 5	3	2			1					1		2
TOTAL	15	8	0	0	3	0	0	0	0	5	0	7
Scale	3	2			1					1		
Value												

 $0 - No \ Relation \qquad 1 - Low \ Relation \qquad 2 - Medium \ Relation \ 3 - High \ Relation$ 

COURSE C	ODE	COURSE NAME		L	Т	Р	С	
PEE 202		COURSE NAME		<u>L</u> 3	1	<u>г</u> 0	<u> </u>	
C:P: A = 3:0:0		ELECTROMAGNETIC FIELDS		L	T	P	H	
C.I. A – 5.0.0				3	1	0	4	
Course Outcon	nes (PEI	E 202):	DOMA	_	LEV			
		lerstand the basics of vector and outline					bering	
CO1		t coordinate system.	Cognit	ive		derstanding		
CO2	To und	erstand the concept of static electric field for	Comit	ivo	Un	dorata	nding	
	simple configuration using Gauss and Coulombs law.							
CO3	Define the knowledge of electrostatics using, Cognitive Understa						nding	
		ry conditions, Poisson's and Laplace equation.	Cogint	ive	011	ucisu	nung	
004	Recall	6 6	~		Re	memł	bering	
CO4		nt laws and outline time varying electric and	Cognit			inding		
		c fields using Maxwell's equation.					8	
CO5		the concept of magnetization and magnetic	Cognit	ive	Un	dersta	nding	
		nfiguration using boundary condition.	0				Ũ	
		VECTOR CALCULUS	1 .		1.1.11		9+3	
0		subtraction, components of vectors, scalar a			-		· •	
· •	<u> </u>	nal coordinate systems (rectangular, cylindrica	-		1 C			
	-	lifferentiation, integration, vector operator del	-		-	ice ai	ia curi;	
		ors. Conversion of a vector from one coordinate ECTRIC FIELD	system t		uier.		9+3	
		field intensity, Electrical field due to point ch	organ Li		infaco	and		
		uss law and its applications. Absolute Electric	-					
•		differences for different configurations. Electric						
Energy density.		interences for unreferit configurations. Electric	upole,	Liccu	Ostati		rgy and	
	)NDUC7	FORS, DIELECTRICS AND CAPACITANC	E				9+3	
		sity, Ohms Law in Point form, Continuity of		Boun	darv	condi		
		als. Permittivity of dielectric materials, Capacit						
<b>•</b>		Laplace's equation, Solution of Laplace and P		<b>.</b>				
Laplace's and P	-			1	, , ,		_	
1		MAGNETIC FIELDS, TIME VARY	ING FI	ELD	S A	ND	9+3	
MAXWELL'S		,						
		re Law, Magnetic flux and magnetic flux dens	sity, Scal	ar an	d Vec	tor M	lagnetic	
	· · · · ·	netic fields produced by current carrying	· · · · · · · · · · · · · · · · · · ·				•	
<b>-</b>	• •	on, Displacement current, Point form of Maxy				•		
		otional Electromotive forces. Boundary Condit						
-		urrent element, Force between differential curr				<u> </u>	<b>U</b>	
materials, Magn	etization	and permeability, Magnetic circuits, inductance	es and mu	tual i	nducta	nces.		
		AGNETIC WAVES					9+3	
		ation, Uniform Plane Waves, Maxwell's equation						
		wes in free space and in a homogenous material		-			-	
1' D1		lesser dialectrice. Dremention in good conductor	Claim a	00				
medium, Plane v	waves in	lossy dielectrics, Propagation in good conductor LECTURE					eorem. TAL	

# 451560TEXTBOOKS1. M. N. O. Sadiku, "Elements of Electromagnetics", Oxford University Publication, 2014.2. A. Pramanik, "Electromagnetism - Theory and applications", PHI Learning Pvt. Ltd, New Delhi, 2009.3. A. Pramanik, "Electromagnetism-Problems with solution", Prentice Hall India, 2012.

4. G. W. Carter, "The electromagnetic field in its engineering aspects", Longmans, 1954.

#### REFERENCES

- 1. W. J. Duffin, "Electricity and Magnetism", McGraw Hill Publication, 1980.
- 2. W. J. Duffin, "Advanced Electricity and Magnetism", McGraw Hill, 1968.
- 3. E. G. Cullwick, "The Fundamentals of Electromagnetism", Cambridge University Press, 1966.
- 4. B. D. Popovic, "Introductory Engineering Electromagnetics", Addison-Wesley Educational Publishers, International Edition, 1971.
- 5. W. Hayt, "Engineering Electromagnetics", McGraw Hill Education, 2012.

#### REFERENCES

1. NPTEL :http://nptel.ac.in/courses

Mapping of COs with POs

	PO 1	PO 2	PO 3	<b>PO</b> 4	РО 5	PO 6	<b>PO</b> 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	-	1	-	-	-	-	-	1	-	1	1	1
CO2	1	2	-	1	-	-	-	-	-	-	1	-	2	1
CO3	1	2	-	-	-	-	-	-	-	-	-	1	1	2
CO4	1	3	-	-	-	-	-	-	-	-	-	-	2	2
CO5	1	2	1	-	-	-	-		-	-	-	1	1	1
Total	6	11	1	3	0	0	0	0	0	1	1	3	7	7
Scaled	2	3	1	1	0	0	0	0	0	1	1	1	2	2

0 – No Relation 1 - Low Relation 2 - Medium Relation 3 - High Relation

COURSE CODE	COURSE NAME	L	Т	P	С

C.D. /	PEE 203			3	0	0	3
U:F: F	A = 3:0:0	ANALOG ELECTRONICS	-	L	Т	Р	H
				3	0	0	3
Cours	se Outcomes (PEE	203):	Dom	ain	Le	vel	_
CO1		aracteristics of diode and analyze the	Cogn			derstan	nd
	rectifier circuits.	, i i i i i i i i i i i i i i i i i i i			An	alyze	
<u> </u>	TT 1 / 1/1 1			•,•	<b>.</b>	1 /	1
CO2	Understand the ch	naracteristics of transistor.	Cogn	itive	Un	derstan	Id
CO3	Understand the co	oncept of MOSFET and analyze the	Cogn	itive	Un	derstan	nd
	circuits and its cha		U		An	alyze	
CO4	Classify and expla	ain different types of amplifier	Cogn	itive		derstan	nd
CO5	Recall and explain OP-Amp	n linear and non-linear application of	Cogn	itive	Un	derstan	ıd
UNIT	-I: DIODE CIR	CUITS					6
							-
$P_{-}$ N 11	inction diode LV	characteristics of a dioder review of half.	wave ar	nd full_	wave r	ectitier	c Zen
•		characteristics of a diode; review of half- lamping and clipping circuits.	-wave ar	nd full-	wave r	ectifier	rs, Zen
diodes		amping and clipping circuits.	-wave ar	nd full-	wave r	ectifier	s, Zen
diodes UNIT	s, Special diodes, cl	lamping and clipping circuits.					8
diodes UNIT Structu	s, Special diodes, cl - II: BJT CIRCU ure and I-V charac	lamping and clipping circuits. J <b>ITS</b> teristics of a BJT; BJT as a switch. BJT	as an ai	mplifie	r: smal	l-signa	<b>8</b> 1 mode
diodes UNIT Structu biasing	s, Special diodes, cl – II: BJT CIRCU ure and I-V charac g circuits, current	lamping and clipping circuits. JITS teristics of a BJT; BJT as a switch. BJT mirror; common-emitter, common-base	as an ai e and co	mplifie	r: smal	l-signa	<b>8</b> 1 mode
diodes UNIT Structu biasing Small	s, Special diodes, cl – II: BJT CIRCU ure and I-V charac g circuits, current	lamping and clipping circuits. <b>JITS</b> teristics of a BJT; BJT as a switch. BJT mirror; common-emitter, common-base ircuits, high-frequency equivalent circuit	as an ai e and co	mplifie	r: smal	l-signa	<b>8</b> 8
diodes UNIT Structu biasing Small UNIT	s, Special diodes, cl – II: BJT CIRCU ure and I-V charac g circuits, current signal equivalent c - III: MOSFET C	lamping and clipping circuits. <b>JITS</b> teristics of a BJT; BJT as a switch. BJT mirror; common-emitter, common-base ircuits, high-frequency equivalent circuit	as an ai e and co s.	mplifie ommon	r: smal collec	l-signa ctor am	8 l mode plifier 8
diodes UNIT Structu biasing Small UNIT MOSF	s, Special diodes, cl – II: BJT CIRCU ure and I-V charac g circuits, current signal equivalent c – III: MOSFET C FET structure and	lamping and clipping circuits. <b>JTTS</b> teristics of a BJT; BJT as a switch. BJT mirror; common-emitter, common-base circuits, high-frequency equivalent circuit <b>CIRCUITS</b>	as an ai e and co s. h. MOS	mplifie ommon SFET a	r: smal collec s an ar	l-signa ctor am	8 l mode plifier 8 :: smal
diodes UNIT Structu biasing Small UNIT MOSF signal	s, Special diodes, cl - II: BJT CIRCU ure and I-V charac g circuits, current signal equivalent c - III: MOSFET C FET structure and model and biasing	lamping and clipping circuits. <b>JITS</b> teristics of a BJT; BJT as a switch. BJT mirror; common-emitter, common-base circuits, high-frequency equivalent circuit <b>CIRCUITS</b> I-V characteristics. MOSFET as a switch	as an an e and co s. h. MOS and con	mplifie ommon SFET a nmon-c	r: smal collec s an ar lrain ar	l-signa ctor am nplifier nplifier	8 l mode plifier 8 :: smal rs; sma
diodes UNIT Structu biasing Small UNIT MOSF signal signal	s, Special diodes, cl - II: BJT CIRCU ure and I-V charac g circuits, current signal equivalent c - III: MOSFET C FET structure and model and biasing	lamping and clipping circuits. <b>ITS</b> teristics of a BJT; BJT as a switch. BJT mirror; common-emitter, common-base circuits, high-frequency equivalent circuit <b>CIRCUITS</b> I-V characteristics. MOSFET as a switc g circuits, common-source, common-gate	as an an e and co s. h. MOS and con	mplifie ommon SFET a nmon-c	r: smal collec s an ar lrain ar	l-signa ctor am nplifier nplifier	8 l mode plifier 8 :: smal rs; sma
diodes UNIT Structu biasing Small UNIT MOSF signal signal equiva	s, Special diodes, cl - II: BJT CIRCU ure and I-V charac g circuits, current signal equivalent c - III: MOSFET C FET structure and model and biasing equivalent circuit alent circuit.	lamping and clipping circuits. <b>ITS</b> teristics of a BJT; BJT as a switch. BJT mirror; common-emitter, common-base circuits, high-frequency equivalent circuit <b>CIRCUITS</b> I-V characteristics. MOSFET as a switc g circuits, common-source, common-gate	as an an e and co s. h. MOS and con s, transc	mplifie ommon SFET a nmon-c onduct	r: smal collec s an ar Irain ar ance, l	l-signa ctor am nplifien nplifien nglifien	8 l mode plifier 8 :: smal rs; sma
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diodes UNIT Structu biasing Small UNIT MOSF signal signal equiva UNIT Differe operat	s, Special diodes, cl - II: BJT CIRCU ure and I-V charac g circuits, current signal equivalent c - III: MOSFET C FET structure and model and biasing equivalent circuit alent circuit. - IV: DIFFEREN' ential amplifier; pe ional amplifier, id	lamping and clipping circuits. <b>JITS</b> teristics of a BJT; BJT as a switch. BJT mirror; common-emitter, common-base circuits, high-frequency equivalent circuit <b>CIRCUITS</b> I-V characteristics. MOSFET as a switch g circuits, common-source, common-gate ts - gain, input and output impedances <b>TIAL, MULTI-STAGE AND OPERAT</b> ower amplifier; direct coupled multi-stage	as an an e and co s. h. MOS and con s, transc FIONAI ge ampli	mplifie ommon FET a nmon-c onduct <b>2 AMP</b> ifier; ir	r: smal collec s an ar lrain ar ance, l LIFIE iternal	l-signa ctor am nplifien nplifien nigh fr <b>RS</b> structu	8         I mode         plifier         sglifier         sgli
diodes UNIT Structu biasing Small UNIT MOSF signal signal equiva UNIT Differe operat curren	s, Special diodes, cl - II: BJT CIRCU ure and I-V charac g circuits, current signal equivalent c - III: MOSFET C FET structure and model and biasing equivalent circuit alent circuit. - IV: DIFFERENT ential amplifier; po ional amplifier, id at, input offset current	lamping and clipping circuits. <b>JTS</b> teristics of a BJT; BJT as a switch. BJT mirror; common-emitter, common-base circuits, high-frequency equivalent circuit <b>CIRCUITS</b> I-V characteristics. MOSFET as a switch g circuits, common-source, common-gate its - gain, input and output impedances <b>TIAL, MULTI-STAGE AND OPERAT</b> ower amplifier; direct coupled multi-stag- leal op-amp, non-idealities in an op-am	as an ar e and co s. th. MOS and con s, transc FIONAI ge ampli p (Outp	mplifie ommon SFET a nmon-c onduct <b>2 AMP</b> ifier; ir ut offs	r: smal collec s an ar lrain ar ance, l LIFIE iternal	l-signa ctor am nplifien nplifien nigh fr <b>RS</b> structu	8         I mode         plifier         sglifier         sgli
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diodes UNIT Structu biasing Small UNIT MOSF signal signal equiva UNIT Differe operati curren UNIT Idealiz instrur using	s, Special diodes, cl - II: BJT CIRCU ure and I-V charac g circuits, current signal equivalent c - III: MOSFET C - ET structure and model and biasing equivalent circuit alent circuit. - IV: DIFFEREN ential amplifier; po ional amplifier, id it, input offset curren - V: LINEAR AN zed analysis of op mentation amplifier an op-amp, voltage	lamping and clipping circuits. <b>JTS</b> teristics of a BJT; BJT as a switch. BJT mirror; common-emitter, common-base circuits, high-frequency equivalent circuit <b>CIRCUITS</b> I-V characteristics. MOSFET as a switce g circuits, common-source, common-gate ts - gain, input and output impedances <b>TIAL, MULTI-STAGE AND OPERAT</b> ower amplifier; direct coupled multi-stag eal op-amp, non-idealities in an op-am ent, slew rate, gain bandwidth product) <b>IDNONLINEARAPPLICATIONS OF</b> p-amp circuits. Inverting and non-inverter r, integrator, active filter, P, PI and PID	as an ar e and co s. h. MOS and con s, transc FIONAI ge ampli p (Outp OP-AM ing amp controlle nd phas	mplifie ommon FET a nmon-c onduct <b>2 AMP</b> ifier; ir ut offs <b>P</b> olifier, ers and e shift	r: smal collec s an ar lrain ar ance, l LIFIE ternal et volt differe lead/la ). An	l-signa ctor am nplifien nghifien nigh fr <b>RS</b> structu age, in ntial an ng comp alog to	8         1 mode         plifier         8         r: smal         rs; sma         equence         8         re of a         put bis         15         mplifier         pensate         Digit
diodes UNIT Structu biasing Small UNIT MOSF signal signal equiva UNIT Differe operat curren UNIT Idealiz instrur using Conve	s, Special diodes, cl - II: BJT CIRCU ure and I-V charac g circuits, current signal equivalent c - III: MOSFET C FET structure and model and biasing equivalent circuit alent circuit. - IV: DIFFEREN' ential amplifier; per ional amp	lamping and clipping circuits. <b>JTS</b> teristics of a BJT; BJT as a switch. BJT mirror; common-emitter, common-base dircuits, high-frequency equivalent circuit <b>CIRCUITS</b> I-V characteristics. MOSFET as a switch g circuits, common-source, common-gate ts - gain, input and output impedances <b>TIAL, MULTI-STAGE AND OPERAT</b> ower amplifier; direct coupled multi-stag eal op-amp, non-idealities in an op-ame ent, slew rate, gain bandwidth product) <b>DNONLINEARAPPLICATIONS OF</b> o-amp circuits. Inverting and non-inverter r, integrator, active filter, P, PI and PID ge regulator, oscillators (Wien bridge a	as an ar e and co s. h. MOS and con s, transc FIONAI ge ampli p (Outp OP-AM ing amp controlle nd phas	mplifie ommon FET a nmon-c onduct <b>2 AMP</b> ifier; ir ut offs <b>P</b> olifier, ers and e shift	r: smal collec s an ar lrain ar ance, l LIFIE ternal et volt differe lead/la ). An	l-signa ctor am nplifien nghifien nigh fr <b>RS</b> structu age, in ntial an ng comp alog to	8         1 mode         plifier         8         r: smal         rs; sma         equence         8         re of a         put bis         15         mplifier         pensate         Digit
diodes UNIT Structu biasing Small UNIT MOSF signal signal equiva UNIT Differe operat curren UNIT Idealiz instrur using Conve	s, Special diodes, cl - II: BJT CIRCU ure and I-V charac g circuits, current signal equivalent c - III: MOSFET C FET structure and model and biasing equivalent circuit alent circuit. - IV: DIFFEREN' ential amplifier; per ional amp	lamping and clipping circuits. <b>JTS</b> teristics of a BJT; BJT as a switch. BJT mirror; common-emitter, common-base ircuits, high-frequency equivalent circuit <b>CIRCUITS</b> I-V characteristics. MOSFET as a switce g circuits, common-source, common-gate ts - gain, input and output impedances <b>TIAL, MULTI-STAGE AND OPERAT</b> ower amplifier; direct coupled multi-stag eal op-amp, non-idealities in an op-ame ent, slew rate, gain bandwidth product) <b>DNONLINEARAPPLICATIONS OF</b> -amp circuits. Inverting and non-inverter r, integrator, active filter, P, PI and PID ge regulator, oscillators (Wien bridge a Comparator, Zero Crossing Detector,	as an ar e and co s. th. MOS and con s, transc <b>FIONAI</b> ge ampli p (Outp <b>OP-AM</b> ing amp controlle nd phas Square	mplifie ommon FET a nmon-c onduct <b>2 AMP</b> ifier; ir ut offs <b>P</b> olifier, ers and e shift	r: smal collec s an ar lrain ar ance, l LIFIE tternal et volt differe lead/la ). An and t	l-signa ctor am nplifien nplifien nigh fr <b>RS</b> structu age, in ntial an ng comp alog to riangul	8         1 mode         plifier         8         rs; smal         equence         8         re of a         put bia         15         mplifier         Digit

- 2. J. V. Wait, L. P. Huelsman and G. A. Korn, "Introduction to Operational Amplifier theory and applications", McGraw Hill U. S., 1992.
- 3. J. Millman and A. Grabel, "Microelectronics", McGraw Hill Education, 1988.

#### REFERENCES

- 1. P. Horowitz and W. Hill, "The Art of Electronics", Cambridge University Press, 1989.
- 2. P. R. Gray, R. G. Meyer and S. Lewis, "Analysis and Design of Analog Integrated Circuits", John Wiley & Sons, 2001.
- 3.Department Lab Manual.

#### **E REFERENCES**

2. <u>www.nptel.ac.in</u>.

#### Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3									1		1	3	3
CO 2	3									1		1	3	3
CO 3	3	2								1	1	2	3	3
CO 4	2	2			1					1	1	1	3	3
CO 5													3	3
Total	11	4			1					4	2	5	15	15
Scaled	2	1			1					1	1	1	3	3

0 – No Relation 1 – Low Relation 2 – Medium Relation 3 – High Relation

<b>COURSE CODE</b>	COURSE NAME	L	Т	Р	С

]	PEE 204			3	0	1	4	
<b>C:P: A</b> =	3:1:0	<b>ELECTRICAL MACHINES -</b>	[	L	Т	Р	Η	
				3	0	2	5	
Course O	utcomes (PEE 204	):	Dom	ain	Lev	vel		
CO1	Lindonstand the on	anotion of DC machines	Cogn	itive	Unc	lerstand	d	
COI	Understand the op	eration of DC machines.	Psycl	nomotor	Perc	ception	L	
					Unc	derstand	d	
CO2	Understand the wi	nding concepts of DC machine.	Cogn			nplex		
	Childerstand the wi	nume concepts of DC indefinite.	Psycl	nomotor	Ove			
						Response		
CO3		ptoring and generating concepts of DC	Cogn			lerstand	d	
	machine.		2	nomotor	Set			
CO4	• • •	ase and three phase transformers	Cogn			alyse		
	circuits.			nomotor	Set	1 .	1	
CO5	Understand the va	rious losses in magnetic circuits	Cogn			derstand	d	
LINUT L.		S – INTRODUCTION	Psyci	nomotor	Set		0.0	
			also a	tatan ma			9+6	
		machine, magnetic structure - stator y		-	· · · ·			
		core, visualization of magnetic field						
		ding open, air gap flux density distribut	ion, fiu	ix per po	ole, inc	iucea E	LIVIF	
in an arma								
	x <b>periments</b> of D.C. Motor Starte	<b>r</b> 0						
		– ARMATURE AND WINDING					9+6	
		mutation – Elementary armature coil a	and co	mmutate	r lan			
		ommutator, linear commutation Deriv						
		vation of torque equation, armature						
	on with armature rea		reactio	in, an <sub>i</sub>	sap II	un uci	isity	
		- MOTORING AND GENERATION					8+6	
		motoring and generation, Types of field	excita	tions – s	enarat			
	<b>*</b>	it characteristic of separately excited			-	•		
		ld-up in a shunt generator, critical field						
		ed characteristics of separately excited,						
		age. Losses, load testing and back-to-bac					L	
	periments			U				
	· •	s (OCC) and load Characteristics of D.C	self-e	xcited ge	enerato	or.		
-	naracteristics of D.C			Ũ				
4. Load ch	naracteristics of D.C	. shunt motor						
5. Load ch	naracteristics of D.C	. series motor						
6. Speed c	control of D.C. shun	t motor						
UNIT- IV	: TRANSFORME	RS AND TESTS				1	1+6	
Principle,	construction and op	peration of single-phase transformers, eq	uivaler	nt circuit	, phase	or diag	ram,	
voltage re	egulation, transform	er - construction, types of connection	and th	eir com	parativ	ve feati	ures,	
		hase and three-phase transformers, Phas						
-		ersion, Tap-changing transformers. Loss						
circuit and	l short circuit tests,	polarity test, back-to-back test- separation	on of h	ysteresis	and e	ddy cui	rrent	

losses							
List of Experiments							
7. Load test on single-phase transform	mer.						
8. Open circuit and short circuit tests	on single phase tra	nsformer.					
UNIT - V: AUTOTRANSFORMERS							
Autotransformers - construction,	principle, applica	tions and comp	parison with two	o winding			
	· · · · ·	-		•			
transformer, Magnetizing current, eff	lect of nonlinear D-	-H curve of magn	ene core material,	marmomes			
in magnetization current	Tect of nonlinear D-	- n curve of magn	elle core material,	marmonics			
	LECTURE	TUTORIAL	PRACTICAL	TOTAL			
			-				
	LECTURE		PRACTICAL	TOTAL			
in magnetization current	LECTURE 45	TUTORIAL 0	PRACTICAL 30	TOTAL 75			
in magnetization current TEXTBOOKS 1. A. E. Fitzgerald and C. Kingsley, '	LECTURE 45	TUTORIAL 0	PRACTICAL 30	<b>TOTAL</b> <b>75</b> tion, 2013.			
in magnetization current TEXTBOOKS	LECTURE 45	TUTORIAL 0	PRACTICAL 30	<b>TOTAL</b> <b>75</b> tion, 2013.			

1. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.

2. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.

3. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.

#### Mapping of COs with POs

	PO	PSO	PSO											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	2	2	2	1				1			1	1	0
CO 2	3	-	2	1				1				1		1
CO 3	3			1				1			1			1
<b>CO 4</b>	3	2	2	2	1		1			1		1		1
CO 5	3			1						1				1
Total	15	4	6	7	2		1	2	1	2	1	3	1	4
Scaled	3	1	1	2	1		1	1	1	1	1	1	1	1

0 –No Relation 1 – Low Relation 2 – Medium Relation 3 – High Relation

#### **COURSE CODE COURSE NAME** Т Р L С 3 0 3 **PEE 301** TRANSMISSION AND DISTRIBUTION 0 C:P: A = 3:0:0 L Т Р Η 3 0 0 3 **Course Outcomes (PEE 301):** Domain Level **Explain** the major components of Transmission and Understanding **CO1** Cognitive Distribution Systems (TDS). Classify different types of Understanding single and three phase transmission line parameters. CO<sub>2</sub> **Outline** the types of transmission line efficiency Cognitive Understanding calculations and its performance **CO3** Explain the different types of insulators and solve for Cognitive Understanding stress and sag in overhead lines. Applying **CO4 Interpret** different types underground cables. Cognitive Understanding **CO5** Summarize the latest technologies in the field of Cognitive Understanding distribution systems. **UNIT -I: TRANSMISSION LINE PARAMETERS** 9 Structure of electric power system: Various levels such as generation, transmission and distribution; -Resistance, Inductance and Capacitance calculations - Single-phase and three-phase lines - double circuit lines – effect of earth on transmission line capacitance. **UNIT-II: PERFORMANCE OF TRANSMISSION LINES** 9 Regulation and efficiency - Tuned power lines, Power flow through a transmission line - Power circle diagrams, Introduction to Transmission loss and Formation of corona - critical voltages - effect on line performance – travelling waveform phenomena. UNIT -III: MECHANICAL DESIGN OF OVERHEAD LINES 9 Line supports - Insulators, Voltage distribution in suspension insulators - Testing of insulators string efficiency – Stress and sag calculation – effects of wind and ice loading. **UNIT - IV: UNDERGROUND CABLES** Q Comparison with overhead line – Types of cables – insulation resistance – potential gradient capacitance of single-core and three-core cables. **UNIT -V: DISTRIBUTION SYSTEM** 9 General aspects - Kelvin's Law - A.C. distribution - Single-phase and three phase - Techniques of voltage control and power factor improvement – Introduction to Distribution loss – Recent trends in transmission and distribution systems LECTURE TUTORIAL TOTAL 45 0 45

#### **SEMESTER III**

#### **TEXTBOOKS**

- 1.D.P. Kothari and I.J. Nagrath, 'Power System Engineering', Tata McGraw Hill, 2<sup>nd</sup>Edition, 2008.
- 2.B.R. Gupta, 'Power System Analysis and Design', S.Chand, New Delhi, 2003.
- 3.S.N. Singh, 'Electric Power Generation, Transmission and Distribution', Prentice Hall India Pvt. Ltd, 2002.

#### REFERENCES

- 1.Luces M.Fualkenberry ,Walter Coffer, 'Electrical Power Distribution and Transmission', Pearson Education, 1996.
- 2.Hadisaddak, 'Power System Analysis,' Tata McGraw Hill Publishing Company',2003
- 3.Central Electricity Authority (CEA), 'Guidelines for Transmission System Planning', New Delhi
- 4. Tamil Nadu Electricity Board Handbook', 2012.

#### **E REFERENCES**

1.NPTEL, Power System Generation, Transmission and Distribution Prof. D. P. Kothari Center for Energy Studies Indian Institute of Technology, Delhi.

#### Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	3								1		2	2	1
CO2	1	3	1		1							1	3	1
CO3	1			1	1					1			2	1
CO4	1	2									1	1	2	1
CO5	1	2										1	2	1
Total	5	10	1	1	1	0	0	0	0	3	1	5	11	5
Scaled	2	3	1	1	1	0	0	0	0	1	1	2	3	2

0 –No Relation 1 – Low Relation 2 – Medium Relation 3 – High Relation

CC	OURSE CODE	COURSE NAME	L	Т	Р	С
	PEE 302	ENVIRONMENTAL SCIENCES	3	0	0	3
С	<b>C:P:</b> A = 1:0:0		L	Т	Р	Н
			3	0	0	3
Cours	e Outcomes (PEE	302 ):	DOI	MAIN	LEV	<b>'EL</b>
CO1		nificance of natural resources and explain	Cog	nitive		ember
	anthropogenic imp		C			erstand
CO2	U	ficance of ecosystem, biodiversity and natural ycles for maintaining ecological balance.	Cog	nitive	Und	erstand
001	-	consequences, preventive measures of major	Cog	nitive	Rem	ember
CO3	•	ognize the disaster phenomenon		ctive	Rece	eive
<b>CO4</b>	Explain the socio-	economic, policy dynamics and practice the	Cog	nitive	Und	erstand
CO4	control measures o	f global issues for sustainable development.			App	ly
	0	pact of population and the concept of various	Cog	nitive	Und	erstand
CO5		and <b>apply</b> the modern technology towards			Anal	ysis
	environmental prot					
		N TO ENVIRONMENTAL STUDIES AND EN				12
	· · ·	ortance – Need for public awareness – Forest r				
		urces: Use and over-utilization of surface and	<b>U</b>			
-		l resources: Uses, environmental effects of		<b>U</b>		
		ning(Odisha) - Food resources: effects of m				
-	▲	logging, salinity, case studies - Energy resour			<u> </u>	<b>U</b> .
		able energy sources, use of alternate energy s				
		urce, land degradation – Role of an individua	al in o	conser	vation	of natural
		of resources for sustainable lifestyles.				
		AND BIODIVERSITY				7
Conce	pt of an ecosystem	- Structure and function of an ecosystem -	- Pro	ducers	, consu	imers and
decom	posers – Biogeoch	nemical cycles - Food chains, food webs	and e	ecologi	ical py	ramids –
Introd	uction, types, chara	cteristic features, structure and function of the	he (a)	Fores	st ecos	ystem (b)
Grassl	and ecosystem (c)	Desert ecosystem (d) Aquatic ecosystem (pe	onds,	strean	ns, lak	es, rivers,
oceans	s, estuaries) – Introd	uction to Biodiversity – Definition: genetic, spe	ecies a	and eco	osystem	1 diversity
- Cons	servation of biodiver	sity: In-situ and Ex-situ conservation of biodive	ersity.		-	
UNIT	-III: ENVIRON	MENTAL POLLUTION				10
Defini	tion – Causes, effect	ets and control measures of: (a) Air pollution	(b) W	Vater p	ollutio	n (c) Soil
polluti	ion (d) Marine pollu	tion (e) Noise pollution (f) Thermal pollution	(g) N	luclear	hazaro	1s – Solid
-	en e	e of an individual in prevention of pollution				
	•	d, earthquake, cyclone and landslide.				
UNIT	- IV: SOCIAL ISS	UES AND THE ENVIRONMENT				10
		esettlement and rehabilitation of people; its pro	blem	s and a	concern	
	<b>-</b>	cid rain, ozone layer depletion, nuclear acciden				
-		Protection Act – Air (Prevention and Contro				
-		f Pollution) Act–Wildlife Protection Act–Fores				
awarei		rendering recommenter recention rectification		iser val	1011 / 10	
anururu						

#### **UNIT – V: HUMAN POPULATION AND THE ENVIRONMENT**

Population growth, variation among nations – Population explosion– Environment and human health HIV / AIDS– Role of Information Technology in Environment and human health.

6

	LECTURE	TUTORIAL	PRACTICAL	SELF STUDY	TOTAL
	45	0	0	0	45

#### **TEXT BOOKS**

- 1. Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co, USA, 2000.
- 2. Townsend C., Harper J and Michael Begon, Essentials of Ecology, Blackwell Science, UK, 2003
- 3. Trivedi R. K and P.K.Goel, Introduction to Air pollution, Techno Science Publications, India, 2003.
- 4. Disaster mitigation, Preparedness, Recovery and Response, SBS Publishers & Distributors Pvt. Ltd, New Delhi, 2006.
- 5. Introduction to International disaster management, Butterworth Heinemann, 2006.
- 6. Gilbert M.Masters, Introduction to Environmental Engineering and Science, Pearson Education Pvt., Ltd., Second Edition, New Delhi, 2004.

#### **REFERENCE BOOKS**

- 1. Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II, Enviro Media, India, 2009.
- 2. Cunningham, W.P.Cooper, T.H.Gorhani, Environmental Encyclopedia, Jaico Publ., House, Mumbai, 2001.
- 3. S.K.Dhameja, Environmental Engineering and Management, S.K.Kataria and Sons, New Delhi, 2012.
- 4. Sahni, Disaster Risk Reduction in South Asia, PHI Learning, New Delhi, 2003.
- 5. Sundar, Disaster Management, Sarup& Sons, New Delhi, 2007.
- 6. G.K.Ghosh, Disaster Management, A.P.H.Publishers, New Delhi, 2006.

#### **E RESOURCES**

- 1. <u>http://www.e-booksdirectory.com/details.php?ebook=10526</u>
- 2. https://www.free-ebooks.net/ebook/Introduction-to-Environmental-Science
- 3. https://www.free-ebooks.net/ebook/What-is-Biodiversity
- 4. <u>https://www.learner.org/courses/envsci/unit/unit\_vis.php?unit=4</u>

- 5. <u>http://bookboon.com/en/pollution-prevention-and-control-ebook</u>
- 6. http://www.e-booksdirectory.com/details.php?ebook=8557
- 7. <u>http://www.e-booksdirectory.com/details.php?ebook=6804</u>
- 8. <u>http://bookboon.com/en/atmospheric-pollution-ebook</u>
- 9. http://www.e-booksdirectory.com/details.php?ebook=3749
- 10. http://www.e-booksdirectory.com/details.php?ebook=2604
- 11. <u>http://www.e-booksdirectory.com/details.php?ebook=2116</u>
- 12. <u>http://www.e-booksdirectory.com/details.php?ebook=1026</u>
- 13. http://www.faadooengineers.com/threads/7894-Environmental-Science

COURSE CODE	COURSE NAME		L	Т	Р	С
PEE 303	SIGNALS AND SYSTEMS		2	1	0	3
C:P: A = 3:0:0			L	Т	Р	Η
			2	1	0	3
Course Outcomes (PEE 3	803):	Domain		Leve	l	
	ncepts of continuous time and discrete	Cognitive		Unde	erstand	1
time systems.						
	complex frequency domain.	Cognitive		Anal	•	
	r transformation techniques	Cognitive			ember	
	e transformation techniques	Cognitive			ember	
CO5 Learn about Z- tran	4	Cognitive		Rem	ember	U
	ION TO SIGNALS AND SYSTEMS en in everyday life, and in various brand					9
Impulse response and step input, cascade interconnect	<b>R OF CONTINUOUS AND DISCRETI</b> response, convolution, input-output beha tions. Characterization of causality and	viour with a stability of 1	a peri LTI s	odic o systen	conve ns. Sy	stem
representation through diff	Serential equations and difference equation y site y series of the serie	ns. State-spa	ace R	epres	entati	on of
its Role. Periodic inputs to	an LTI system, the notion of a frequency					
impulse response.						
UNIT – III: FOURIER T						9
harmonic spectrum and TI	ion of periodic signals, Waveform Sy HD. Fourier Transform, convolution/mul	tiplication a	nd th	neir ef	ffect i	n the
	tude and phase response, Fourier doma $\Gamma$ ) and the Discrete Fourier Transform	· · · · · · · · · · · · · · · · · · ·				
UNIT – IV: LAPLACE	FRANSFORMS					6
	ansform for continuous time signals and	•				poles
	actions and signals, Laplace domain a viour. Application to simple circuits.					ential
equations and system beha		UCTION				ential
equations and system beha UNIT – V: Z - TRANSFO The z-Transform for discre and sequences, z-domain a signals. Reconstruction: id Relation between continue	viour. Application to simple circuits.	tions, poles implications der hold. Al ion to the a	s. Spe iasing pplic	zeros ectra o g and cation	of sys of san its ef	12 stems upled fects.

	30	15	45
TEXTBOOKS			
3. A. V. Oppenheim, A. S. Willsky and S. H. Nawa	b, "Signals and	l systems", Pren	tice Hall
India, 1997.			
4. J. G. Proakis and D. G. Manolakis, "Digital Signa	al Processing: l	Principles, Algo	rithms,
and Applications", Pearson, 2006.			
3. H. P. Hsu, "Signals and systems", Schaum's serie	s, McGraw Hil	ll Education, 20	10.
4. S. Haykin and B. V. Veen, "Signals and Systems"			
	, <u>,</u>	)	
REFERENCES			
2. A. V. Oppenheim and R. W. Schafer, "Discrete-7	Time Signal Pro	ocessing", Prent	ice Hall, 2009.
	C	<b>U</b>	
2. M. J. Robert "Fundamentals of Signals and System	ms", McGraw	Hill Education,2	2007.
3. B. P. Lathi, "Linear Systems and Signals", Oxford			

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	2	2	2	1				1			1	1	0
CO 2	3	3	2	1		3		1				2		1
CO 3	3			1		3		1			1			1
<b>CO 4</b>	3	2	2	2	1		1			2		2		1
CO 5	3			1						2				1
Total	15	7	6	7	2	6	1	2	1	4	1	5	1	4
Scaled	3	2	1	1	1	1	1	1	1	1	1	1	1	1

CO	URSE CODE	COURSE NAME		L	Т	Р	С
	PEE 304			3	0	1	4
C	<b>:P:</b> A = 3:1:0	<b>ELECTRICAL MACHINES</b> – 1	II	L	Т	Р	Н
				3	0	2	5
Course	e Outcomes (PEE	304):	Domain		L	evel	
CO1	To Understand the	fundamentals of different types of slots	Cognitiv	'e	U	nderst	anding
	and windings used		Psychon			echan	
CO2		e concepts of pulsating and revolving	Cognitiv				anding
CO3	magnetic fields.		Psychon	notor	M	echan	1SM
		he operation of induction machines,	Cognitiv	'e	U	nderst	anding
		teristics, equivalent circuit and its phasor	Psychon			echan	0
004	diagram.	1.00			_		
CO4		e different typesof starting, braking and induction motors. React the generator	Cognitiv	10	TL	ndoret	ondina
		xcitation and doubly-fed Induction	Psychon			espons	anding se
	machines.		1 5 9 0 11 0 11	10001		-spon	-
CO5	To Understand th	e operation of single-phase induction	Cognitiv	ve.	U	nderst	anding
		ormance parameters.	Psychon			ercepti	
UNIT	-	TALS OF AC MACHINE WINDINGS	-			-	9+6
factor. List of 1.Load 2. Load 3. Load 4. Load UNIT	<b>Experiments</b> test on three phase d test on three phase d test of a three-pha d test on single-pha – <b>II: PULSATING</b>	se induction motor. GAND REVOLVING MAGNETIC FIE	LDS			_	9+6
produc spatial 120° (c List of 5. No 1	ed by a single win ly displaced windin carrying three-phase <b>Experiments</b> oad and blocked ro	-Alternating current in windings with spat ding – Fixed current and alternating curr gs– Windings spatially shifted by 90° – T e balanced currents) – Revolving magnetic tor test on single phase induction motor. tor test on three phase induction motor.	ent. Pulsa hree wind	ating f	fields	prod	uced by
UNIT-	III: INDUCTIO	N MACHINES					9+6
		ypes of rotors (squirrel cage and slip-ring		-	•		
-		or Diagram– Effect of parameter variation	-	-			
		king and speed control for induction m	otors–Gei	nerato	r ope	eration	n –Self-
	ion– Doubly-Fed Ir <b>Experiments</b>	nduction Machines.					
LIST OI	Experiments						

- 7. Regulation of three phase alternator by EMF /MMF methods.
- 8. V and inverted V curves of three phase synchronous motor.

#### **UNIT – IV: SINGLE PHASE INDUCTION MOTORS**

Constructional details of single-phase induction motor – Double revolving field theory and operation – Equivalent circuit – Determination of parameters – Split-phase starting methods and applications. **List of Experiments** 

#### List of Experiments

9. OCC and load characteristics of three phase alternator.

## **UNIT – V: SYNCHRONOUS MACHINES**

Constructional details – Cylindrical rotor synchronous machine– EMF equation –Equivalent circuit – Phasor diagram–Armature reaction–Voltage regulation– V-curves. Salient pole machine – Two reaction theory –Phasor diagram –Power angle characteristics. Synchronizing and parallel operation. (Basic operation of synchronous motors)

#### **List of Experiments**

10. Study of induction motor starters.

LECTURE	TUTORIAL	PRACTICAL	TOTAL
45	0	30	75

9+6

9+6

## **TEXTBOOKS:**

- I. J. Nagrath and D. P. Kothari, 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, 2010.
- 2. M. G. Say, 'Performance and Design of AC Machines', CBS Publishers, 2002.
- 3. P. S. Bimbhra, 'Electrical Machinery', Khanna Publishers, 2011.
- 4. B.L.Theraja, 'A Textbook of Electrical Technology', Vol. I & II, M/s S.Chand, Delhi,2013.

## **REFERENCES:**

- 1. A. E. Fitzgerald, Charles Kingsley, Stephen.D.Umans, 'Electric Machinery', Tata McGraw Hill publishing Company Ltd, 2013.
- 2. A. S. Langsdorf, 'Alternating Current Machines', Tata McGraw Hill publishing Company Ltd, 1984.
- 3. P. C. Sen, "Principles of Electric Machines and Power Electronics", John Wiley & Sons, 2007.
- 4. J.B. Gupta, 'Theory and Performance of Electrical Machines', S.K.Kataria and Sons, 2002.
- 5. Deshpande M.V., 'Electrical Machines', PHI Learning Pvt Ltd., New Delhi 2011.
- 6. A. G. Warren, 'Problems in Electrical Engineering', Parker and Smith Solutions, New York, 1940.
- 7. K. Murugesh Kumar, 'Electric Machines', Vikas Publishing House Pvt Ltd, 2002.
- 8. Department Laboratory Manual.

## **E REFERENCES:**

http://freevideolectures.com/Course/2335/Basic-Electrical-Technology35-38,

Prof. L. Umanand, IISc Bangalore.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO	PO	PSO	PSO
											11	12	L	2
CO 1	3	2	2	2	1	0	0	0	0	0	0	2	2	1
CO 2	3	2	2	2	1	0	0	0	0	0	0	1	2	1
CO 3	3	2	2	2	1	0	0	0	0	0	0	1	1	1
<b>CO 4</b>	2	2	1	3	2	0	0	0	0	0	0	1	1	1
CO 5	3	0	0	0	1	0	0	0	0	0	0	1	1	1
Total	14	8	7	9	6	0	0	0	0	0	0	6	7	5
Scaled	3	2	2	2	1	0	0	0	0	0	0	1	2	1

## **SEMESTER IV**

CO	OURSE CODE	COURSE NAME		L	Т	Р	С
	PEE 401	DIGITAL ELECTRONICS		3	0	0	3
(	C:P: A = 3:0:0			L	Т	Р	СН
				3	0	0	3
Cours	se Outcomes (PEE 4	401):	Domain		L	evel	
CO1	Understand numer	ical values in various number systems	Comitiv	2	T	ndora	tanding
	and show number	conversions between different number	Cognitive	e	0	nuers	tanding
	Systems.						
CO2	•	functions and minimization techniques					
		d postulates and theorems of Boolean	Cognitive	e	A	nalyz	Ę
	-	tion of Boolean functions using basic					
001	laws.	. 1.1 . 1	<b>O</b> '''		_	1	
CO3		ates and their applications and construct	Cognitive	e	A	pply	
<b>CO4</b>		nd sub tractors using logic gates. process of Analog to Digital conversion	Cognitive	2	T	ndora	tanding
04	and its applications		Cognitivo	C	0	nuers	anung
CO5		process of Digital to Analog conversion	Cognitive	<u> </u>	U	nders	tanding
000	and its applications		Coginary	C		naers	unang
UNIT		TALS OF DIGITAL SYSTEMS AND I	LOGIC F	AMI	LIES		9
		ircuits, AND, OR, NOT, NAND, NOF					rations,
Boole	an algebra, example	es of IC gates, number systems-binary, s	signed bin	ary, d	octal	hexad	lecimal
numb	er, binary arithmeti	c, one's and two's complements arithm	netic, code	es, er	ror d	letecti	ng and
correc	cting codes, character	ristics of digital ICs, digital logic families.					
		TIONAL DIGITAL CIRCUITS					9
		for logic functions, K-map representati					
	<b>U</b>	ninimization of logical functions. Don't				-	
	-	lders, Subtractors, ALU, elementary Al	-		-		-
<u> </u>	od of function realization	/ checker/generator, code converters, p	riority end	coder	s, ae	coder	s Q-M
		AL CIRCUITS AND SYSTEMS					9
		t properties of Bistable latch, JK, SR, D a	nd T types	flin-	flone	annli	-
		ers, applications of shift registers, Asyn					
-		flops, special counter IC's, applications of		couli		o y nor	nonous
	<u> </u>	D/A CONVERTERS					9
		rs: weighted resistor/converter, R-2R Lac	Ider DAC	snac	ificat	ions f	
0	U	AC ICs, sample and hold circuit, analog		-			
	-	mparator ADC, successive approximation	-			-	
	ple of ADC ICs.	inputator ribe, successive approximate	, in 112 C, i	peen	icuit		TID C,
		UCTOR MEMORIES AND PROGRAM	MMABLE		GIC		9
DEVI							-
		l operation, expanding memory size, cla	ecification	and	char	actori	stice of
	• •	nory, ROM, RAM, content addressable more					
	-	ommonly used memory chips, ROM as	· · · · · · · · · · · · · · · · · · ·				-
	······································		<b></b> ,	, -	,		

		LECTURE	TUTORIAL	PRACTICAL	TOTAL
		45	0	0	45
ТЕХТ	FBOOKS				
1.	R. P. Jain, "Modern Digital	Electronics", M	cGraw Hill Educ	ation, 2009.	
2.	M. M. Mano, "Digital logic	and Computer of	lesign", Pearson	Education India, 20	)16.
3.	A. Kumar, "Fundamentals	of Digital Circuit	ts", Prentice Hall	India, 2016.	
REFF	ERENCES				
1.	Taub and Schilling, 'Digital	Integrated Circu	uits', McGraw Hi	11, 2002.	
2.	Samuel C. Lee "Digital Cir	cuits and Logic	Designs" Prentice	e Hall of India; 200	00.
3.	Fletcher, W.I., 'An Enginee	ring Approach to	Digital Design',	Prentice Hall of Ir	ndia, 2002.
4.	Anand Kumar, Fundamenta	al of Digital circu	uits, PHI 2003.		
E RE	FERENCES				
1.	NPTEL, Digital Logic Circ	uits, Prof. S.Srin	ivasan, IIT Madr	as.	
•			1 11 1775	T 7 1	

2. NPTEL, Digital Logic Circuits, Prof. D. Roychoudhury, IIT Kharagpur.

## Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	2	1	3	-	-	1	1	1	-	1	-	2	2	1
CO2	3	2	1	-	-	2	0	2	1	-	-	2	1	2
CO3	2	2	1	-	-	1	2	2	1	1	-	1	2	2
CO4	2	2	3	-	-	1	1	1	-	-	1	1	1	2
CO5	3	2	2	-	-	0	1	1	1	1	1	2	2	2
Total	12	9	10	-	-	4	5	7	3	3	2	8	8	9
Scaled	3	2	2			1	1	2	1	1	1	2	2	2

COU	RSE CODE	COURSE NAME		L	Т	P	С
Р	EE 404			3	0	1	4
<b>C:P:</b> <i>A</i>	A = 3:1:0	<b>POWER ELECTRONICS</b>		L	Т	Р	Н
				3	0	2	5
Cours	se Outcomes	(PEE 404):	Dom	ain		Le	vel
CO1		nd the structure, operation and characteristics of hing devices.	Cognitiv Psychom		U g	nders	tandin
CO2		the operation, characteristics and performance of controlled rectifiers.	Cognitiv Psychom		g	nders espor	tandin 1se
CO3	Analysis the	operation of DC - DC choppers.	Cognitiv Psychom			.nalyz Iechai	
<b>CO4</b>	•	e operation of various inverters and infer the M techniques.	Cognitiv Psychom		Ν	.nalyz Iecha	nism
CO5	To Understand the concept of various types of AC voltage Cognit				g	Inders	tandin nism
Circui List o 1.Chai 2. Cha 3. Cha	ts. <b>f Experimen</b> racteristics of tracteristics o tracteristics o	SCR. f MOSFET					9+6
Single with F highly List o 4. Sing	e phase half-v R-load and hi inductive loa <b>f Experimen</b> gle phase full	vave and full-wave thyristor rectifiers – Single pl ghly inductive load – Three phase full-bridge th ad. ts y controlled rectifier with R, RL load					bad and
Types Load o List o 5. BU	of Choppers, commutated of <b>f Experimen</b>	converter using MOSFET	Analysis (	of Vo	ltage	, Curr	9+6 rent and
UNIT Single Bipola	<b>– IV: INV</b> phase, Thre ar sinusoida						

#### **List of Experiments**

7. Single phase IGBT PWM inverter.

8. Series Inverter/ Parallel Inverter.

#### **UNIT -V: AC VOLTAGE CONTROLLERS**

**9+6** 

Single-phase and three phase AC voltage controllers -. Multi-stage sequence control – step-up and step-down cycloconverter – Single phase to single phase and Single phase to Three phase cycloconverters.

#### **List of Experiments**

- 9. Single phase AC voltage controller using SCR / TRIAC
- 10. Single phase cycloconverter
- 11. Mini project: Design of basic power converter circuits.

	LECTURE	TUTORIAL	PRACTICAL	TOTAL
	45	0	30	75
TEXTROOKS				

- 1. Rashid, M.H., 'Power Electronics: Circuits, Devices and Applications', Pearson Education India, 2009.
- 2. Singh, M.D and Kanchandani, 'Power Electronics', Tata McGraw Hill & Hill publication Company Ltd New Delhi, 2009.
- 3. Bimbhra, P.S., 'Power Electronics', Khanna Publishers, 2007.
- 4. Ned Mohan, Tore M. Undeland and William P.Robbins, 'Power Electronics: Converters, Applications and Design', New Jersey, John Wiley and Sons, 2007.

#### REFERENCES

- 1. Dubey, G.K., Doradia, S.R., Joshi, A. and Sinha, R.M., 'Thyristorised Power Controllers', Wiley Eastern Limited, 1986.
- 2. Lander, W., 'Power Electronics', McGraw Hill and Company, Third Edition, 2009.
- 3. Sen.P.C., 'Power Electronics', Tata McGraw-Hill Publishing Co. Ltd., New Delhi, 2005.
- 4. Joseph Vithayathil, 'Power Electronics', McGraw-Hill New York, 1996.
- 5. Erickson, R.W and Maksimovic, D., 'Fundamentals of Power Electronics', Springer Science & Business Media, 2007.
- 6. Umanand, L., 'Power Electronics: Essentials and Applications', Wiley India, 2009.
- 7. Department Laboratory Manual.

#### **E REFERENCES**

- 1. Lecture Series on Power Electronics by Prof. B.G. Fernandes, Department of Electrical Engineering, IIT Bombay.
- 2. http://www.nptel.ac.in/courses/108105066/PDF/L-1(SSG)(PE)%20((EE)NPTEL).pdf

	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	2	1	0	0	1	3	0	0	0	0	1	3	1
CO 2	2	1	2	1	0	0	1	0	0	0	0	0	2	2
CO 3	3	1	1	0	0	0	0	0	0	0	0	0	1	2
<b>CO 4</b>	1	3	2	0	0	1	0	0	0	0	0	0	2	1
CO 5	1	2	3	1	3	0	1	1	0	0	0	0	3	2
Total	10	9	9	2	3	2	5	1	0	0	0	1	11	8
Scaled	2	2	2	1	1	1	1	1	0	0	0	1	3	2

0 – No Relation 1 - Low Relation 2 - Medium Relation 3 - High Relation

#### **SEMESTER V**

	-	SEMESTER V			-	
	RSE CODE	COURSE NAME	L	Т	Р	С
	EE 501	POWER SYSTEMS-I	3	0	0	3
C:P: A	= 3:0:0	(APPARATUS AND MODELING)	L	Т	Р	Η
			3	0	0	3
Course	e Outcomes (1	PEE 501):	Do	main		Level
CO1	Understand	the concepts of power systems.	Co	gnitiv	e	Understand
CO2	Understand	the various power system components.	Co	gnitiv	e	Understand
CO3	Evaluate fai	It currents for different types of faults.	Co	gnitiv	e	Evaluate
CO4		the generation of over voltages and insulat basic protection schemes.	on Co	gnitiv	e	Understand
CO5		concepts of HVDC power transmission a nergy generation.	nd Co	gnitiv	e	Understand
TINIT	- I: INTROE					9
Need for Single	or system ana line diagram -	lysis in planning and operation of modern power Per unit representation and Per unit calculations -				ase analysis -
Need for Single 1 to Elect <b>UNIT</b> - Primitiv	or system ana line diagram - tricity Deregu – II: MODE ve network ar	lysis in planning and operation of modern power Per unit representation and Per unit calculations - lation. LLING OF POWER SYSTEM COMPONENT d its matrices – bus incidence matrix – bus admitt	Chang S ance an	e of ba	ase – impe	<ul> <li>ase analysis -</li> <li>introduction</li> <li>9</li> <li>edance matrix</li> </ul>
Need fo Single I to Elect <b>UNIT</b> - Primitiv formati for diffe	or system ana line diagram tricity Deregu – <b>II: MODE</b> ve network ar on – Z – Bus erent power s	lysis in planning and operation of modern power Per unit representation and Per unit calculations - lation. <b>LLING OF POWER SYSTEM COMPONENT</b> Id its matrices – bus incidence matrix – bus admitt building algorithm - Modelling of generator, load system studies.	Chang S ance an	e of ba	ase – impe	<ul> <li>ase analysis -</li> <li>introduction</li> <li>9</li> <li>edance matrix smission line</li> </ul>
Need fo Single I to Elect UNIT - Primitiv formati for diff UNIT -	or system ana line diagram - tricity Deregu – II: MODE ve network ar on – Z – Bus erent power s – III: FAULT	lysis in planning and operation of modern power Per unit representation and Per unit calculations - lation. LLING OF POWER SYSTEM COMPONENT d its matrices – bus incidence matrix – bus admitt building algorithm - Modelling of generator, load system studies. CANALYSIS-UNSYMMETRICAL FAULTS	Chang S ince an transfe	e of ba d bus : ormer,	impe tran	<ul> <li>ase analysis -</li> <li>introduction</li> <li>9</li> <li>edance matrix smission line</li> <li>9</li> </ul>
Need fo Single I to Elect UNIT - Primitiv formati for diffe UNIT - Need fo balance flow ch symme	or system ana line diagram - tricity Deregu – II: MODE ve network ar on – Z – Bus erent power s – III: FAULT or short circuited three phase hart. Computa trical comport	<ul> <li>lysis in planning and operation of modern power.</li> <li>Per unit representation and Per unit calculations - lation.</li> <li>LLING OF POWER SYSTEM COMPONENT d its matrices – bus incidence matrix – bus admitt building algorithm - Modelling of generator, load system studies.</li> <li>ANALYSIS-UNSYMMETRICAL FAULTS t study - basic assumptions in fault analysis of pofaults – problem formulation – fault analysis usin ations of short circuit capacity, post fault voltag ents – sequence impedances – sequence networks</li> </ul>	Chang S ince an transfe wer sys g Z-bus and c	e of ba d bus : prmer, stems. matri urrent:	impe tran Sym x – a s. In	<ul> <li>ase analysis -</li> <li>introduction</li> <li>9</li> <li>edance matrix smission line</li> <li>9</li> <li>metrical (or)</li> <li>lgorithm and troduction to</li> </ul>
Need fo Single 1 to Elect UNIT - Primitiv formati for diffe UNIT - Need fo balance flow ch symme L-G, L-	or system ana line diagram - tricity Deregu – II: MODE ve network ar on – Z – Bus erent power s – III: FAULT or short circuited three phase nart. Computa trical compor -L and L-L-G	<ul> <li>lysis in planning and operation of modern power.</li> <li>Per unit representation and Per unit calculations - lation.</li> <li>LLING OF POWER SYSTEM COMPONENT d its matrices – bus incidence matrix – bus admitt building algorithm - Modelling of generator, load system studies.</li> <li>ANALYSIS-UNSYMMETRICAL FAULTS t study - basic assumptions in fault analysis of pofaults – problem formulation – fault analysis usin ations of short circuit capacity, post fault voltag ents – sequence impedances – sequence networks</li> </ul>	Chang S ince an transfe wer sys g Z-bus and c	e of ba d bus : prmer, stems. matri urrent:	impe tran Sym x – a s. In	<ul> <li>ase analysis -</li> <li>introduction</li> <li>9</li> <li>edance matrix smission line</li> <li>9</li> <li>metrical (or)</li> <li>lgorithm and troduction to</li> </ul>
Need fo Single I to Elect UNIT - Primitiv formati for diffe UNIT - Need fo balance flow ch symme L-G, L- UNIT - Need fo Gauss-	or system ana line diagram - tricity Deregu - II: MODE ve network ar on – Z – Bus erent power s - III: FAULT or short circuit ed three phase hart. Computa trical compor -L and L-L-G - IV: POW or Power Flow Seidel, Newt	Ilysis in planning and operation of modern power Per unit representation and Per unit calculations - lation. <b>LLING OF POWER SYSTEM COMPONENT</b> d its matrices – bus incidence matrix – bus admitte building algorithm - Modelling of generator, load ystem studies. <b>CANALYSIS-UNSYMMETRICAL FAULTS</b> t study - basic assumptions in fault analysis of por faults – problem formulation – fault analysis usin ations of short circuit capacity, post fault voltag ents – sequence impedances – sequence networks faults.	Chang Sance an transfe wer sys g Z-bus and c Unsyn	e of ba d bus a prmer, stems. matri urrenta nmetri	impe tran Sym x – a s. In cal fa	<ul> <li>9</li> <li>10</li> <li>10</li> <li>11</li> <li>12</li> <li>12</li> <li>13</li> <li>14</li> <li>14</li> <li>15</li> <li>16</li> <li>16</li> <li>17</li> <li>18</li> <li>18</li> <li>19</li> <li>19</li> <li>10</li> /ul>
Need fo Single I to Elect UNIT - Primitiv formati for diffe UNIT - Need fo balance flow che symme L-G, L- UNIT - Need fo Gauss- method	or system ana line diagram - tricity Deregu - II: MODE ve network ar on – Z – Bus erent power s - III: FAULT or short circuited three phase hart. Computa trical comport -L and L-L-G - IV: POW or Power Flow Seidel, Newt	Ilysis in planning and operation of modern power Per unit representation and Per unit calculations - lation. <b>LLING OF POWER SYSTEM COMPONENT</b> d its matrices – bus incidence matrix – bus admitt building algorithm - Modelling of generator, load ystem studies. <b>CANALYSIS-UNSYMMETRICAL FAULTS</b> t study - basic assumptions in fault analysis of por faults – problem formulation – fault analysis usin ations of short circuit capacity, post fault voltag ents – sequence impedances – sequence networks faults. <b>ER FLOW ANALYSIS</b>	Chang Sance an transfe wer sys g Z-bus and c Unsyn	e of ba d bus a prmer, stems. matri urrenta nmetri	impe tran Sym x – a s. In cal fa	<ul> <li>9</li> <li>10</li> <li>10</li> <li>11</li> <li>12</li> <li>12</li> <li>13</li> <li>14</li> <li>14</li> <li>15</li> <li>16</li> <li>16</li> <li>17</li> <li>18</li> <li>18</li> <li>19</li> <li>19</li> <li>10</li> /ul>
Need fo Single 1 to Elect UNIT - Primitiv formati for diff UNIT - Need fo balance flow ch symme L-G, L- UNIT - Need fo Gauss- method UNIT- Types o single 1 critical	or system ana line diagram - tricity Deregu - II: MODE ve network ar on – Z – Bus erent power s - III: FAULT or short circuit ed three phase hart. Computa trical compor -L and L-L-G - IV: POW or Power Flow Seidel, Newt s -V: STABIL of stability - machine conn clearing angl	Ilysis in planning and operation of modern power Per unit representation and Per unit calculations - lation. <b>LLING OF POWER SYSTEM COMPONENT</b> d its matrices – bus incidence matrix – bus admitti building algorithm - Modelling of generator, load ystem studies. <b>CANALYSIS-UNSYMMETRICAL FAULTS</b> t study - basic assumptions in fault analysis of por faults – problem formulation – fault analysis usin ations of short circuit capacity, post fault voltag ents – sequence impedances – sequence networks faults. <b>ER FLOW ANALYSIS</b> v Analysis – bus classification – derivation of pow on–Raphson and Fast Decoupled Power Flow n	Chang ance an transfor wer system g Z-bustem and c Unsym ver flow ethods criterio using c	e of ba d bus a prmer, stems. matri urrenta metri v equa – cor pn - st lassica	impe tran Sym x – a s. In cal fa tion npari	<ul> <li>9</li> <li>9</li> <li>9</li> <li>9</li> <li>9</li> <li>9</li> <li>9</li> <li>9</li> <li>10</li> <li>9</li> <li>11</li> <li>12</li> <li>9</li> <li>- solution by ison of three</li> <li>9</li> <li>12</li> <li>14</li> <li>15</li> <li>15</li> <li>16</li> <li>17</li> <li>18</li> <li>18</li> <li>19</li> <li>10</li> /ul>
Need fo Single 1 to Elect UNIT - Primitiv formati for diff UNIT - Need fo balance flow ch symme L-G, L- UNIT - Need fo Gauss- method UNIT- Types o single 1 critical	or system ana line diagram - tricity Deregu - II: MODE ve network ar on – Z – Bus erent power s - III: FAULT or short circuit ed three phase hart. Computa trical compor -L and L-L-G - IV: POW or Power Flow Seidel, Newt s -V: STABIL of stability - machine conn clearing angl	lysis in planning and operation of modern power Per unit representation and Per unit calculations - lation. <b>LLING OF POWER SYSTEM COMPONENT</b> d its matrices – bus incidence matrix – bus admitt building algorithm - Modelling of generator, load ystem studies. <b>CANALYSIS-UNSYMMETRICAL FAULTS</b> t study - basic assumptions in fault analysis of po- faults – problem formulation – fault analysis usin ations of short circuit capacity, post fault voltag ents – sequence impedances – sequence networks faults. <b>ER FLOW ANALYSIS</b> v Analysis – bus classification – derivation of pov on–Raphson and Fast Decoupled Power Flow n <b>TTY ANALYSIS</b> Swing equation in state space form - equal area ected to infinite bus by modified Euler's method e and time. Causes of voltage instability – voltag thods of improving power system stability.	Chang ance an transfor wer system g Z-bustem and c Unsym ver flow ethods criterio using c	e of ba d bus a prmer, stems. matri urrenta metri v equa – cor lassica ity pro	impe tran Sym x – a s. In cal fa tion npari	<ul> <li>9</li> <li>9</li> <li>9</li> <li>9</li> <li>9</li> <li>9</li> <li>9</li> <li>9</li> <li>10</li> <li>9</li> <li>11</li> <li>9</li> <li>12</li> <li>13</li> <li>14</li> <li>14</li> <li>15</li> <li>15</li> <li>16</li> <li>16</li> <li>17</li> <li>18</li> <li>18</li> <li>19</li> <li>19</li> <li>10</li> /ul>

#### **TEXT BOOKS**

- 1. J. Grainger and W. D. Stevenson, "Power System Analysis", McGraw-Hill Education; 2nd edition (December 28, 2015)
- 2. O. I. Elgerd, "Electric Energy Systems Theory", McGraw Hill Education, 1st July 2017.
- 3. A. R. Bergen and V. Vittal, "Power System Analysis", Pearson Education Inc., 2<sup>nd</sup> Edition, 2009.

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- 1. D. P. Kothari and I. J. Nagrath, "Modern Power System Analysis", McGraw Hill Education, 4th Edition (29 June 2011)
- 2. B. M. Weedy, B. J. Cory, N. Jenkins, J. Ekanayake and G. Strbac, "Electric Power Systems", Wiley, 5 edition (December 26, 2012)

#### **E REFERENCES**

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#### Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3									1		1	3	2
CO 2	3									1		1	3	2
CO 3	3	2								1	1	2	3	2
CO 4	3	2			1					1	1	1	3	2
CO 5	3	2			1					1	1	1	3	2
Total	15	6	0	0	2	0	0	0	0	5	3	6	3	2
Scaled	3	1	0	0	1	0	0	0	0	1	1	1	1	1

0 –No Relation 1 – Low Relation 2 – Medium Relation 3 – High Relation

COU	JRSE CODE	COURSE N	L	Т	P	С		
		INDUSTRIAL ECON	<b>IOMIICS ANI</b>	D	3	0	0	3
		FOREIGN T	RADE					
<b>C:P:</b> <i>A</i>	4				L	Т	P	Н
3:0:0					3	0	0	3
Cours	e Outcomes:		]	Domain	1	Lev	vel	
CO1	States the inter	national trade theory	(	Cognitiv	ve	Rei	nem	ber
CO2	List the interna	tional trade policy	(	Cognitiv	ve	Rei	nem	ber
CO3	Outline econom	nic scales	(	Cognitiv	ve	Rei	nem	ber
CO4	Distinguish the	Human Aspects and Social I	ssues in 0	Cognitiv	ve	Un	derst	anding
	TIM							
CO5	List the sustain	ability of technology	(	Cognitiv	ve	Rei	nem	ber
Learn	ing Objectives:					1		
		d international trade theory						
		rnational trade policy						
		d the economics scales						
		nomy macroeconomics						
		rnational monetary system		-				10
UNIT		UCTION TO INTERNATI						10
	-	ive Advantage - The Standard	•					
		, and the Terms of Trade - F						
		of Scale, Imperfect Compe	etition, and In	ternatio	nal T	rade	- Ec	onomic
	h and Internatio	nal Trade	<b>V</b>					9
		ariffs - Nontariff Trade Barr		Low Dro	tectio	niem	Fo	-
		Unions and Free Trade A						
-		tional Resource Movements a					I EC	ononne
					poratio	5115		o
	- III: ECONO		T	<b>D</b>	<b>F</b>		C	8
	,	Imperfect Competition, and	International	rade -	Econo	omic	Grov	wth and
	ational Trade							Γ_
UNIT	- IV: ECONC	OMY MACROECONOMIC	S					9
The F	Price Adjustmen	t Mechanism with Flexible	and Fixed E	xchange	e Rate	es - '	The	Income
Adjus	tment Mechan	ism and Synthesis of A	Automatic Ad	ljustmer	nts -	Op	en-E	conomy
Macro	economics: Ad	justment Policies - Prices an	nd Output in a	an Oper	n Eco	nomy	: Ag	gregate
	nd and Aggregat		*	Ĩ		2		
		ATIONAL MONETARY SY	YSTEM					9
Flexib	le versus Fixed	Exchange Rates, the Europ	nean Monetary	System	n and	Ma	croed	onomic
		45 21 The International Mone	•	•				
	2001 annun on 0		and south a second seco		~~	**** * 1		
		+5 21 The International Wone		TUTC	DRIA	L		TAL
		+5 21 The international Work	LECTURE 45	TUTO	ORIA 0	L	TO	TAL 15

## 1. Dominick Salvatore (2013), "International Economics" John Wiley & Sons, USA

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2. Thomas A Pugel, "International Economics" McGraw Hill Education, 13th Edition, New Delhi

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Mapping COs versus POs

	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	<b>PO8</b>	PO9	<b>PO10</b>	PO	PO	PSO	PSO
											11	12	1	2
CO 1	2	2	2	3	3	3	2	2	3					
CO 2	2	2	2	3	3	3	2	2	3					
CO 3	2	2	2	3	3	3	2	2	3					
CO 4	2	2	2	3	3	3	2	2	3					
CO 5	2	2	2	3	3	3	2	2	3					
Total	10	10	10	15	15	15	10	10	15					
Scaled	2	2	2	3	3	3	2	2	3					

0 –No Relation 1 – Low Relation 2 – Medium Relation 3 – High Relation

COU	RSE CODE	COURSE NAME		L	Т	Р	С
	PEE 504	CONTROL SYSTEMS		3	0	1	4
<b>C:P:</b>	A = 3:1:0			L	Т	Р	H
				3	0	2	5
Cours	se Outcomes (1	PEE 504):	Domain	Level			
CO1	Identify the	basic elements, derive the transfer function	Cognitive	Under	standi	ng	
		te the overall gain of the control system and	Psychomotor	Comp	lex or	Over	t
	<b>Construct</b> t generators.	he transfer function of DC motors and DC	-	Respon	nse		
CO2		performance of I and II system with static and	Cognitive	Under	standi	ng	
	dynamic error		Psychomotor	Set			
CO3		e frequency domain specifications and show	Cognitive	Remen	nberir	ng	
	the response	of frequency response.	Psychomotor	Under	standi	ng	
<b>CO4</b>	Determine	the stability of the systems and <b>Design</b> the	Cognitive	Under	standi	ng	
	suitable compensator and controller for the given Psych		Psychomotor	Design	ı		
	performance	criteria of the control	-	Percep			
005	system	the transition motion <b>P</b> 1 to 0/ /	<u>Carriti</u>	-			
CO5		tate transition matrix. <b>Explain</b> State space	Cognitive	Remer	nberir	ng	
		<b>construct</b> and <b>verify</b> the canonical state Kalman's test for controllability and					
	observability	•					
Learr		s: Control Systems is the engineering discipling	e that applies co	ntrol the	orv to	desi	on
		behaviors. To make students understand the co			-		-
-		state –space analysis, to design the compensat		-			
	the PID comp			equency	uonn	uiii, t	,
U	-	IS AND THEIR REPRESENTATION				15	
		ontrol systems – Open and closed loop system	ns – Principles o	of feedb	ack 1	-	
		ram reduction techniques – Signal flow graph					
		slation and rotational mechanical systems.		,		0	
	f Experiments	•					
1.	Transfer funct	tion and modeling of separately excited DC Ge	nerator.				
2.	Transfer funct	tion and modeling of Armature & field-control	led DC Motor.				
		nction of AC Servomotor					
		RESPONSE ANALYSIS				15	
		ne domain specifications - Standard test signal					
	· · ·	ndard test inputs. Error coefficients – Generaliz	zed error series -	- Steady	state	error	
	f Experiments						
	•	nchro Transmitter and Receiver.					
		f DC Stepper Motor tion of Lorder and Horder system by using Sci	lab				
0.	Digital simula	tion of I order and II order system by using Sci	1aU.				

UNIT - III: FREQUENCY-RESPONSE A				15
Frequency domain specification – Bode plot	t – Polar plot – E	Determination of	f closed loop resp	onse from
open loop response - Correlation between fr	equency domain	and time domain	n specifications	
List of Experiments				
7. Frequency response of Lag, Lead & I				
<b>8.</b> Determination of Phase margin and C			ig Scilab.	1
UNIT - IV: STABILITY ANALYSIS ANI				15
Characteristics equation – Location of roots	*	•		
- Root locus construction - Effect of pole				
design of Proportional, Integral and Deriva	ative Controllers-	- Lead and Lag	compensator- Ar	alog and
Digital implementation of controllers. UNIT – V: STATE VARIABLE ANALYS				15
Concepts of state variables. State space r				_
<ul> <li>forms State Space representation of continerepresentation –. Concept of controllability a List of Experiments</li> <li>9. Transfer function and modeling of W 10. DC Position using feedback Control</li> </ul>	and observability. ard – Leonard spo			
10. DC I Ushion using recubler Collitor	system.			
	LECTURE	TUTORIAL	PRACTICAL	TOTAI
		TUTORIAL 0	PRACTICAL 30	TOTAI 75
TEXTBOOKS 1. I.J. Nagrath & M. Gopal, 'Control S 2003	LECTURE 45 Systems Engineer	0 ring', New Age	<b>30</b> e International Pu	75 ublishers,
<b>TEXTBOOKS</b> 1. I.J. Nagrath & M. Gopal, 'Control S	LECTURE 45 Systems Engineer	0 ring', New Age	<b>30</b> e International Pu	75 ublishers,
TEXTBOOKS 1. I.J. Nagrath & M. Gopal, 'Control S 2003	LECTURE 45 Systems Engineer	0 ring', New Age dition, John Wile	<b>30</b> E International Pu ey &Sons, Inc, 20	75 ublishers, 007.
<ul> <li>TEXTBOOKS</li> <li>1. I.J. Nagrath &amp; M. Gopal, 'Control S 2003</li> <li>2. Norman S. Nise, "Control System Eng</li> <li>3. M. Gopal, 'Control Systems, Principle</li> <li>4. Richard C. Dorf&amp; Robert H. Bishop, "</li> </ul>	LECTURE         45         Systems Engineer         gineering" Fifth edges & Design', Tata	0 ring', New Age dition, John Wile a McGraw Hill,	<b>30</b> e International Pu ey &Sons, Inc, 20 New Delhi, 2002	<b>75</b> ublishers, 007.
<ul> <li>TEXTBOOKS</li> <li>1. I.J. Nagrath &amp; M. Gopal, 'Control S 2003</li> <li>2. Norman S. Nise, "Control System Eng</li> <li>3. M. Gopal, 'Control Systems, Principle</li> <li>4. Richard C. Dorf&amp; Robert H. Bishop, "</li> </ul>	LECTURE         45         Systems Engineer         gineering" Fifth ed         es & Design', Tata         'Modern Control	0 ring', New Age dition, John Wile a McGraw Hill, Systems", Addi	<b>30</b> e International Pu ey &Sons, Inc, 20 New Delhi, 2002 son– Wesley, 201	<b>75</b> ublishers, 007.
<ul> <li>TEXTBOOKS</li> <li>1. I.J. Nagrath &amp; M. Gopal, 'Control S 2003</li> <li>2. Norman S. Nise, "Control System Eng</li> <li>3. M. Gopal, 'Control Systems, Principle</li> <li>4. Richard C. Dorf&amp; Robert H. Bishop, "</li> </ul>	LECTURE         45         Systems Engineer         gineering" Fifth ed         es & Design', Tata         'Modern Control	0 ring', New Age dition, John Wile a McGraw Hill, Systems", Addi	<b>30</b> e International Pu ey &Sons, Inc, 20 New Delhi, 2002 son– Wesley, 201	<b>75</b> ublishers, 007.
<ul> <li>TEXTBOOKS</li> <li>1. I.J. Nagrath &amp; M. Gopal, 'Control S 2003</li> <li>2. Norman S. Nise, "Control System Eng</li> <li>3. M. Gopal, 'Control Systems, Principle</li> <li>4. Richard C. Dorf&amp; Robert H. Bishop, "</li> </ul>	LECTURE         45         Systems Engineer         gineering" Fifth ed         es & Design', Tata         'Modern Control         is', Prentice Hall of	0 ring', New Age dition, John Wile a McGraw Hill, Systems", Addi of India Ltd., Ne	30 e International Pu ey &Sons, Inc, 20 New Delhi, 2002 son– Wesley, 201 ew Delhi, 2014.	<b>75</b> ublishers, 007. 12.
<ul> <li>TEXTBOOKS</li> <li>1. I.J. Nagrath &amp; M. Gopal, 'Control S 2003</li> <li>2. Norman S. Nise, "Control System Eng</li> <li>3. M. Gopal, 'Control Systems, Principle</li> <li>4. Richard C. Dorf&amp; Robert H. Bishop, "</li> <li>REFERENCES</li> <li>2. B.C. Kuo, 'Automatic Control System</li> </ul>	LECTURE         45         Systems Engineer         gineering" Fifth ed         es & Design', Tata         'Modern Control         us', Prentice Hall of         ng', 4 <sup>th</sup> edition, Point	0 ring', New Age dition, John Wild a McGraw Hill, Systems", Addi of India Ltd., Ne earson Education	30 e International Pu ey &Sons, Inc, 20 New Delhi, 2002 son– Wesley, 201 ew Delhi, 2014. n, New Delhi, 200	75 ublishers, 007. 12. 03 / PHI.

NTPEL, Control Systems Engineering (Web Course), Prof. M. Gopal, IIT Kharagpur.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12	PS O1	PS O2
CO1	2	3	2	1			1	1	1			1		
CO2	2	3	1		2	1	1	1	1	1		2	2	1
CO3	3	3	3	2			1		3				2	2
CO4	1	2	2	3	2	2	1	1	2	1	1	2	1	2
CO5	2	1	1	1	2	1	1	1	2	1		1	2	2
Total	10	10	9	7	4	4	5	4	9	3	1	6	7	7
Scaled	2	2	2	2	1	1	1	1	2	1	1	2	2	2

## **SEMESTER VI**

				1			
CC	OURSE CODE	COURSE NAME		L	Τ	P	С
	PEE 601	<b>POWER SYSTEMS-II</b>		3	0	0	3
<b>C:P:</b> <i>A</i>	A = 3:0:0	(OPERATION AND CONTROL	L)	L	Т	P	Η
				3	0	0	3
Cours	e Outcomes (PEE	501):	Domain		Leve	1	<u>.</u>
CO1	Use numerical m steady state.	ethods to analyze a power system in	Cognitiv	Analy	Analyze		
CO2		y constraints in a synchronous grid.	Cognitiv	Cognitive		rstand	
CO3	Understand metho power flow	ds to control the voltage, frequency and	Cognitiv	e	Unde	rstand	
<b>CO4</b>	Understand the mo	nitoring and control of a power system.	Cognitiv	e	Unde	rstand	
CO5	Understand the bas	sics of power system economics.	Cognitiv	e	Unde	rstand	
system engine	and Load Frequence	o provide the knowledge of optimization may Control (LFC). To provide a solid required to control the governing system is al scheduling, reactive power control.	foundatio	n in 1	mather	natical	l an
	- I: INTRODUCT					9	
load correserve and ex	urves and load-durates, spinning reserves ponential curve fitti	stem operation and control - system load ion curve - load factor - diversity factor - s, cold reserves, hot reserves - Importance ng techniques for forecasting – plant level	Reserve re e of load f	equire orecas	ments: sting -	Instal quadra rols.	led atic
		ER - FREQUENCY CONTROL		<u> </u>		9	
betwee area sy	en two synchronous ystem: static and dy ling - static analysis	g mechanism and modelling - speed-loa machines in parallel - concept of control mamic analysis of uncontrolled and cont of uncontrolled case - tie line with freque	area - LH rolled cas	FC cor ses - t	ntrol of wo-are	f a sing a syst	gle- em:
UNIT	- III: REACTIVE	POWER-VOLTAGE CONTROL				9	
model changi	ling - static and dyi	a of reactive power - basics of reactive po namic analysis - stability compensation - ection reactive power - SVC (TCR + TS	methods	of vol	ltage co	ontrol:	tap-
UNIT	- IV: UNIT COM	IMITMENT AND ECONOMIC DISPA	ТСН			9	
coord direc	lination equations v	dispatch problem – I/O cost characterization without and with loss (No derivation of ration method - statement of unit commission ic programming.	loss coef	ficient	(s) - sc	olution	by
UNIT	-V: COMPUTER	R CONTROL OF POWER SYSTEMS				9	
		control of power systems - concept of energy control centre – function and control - system hardware configuration – SC.					

		LECTURE	PRACTICAL	TOTAL
		45	0	45
TEXTB	OOKS			
1. Ol	lle.I.Elgerd, 'Electric Energy Systems th	heory - An i	ntroduction', Tata	a McGraw Hill
Ec	lucation Pvt. Ltd., New Delhi, 34th reprint	, 2010.		
2. Al	llen. J. Wood and Bruce F. Wollenberg, 'I	Power Generat	ion, Operation and	d Control', John
W	iley & Sons, Inc., 3 <sup>rd</sup> Edition ,2013.			
3. Ki	undur P., 'Power System Stability and Cor	ntrol, Tata Mc	Graw Hill, New D	elhi, 5th reprint,
20	014.			
REFE	RENCES			
1. Na	agrath I.J. and Kothari D.P., 'Modern Pow	er System Ana	alysis', Tata McG	raw-Hill, Fourth
Ec	lition,2011.			
2. Ha	adi Saadat, 'Power System Analysis', Tata	a McGraw Hil	l Education Pvt. L	.td., New Delhi,
21	<sup>st</sup> reprint, 2010.			
3. Ał	ohijit Chakrabarti, Sunita Halder, 'Power	System Analy	ysis Operation an	d Control', PHI
lea	arning Pvt. Ltd., New Delhi, Third Edition	, 2010.		
E REFEI	RENCES			
www.	nptel.ac.in			
https://	/nptel.ac.in/courses/108102047/29			

	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	2	1	1	1	1	-	-	-	1	-	1	2	2
CO 2	3	3	2	2	1	1	1	-	-	1	-	1	1	1
CO 3	2	1	1	2	1	0	-	-	-	1	-	2	1	1
<b>CO 4</b>	1	1	1	1	1	0	1	-	-	1	-	1	2	2
CO 5	2	1	1	1	1	1	-	-	-	1	-	1	1	1
Total	10	8	6	5	5	3	2	0	0	5	0	6	7	7
Scaling	2	2	2	1	1	1	1	0	0	1	0	2	2	2

	URSE CODE	COURSE NAME		L	Т	P	C	
		E-WASTE MANAGEMENT		3	0	0	3	
C:P: A				L	Т	P	Η	
3:0:0				3	0	0	3	
Cours	e Outcomes:		Doma	in	I	Level		
CO1	Able to <b>find</b> the	technologies for waste electrical and	Cogni	tive	R	lemer	nber	
	electronic equipm	-	0					
CO2		the methods of Mechanical Processing	Cogni	tive	R	lemer	nher	
	of waste disposal	the methods of Weenameur Processing	cogin			lenner	noer	
<b>CO3</b>		the sources of Hydrometallurgical	Cogni	tive	R	lemer	nher	
005	Processing	the sources of Hydrometantifgical	Cogin	live			stand	
004	C .		<u> </u>					
CO4	Able to summari	ze the Electronic Waste Recycling	Cogni	live		lemer		
<u> </u>			<u> </u>	•			stand	
CO5	Able to <b>demonst</b>	Cogni	tive		lemer			
	arning Objectives:				l	Inder	stand	
•	To study various e	ources Is of waste disposal nergy generation methods						
•	To study various en To analyse recyclin	ls of waste disposal nergy generation methods ng of e-waste						
• UNIT-	To study various e To analyse recyclin	ls of waste disposal nergy generation methods ng of e-waste					9	
• UNIT- Introdu	To study various en To analyse recyclin I: INTRODUCTI	ds of waste disposal nergy generation methods ng of e-waste CON Waste, Generation and Management, E					World, The	
• UNIT- Introdu Proble	To study various e To analyse recyclin <b>I: INTRODUCTI</b> Iction, Electronic V m of WEEE, WEEI	Is of waste disposal nergy generation methods ng of e-waste ON Vaste, Generation and Management, E E Management Leaching Processes, Aci					World, The	
UNIT- Introdu Problet Using	To study various en To analyse recyclin <b>I: INTRODUCTI</b> action, Electronic V m of WEEE, WEEI Supercritical Fluids	ds of waste disposal nergy generation methods ng of e-waste ON Vaste, Generation and Management, E E Management Leaching Processes, Aci , Bioleaching.					World, The g, Leaching	
UNIT- Introdu Problet Using UNIT-	To study various en To analyse recyclin <b>I: INTRODUCTI</b> Inction, Electronic V m of WEEE, WEEI Supercritical Fluids <b>II: MECHANIC</b>	Is of waste disposal nergy generation methods ng of e-waste ON Waste, Generation and Management, E E Management Leaching Processes, Aci , Bioleaching.	id and A	Alkali	ne Le	achin	World, The g, Leaching 9	
UNIT- Introdu Probles Using UNIT- Mecha	To study various en To analyse recyclin <b>I: INTRODUCTI</b> action, Electronic V m of WEEE, WEEI <u>Supercritical Fluids</u> <b>II: MECHANICA</b> nical Processing, (	Is of waste disposal nergy generation methods ng of e-waste <b>ON</b> Waste, Generation and Management, E E Management Leaching Processes, Aci , Bioleaching. AL PROCESSING Comminution, Size Separation, Density	id and A	Alkali ation,	ne Le Sepa	achin	World, The g, Leaching 9 n by Dense	
UNIT- Introdu Problez Using UNIT- Mecha Mediu	To study various en To analyse recyclin <b>I: INTRODUCTI</b> Iction, Electronic V m of WEEE, WEEI Supercritical Fluids <b>II: MECHANICA</b> nical Processing, C m, Separation via S	Is of waste disposal nergy generation methods ng of e-waste ON Vaste, Generation and Management, E E Management Leaching Processes, Aci , Bioleaching. AL PROCESSING Comminution, Size Separation, Density Suspensions, Jigs, Flowing Film Conce	id and A	Alkali ation, s, Air	ne Le Sepa · Sepa	achin tration tration	World, The g, Leaching 9 n by Dense n, Magnetic	
UNIT- Introdu Proble Using UNIT- Mecha Mediu Separa	To study various en To analyse recyclin <b>I: INTRODUCTI</b> action, Electronic V m of WEEE, WEEI Supercritical Fluids <b>II: MECHANICA</b> nical Processing, C m, Separation via S tion, Dry Separato	Is of waste disposal nergy generation methods ng of e-waste CON Waste, Generation and Management, E E Management Leaching Processes, Aci , Bioleaching. AL PROCESSING Comminution, Size Separation, Density Suspensions, Jigs, Flowing Film Conce rs, Wet Separators, Electrostatic Separa	id and A 7 Separa entrators ation, E	ation, s, Air	ne Le Sepa · Sepa ficatio	achin tration tration	World, The g, Leaching 9 n by Dense n, Magnetic	
UNIT- Introdu Probler Using UNIT- Mecha Mediur Separa Frictio	To study various en To analyse recyclin <b>I: INTRODUCTI</b> action, Electronic V m of WEEE, WEEI Supercritical Fluids <b>II: MECHANICA</b> nical Processing, C m, Separation via S tion, Dry Separaton n, Electrification by	Is of waste disposal nergy generation methods ng of e-waste ON Vaste, Generation and Management, E E Management Leaching Processes, Aci , Bioleaching. AL PROCESSING Comminution, Size Separation, Density Suspensions, Jigs, Flowing Film Conce rs, Wet Separators, Electrostatic Separa Ion Bombardment, Eddy Current (Four	id and A 7 Separa entrators ation, E	ation, s, Air	ne Le Sepa · Sepa ficatio	achin tration tration	World, The g, Leaching 9 n by Dense n, Magnetic	
UNIT- Introdu Probles Using UNIT- Mecha Medium Separa Frictio UNIT-	To study various en To analyse recyclin <b>I: INTRODUCTI</b> action, Electronic V m of WEEE, WEEI <u>Supercritical Fluids</u> <b>II: MECHANICA</b> nical Processing, C m, Separation via S tion, Dry Separator n, Electrification by <b>III: HYDRO ME</b>	Is of waste disposal nergy generation methods ng of e-waste CON Waste, Generation and Management, E E Management Leaching Processes, Aci , Bioleaching. AL PROCESSING Comminution, Size Separation, Density Suspensions, Jigs, Flowing Film Conce rs, Wet Separators, Electrostatic Separa	d and A Separa entrators ation, E cault Cu	Alkali ation, s, Air lectri rrent)	ne Le Sepa · Sepa ficatio	achin ratio ratio on by	World, The g, Leaching 9 n by Dense n, Magnetic Contact of 9	
UNIT Introdu Problez Using UNIT Mecha Mediuz Separa Frictio UNIT Hydror	To study various en To analyse recyclin <b>I: INTRODUCTI</b> action, Electronic V m of WEEE, WEEI Supercritical Fluids <b>II: MECHANICA</b> nical Processing, C m, Separation via S tion, Dry Separator n, Electrification by <b>III: HYDRO ME</b> metallurgical Proce	Is of waste disposal nergy generation methods ng of e-waste CON Waste, Generation and Management, E E Management Leaching Processes, Aci , Bioleaching. AL PROCESSING Comminution, Size Separation, Density Suspensions, Jigs, Flowing Film Conce rs, Wet Separators, Electrostatic Separa Ion Bombardment, Eddy Current (Four TALLURGICAL PROCESSING	d and A Separa entrators ation, E cault Cu	Alkali ation, s, Air lectri rrent)	ne Le Sepa · Sepa ficatio	achin ratio ratio on by	World, The g, Leaching 9 n by Dense n, Magnetic Contact of 9 cementation	
UNIT- Introdu Problet Using UNIT- Mecha Mediut Separa Frictio UNIT- Hydrot Electrot UNIT-	To study various en To analyse recyclin <b>I: INTRODUCTI</b> action, Electronic V m of WEEE, WEEI Supercritical Fluids <b>II: MECHANICA</b> nical Processing, C m, Separation via S tion, Dry Separator n, Electrification by <b>III: HYDRO ME</b> metallurgical Proce ometallurgical Proce	Is of waste disposal nergy generation methods ng of e-waste ON Waste, Generation and Management, E E Management Leaching Processes, Aci , Bioleaching. AL PROCESSING Comminution, Size Separation, Density Suspensions, Jigs, Flowing Film Conce rs, Wet Separators, Electrostatic Separa / Ion Bombardment, Eddy Current (Four TALLURGICAL PROCESSING essing: Liquid-Liquid Extraction, Supe essing: Pyrometallurgical Processing IC WASTE RECYCLING	d and A Separa entrators ation, E cault Cu ercritica	Alkali ation, s, Air lectri rrent) 1 Ex	ne Le Sepa Sepa ficatio tractic	achin tration tration on by	World, The g, Leaching 9 n by Dense n, Magnetic Contact of 9 cementation 9	
UNIT Introdu Problez Using UNIT Mecha Mediuz Separa Frictio UNIT Hydror Electro UNIT	To study various en To analyse recyclin <b>I: INTRODUCTI</b> action, Electronic V m of WEEE, WEEI Supercritical Fluids <b>II: MECHANICA</b> nical Processing, C m, Separation via S tion, Dry Separator n, Electrification by <b>III: HYDRO ME</b> metallurgical Proce <b>IV: ELECTRON</b> onic Waste Recycl	Is of waste disposal nergy generation methods ng of e-waste ON Vaste, Generation and Management, E E Management Leaching Processes, Aci , Bioleaching. AL PROCESSING Comminution, Size Separation, Density Suspensions, Jigs, Flowing Film Conce rs, Wet Separators, Electrostatic Separa v Ion Bombardment, Eddy Current (Four TALLURGICAL PROCESSING essing: Liquid-Liquid Extraction, Super- ssing: Pyrometallurgical Processing IC WASTE RECYCLING ling: Materials Recycling Consideration	id and A 7 Separa entrators ation, E cault Cu ercritica ons, Po	Alkali ation, s, Air lectri rrent) 1 Ex	ne Le Sepa Sepa ficatio tractic	achin ration ration on by on, C eram	World, The g, Leaching 9 n by Dense n, Magnetic Contact or 9 cementation 9 ics, Printee	
UNIT- Introdu Problet Using UNIT- Mecha Mediut Separa Frictio UNIT- Hydrot Electro Circuit	To study various en To analyse recyclin <b>I: INTRODUCTI</b> action, Electronic V m of WEEE, WEEI Supercritical Fluids <b>II: MECHANICA</b> nical Processing, C m, Separation via S tion, Dry Separator n, Electrification by <b>III: HYDRO ME</b> metallurgical Procession <b>IV: ELECTRON</b> onic Waste Recyclin Boards, Mechania	Is of waste disposal nergy generation methods ng of e-waste ON Vaste, Generation and Management, E E Management Leaching Processes, Aci , Bioleaching. AL PROCESSING Comminution, Size Separation, Density Suspensions, Jigs, Flowing Film Conce rs, Wet Separators, Electrostatic Separa of Ion Bombardment, Eddy Current (Four TALLURGICAL PROCESSING essing: Liquid-Liquid Extraction, Super- essing: Liquid-Liquid Extraction, Super- essing: Pyrometallurgical Processing IC WASTE RECYCLING ling: Materials Recycling Consideration cal Processing, Hydrometallurgical Pro-	A separation of the separation	Alkali ation, s, Air lectri rrent) 1 Ex 1 Ex g, Bi	ne Le Sepa Sepa ficatio tractio	achin ration ration on by on, C eram Iro n	World, The g, Leaching 9 n by Dense n, Magnetic Contact of 9 Cementation 9 ics, Printec netallurgica	
UNIT- Introdu Problet Using UNIT- Mecha Mediut Separa Frictio UNIT- Hydrot Electrot UNIT- Electrot Circuit Proces	To study various en To analyse recyclin <b>I: INTRODUCTI</b> action, Electronic V m of WEEE, WEEI Supercritical Fluids <b>II: MECHANICA</b> nical Processing, C m, Separation via S tion, Dry Separator n, Electrification by <b>III: HYDRO ME</b> metallurgical Procession <b>IV: ELECTRON</b> onic Waste Recyclin Boards, Mechania	Is of waste disposal nergy generation methods ng of e-waste ON Waste, Generation and Management, E E Management Leaching Processes, Aci , Bioleaching. AL PROCESSING Comminution, Size Separation, Density Suspensions, Jigs, Flowing Film Conce rs, Wet Separators, Electrostatic Separa of Ion Bombardment, Eddy Current (Four TALLURGICAL PROCESSING essing: Liquid-Liquid Extraction, Supersing: Pyrometallurgical Processing IC WASTE RECYCLING ling: Materials Recycling Consideration cal Processing, Hydrometallurgical Processing lurgical Processing, Monitors, Cath	A separation of the separation	Alkali ation, s, Air lectri rrent) 1 Ex 1 Ex g, Bi	ne Le Sepa Sepa ficatio tractio	achin ration ration on by on, C eram Iro n	World, The g, Leaching 9 n by Dense n, Magnetic Contact of 9 Cementation 9 ics, Printec netallurgica	

Batteries: Nickel–Cadmium (NiCd) Batteries, Manual Sorting, Component Separation by Unity Operations of Mineral Treatment, Pyro metallurgical Route, Hydrometallurgical Route, Nickel Metal Hydride (NiMH) Batteries, Characteristics of Nickel Metal Hydride Batteries—NiMH, Recycling NiMH Batteries, Lithium Ion Batteries, Constituents of Rechargeable Lithium-Ion Batteries (LIBs), Cathode Materials, Anode Materials, Electrolytes, Separator, Recycling LIBs Batteries, Zinc-Manganese Dioxide Systems

LECTURE	TUTORIAL	TOTAL
45	0	45

#### **TEXTBOOKS**

- 1. Hugo Marcelo Veit Andréa Moura Bernardes, Electronic Waste Recycling Techniques, Springer International Publishing Switzerland 2015.
- 2. "E-waste in India: Research unit, Rajya Sabha Secretariat, New Delhi, June 2011"

# REFERENCES

#### **GOOGLE BOOKS**

- 1. e-waste Management: From waste to Resource Klaus Hieronymi, Ramzy Kahnat, Eric williams Tech. & Engg.-2013(Publisher: Earthscan 2013).
- 2. What is the impact of E-waste: Tamara Thompson
- 3. E-waste poses a Health Hazard: Sairudeen Pattazhy

#### **E REFERENCES**

#### WEBLINKS:

- www.unep.org
- www.routledge.com
- www.amazon.com
- www.bookdepository.com
- www.ecoactiv.com

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	1					2	3	2			1	1	2	1
CO 2			2	1		2	3	2			1	1	1	1
CO 3		1	1	1	2	2	2	2			1	1	2	2
CO 4	1	1	1	1			2	2		2	2	2	2	2
CO 5	2		3	2	2	2	2	2			2	2	3	3
Total	4	2	7	5	4	8	12	10		2	7	7	10	9
Scaled	1	1	2	1	1	2	3	2		1	2	2	2	2

 $0\ -No\ Relation \ 1\ -Low\ Relation \ 2\ -Medium\ Relation\ 3\ -High\ Relation$ 

CC	OURSE CODE	COURSE NAM	ME		L	Т	P	С	
		DISASTER MANAG	GEMENT		3	0	0	3	
<b>C:P:</b> <i>A</i>	A				L	Τ	P	Η	
3:0:0					3	0	0	3	
Cours	se Outcomes:			Doma	nin		Level		
CO1	Understanding the disaster preparedne	concepts of application of ss	types of	Cogni	Cognitive				
CO2	1	his course the students will b g essentials of disaster.	be able to	Cogni	ze				
CO3	Have a good und waves occurring gl	erstanding of importance of obally	f seismic	Cogni	tive		Analy	ze	
CO4		his course, the students will bial for disaster mitigation	be able to	Cogni	tive		Appli	cation	
CO5	Have a keen knowl	edge on essentials of risk redu	uction	Cogni	tive		Appli	cation	
Introd identif manag	fication – Risk sha gement –Alternative	ON preparedness – Goals and aring – Disaster and develo to dominant approach– disas	opment: I	Develop	ment	plan	is and	disast	
Introd identif manag partne <b>UNIT</b> Applio Decisi extran of rem	luction – Disaster fication – Risk sha gement –Alternative ership <b>C-II: APPLICATIO</b> cation of various tec ion support system nets – video teleconfe note sensing and GIS	preparedness – Goals and aring – Disaster and develo to dominant approach– disas <b>N OF TECHNOLOGY IN I</b> hnologies: Data bases – RDF and other systems – Geogra erencing. Trigger mechanism - Case study	opment: I ster-develo DISASTE BMS – Ma aphic info	Develop pment R RISH anagem rmation	oment linkag K REI ent In	plan ges -F DUC forma	rincip Princip TION ation s – Intra	ne- Ris disast le of ris 9 ystems inets ar htributic	
Introd identif manag partne UNIT Applic Decisi extran of rem UNIT Trigge	luction – Disaster fication – Risk sha gement –Alternative ership <b>C-II: APPLICATIO</b> cation of various tec ion support system nets – video teleconfe note sensing and GIS <b>C-III: AWARENES</b> er mechanism – con	preparedness – Goals and aring – Disaster and develo to dominant approach– disas <b>N OF TECHNOLOGY IN I</b> hnologies: Data bases – RDF and other systems – Geogra erencing. Trigger mechanism	opment: I ster-develo DISASTE BMS – Ma aphic info – Remote m – risk 1	Develop pment R RISH anagem rmation sensing	oment linkag K REI ent In systo g-an in	plan ges -F DUC forma ems - nsigh	rincipl TION ation s – Intra t – cor	<ul> <li>Pe- Ris disastered disas</li></ul>	
Introd identif manag partne UNIT Applio Decisi extran of rem UNIT Trigge inform	luction – Disaster fication – Risk sha gement –Alternative ership <b>7-II: APPLICATIO</b> cation of various tec ion support system nets – video teleconfe note sensing and GIS <b>7-III: AWARENES</b> er mechanism – com nation network – risk	preparedness – Goals and aring – Disaster and develo to dominant approach– disas <b>N OF TECHNOLOGY IN I</b> hnologies: Data bases – RDF and other systems – Geogra erencing. Trigger mechanism - Case study <b>S OF RISK REDUCTION</b> stitution of trigger mechanism	opment: I ster-develo DISASTE BMS – Ma aphic info – Remote m – risk 1 ss	Develop pment R RISH anagem rmation sensing	oment linkag K REI ent In systo g-an in	plan ges -F DUC forma ems - nsigh	rincipl TION ation s – Intra t – cor	<ul> <li>Pe- Ris disastered disas</li></ul>	
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Introd identif manag partne UNIT Applio Decisi extran of rem UNIT Trigge inform UNIT Implic prepar UNIT Seism	luction – Disaster fication – Risk sha gement –Alternative ership <b>C-II: APPLICATIO</b> cation of various tec ion support system nets – video teleconfe note sensing and GIS <b>C-III: AWARENES</b> er mechanism – con- nation network – risk <b>C-IV: DEVELOPM</b> cation of development redness – Communit <b>C-V: SEISMICITY</b> iic waves – Earthqua	preparedness – Goals and aring – Disaster and develo to dominant approach– disas <b>N OF TECHNOLOGY IN I</b> hnologies: Data bases – RDF and other systems – Geogra erencing. Trigger mechanism - Case study <b>S OF RISK REDUCTION</b> stitution of trigger mechanism reduction by public awareness <b>ENT PLANNING ON DISA</b> and planning – Financial arrang y based disaster management– akes and faults – measures of s and earthquakes	opment: I ster-develo DISASTE BMS – Ma aphic info – Remote m – risk 1 ss ASTER gements – – Emergen	Develop pment R RISH anagem rmation sensing reduction Areas of cy respondence quake, the TUTO	oment linkag <b>x REI</b> ent In a syste g-an in on by of imp onse. magni	plan ges -F DUC' forma ems - nsigh educa	rincip rincip rincip rincip rion ation s – Intra t – cor ation – ation – and in TO	<ul> <li>Pe- Ris disastered disas</li></ul>	

- 1. Siddhartha Gautam and K Leelakrishna Rao, "Disaster Management Programmes and Policies", Vista International Pub House, 2012,
- 2. Arun Kumar, "Global Disaster Management", SBS Publishers, 2008

### REFERENCES

- 1. Encyclopaedia of Disaster Management, Neha Publishers & Distributors, 2008
- 2. Pradeep Sahni, Madhavi Malalgoda and Ariyabandu, "Disaster risk reduction in South Asia", PHI, 2002
- 3. Amita Sinvhal, "Understanding earthquake disasters" TMH, 2010.
- 4. Pardeep Sahni, Alka Dhameja and Uma Medury, "Disaster mitigation: Experiences and reflections", PHI, 2000

## **E REFERENCES**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO 1		1	1					1			1	1	2	2
CO 2			2		3						2	2	2	2
CO 3						2	2				1	1		1
CO 4		2	2		1	1	1	2	1	1	3	1	1	
CO 5						2	3	3		2	1	1	2	2
Total	0	3	5	0	4	5	6	6	1	3	8	6	7	7
Scaled	0	1	1	0	1	1	1	1	1	1	2	1	2	2

## Mapping of COs with POs

0 –No Relation 1 – Low Relation 2 – Medium Relation 3 – High Relation

COU	RSE CODE	COURSE NAME		L	Т	P	С		
]	PEE 604	MICROPROCESSORS AND		3	0	1	4		
C:P: A	A = 3:1:0	MICROCONTROLLERS		L	Т	Р	Н		
				3	0	2	5		
Cours	e Outcomes (P	EE 604):	Don	nain		Leve	 l		
	× ×	,		Domani			Level		
CO1	To understa microcontrolle	nd the fundamentals of microprocessors, ers and embedded systems	1 , C						
CO2	To understand cycles of 8051	the architecture, Timing diagrams and Execution	Cog	nitive		Unde	rstand	ling	
CO3		the types of addressing modes, Instruction types and the basic concepts of programming	Psyc or	nitive chome ective		Set	rstand		
CO4	To understand D/A, timer etc.	l interfacing design of peripherals like I/O, A/D,	Cacing design of peripherals like I/O, A/D,       Cognitive         Psychomot       or         Affective       Affective						
CO5	To understand external devic	l communication protocols and interfacing with es	Psyc or	nitive chomo ective		Understanding Set Responding			
periph UNIT Funda archit	<ul> <li>erals like I/O, A</li> <li>- I: FUNDAM</li> <li>mentals of Micr</li> <li>ecture, Compa</li> </ul>	Able to do assembly language programming, do in /D, D/A, timer etc. and to develop systems using do IENTALS OF MICROPROCESSORS roprocessor Architecture, 8-bit Microprocessor and rison of 8-bit microcontrollers, 16-bit and 32-bit had average and its characteristics. Bala of microprocessor	iffere nd Mi it mic	ent mic	ontr	ontrol 9 oller ollers.			
	ms. Overview	ded system and its characteristics, Role of microc of the 8051 family.	ontro	oners	in e	T	deu		
-	11+ 'T'H_H' X05	1 ARCHITECTURE			rict	9 ers S	FRs (	Clo	
UNIT International R	al Block Diagra ESET circuits, S	m, CPU, ALU, address, data and control bus, y Stack and Stack Pointer, Program Counter, I/O y, Timing diagrams and Execution Cycles.						Da	

Addressing modes: Introduction, Instruction syntax, Data types, Subroutines Immediate addressing, Register addressing, Direct addressing, Indirect addressing, Relative addressing, indexed addressing, Bit inherent addressing, bit direct addressing. 8051 Instruction set, Instruction timings. Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction. Assembly language programs, C language programs. Assemblers and compiler Programming and Debugging tools.

#### List of Experiments

- 1. Simple arithmetic operations with 8085 Microprocessors: Multi precision addition / subtraction / multiplication / division.
- 2. Programming with control instructions: Increment / Decrement, Ascending / Descending order, Maximum / Minimum of numbers, Rotate instructions.
- 3.Demonstration of basic instructions with 8051 Micro controller execution, including: a. Conditional jumps, looping b. Calling subroutines. c. Stack parameter testing
- 4. Design program for code conversions.

## UNIT – IV: MEMORY AND I/O INTERFACING

9+3

Memory and I/O expansion buses, control signals, memory wait states. Interfacing of peripheral devices such as General Purpose I/O, ADC, DAC, timers, counters, memory devices. **List of Experiments** 

5. Interfacing Converters of 8-bit D/A and A/D.

UNIT-V:	EXTERNAL	COMMUNICATION	INTERFACE	AND	9+15
APPLICAT	IONS				

Synchronous and Asynchronous Communication. RS232, SPI, I2C. Introduction and interfacing to protocols like Blue-tooth and Zig-bee. LED, LCD and keyboard interfacing. Stepper motor interfacing, DC Motor interfacing, sensor interfacing.

#### List of Experiments

6.Interfacing of Keyboard with 8085

7. Interfacing of seven segment display with 8085.

8. Serial communication, I/O Port operations.

9. Design and implementation of Traffic Light control.

10.Design and implementation of Stepper motor control

LECTURE	PRACTICAL	TOTAL
45	30	75

## TEXTBOOKS

- 1. M.A.Mazidi, J.G.Mazidi and R.D.McKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", Pearson Education, 2007.
- 2. K.J. Ayala, "8051 Microcontroller", Delmar Cengage Learning, 2004.
- 3. R. Kamal, "Embedded System", McGraw Hill Education, Third Edition, 2017.
- 4. R.S. Gaonkar, "Microprocessor Architecture: Programming and Applications with the 8085", Penram International Publishing, 6<sup>th</sup> Edition, 2013

## REFERENCES

1. D.A.Patterson and J.H.Hennessy, "Computer Organization and Design: The Hardware /Software interface", Morgan Kaufman Publishers, 5<sup>th</sup> Edition, 2013.

## 2. D.V.Hall, "Microprocessors & Interfacing", McGraw Hill Higher Education, 2005.

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BANG/notused/Microprocessors%20and%20Microcontrollers-/Learning%20Material%20-

% 20 Microprocessors % 20 and % 20 microcontrollers.pdf

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	1	0	2	0	0	0	0	0	0	1	1	0	1	1
CO 2	1	2	1	3	1	0	0	0	2	1	2	1	1	1
CO 3	0	0	0	0	0	1	2	0	1	2	0	0	1	1
CO 4	1	1	2	2	1	0	0	0	2	1	2	1	0	1
CO 5	1	2	2	1	0	0	3	0	3	2	1	0	0	1
Total	4	5	7	6	2	1	5	0	8	7	6	2	3	5
Scaled	1	1	2	1	1	1	1	0	2	2	1	1	1	1

### Mapping of COs with POs

0 – No Relation 1 – Low Relation 2 – Medium Relation 3 – High Relation

Department	Electrical & Electronics Engineering	Course	Code	603	Sub. Code	PEE 701	Su Nai	ne	Electric Vehicles and Power Management
Year	IV	Semes	ter	VII	Regulation	2015	Ma Ma		100
MODE OF F	EVALUATION	N & WEIG	HTAGI	E(%)	Cree	dit		I	Hours/ Week
CA 1	CA 2	CA 3	CA 4	Total	L Τ 3 0	<b>P</b> 0		3	
15%	15%	20%	50%	100%	L = 45; T	'=0; P	= 0;	r	Total = 45 hrs
<b>Objective</b> (s)	This course in hybrid and ele			nental c	oncepts, princ	iples, aı	nalysi	s and	l design of
Unit- 1	ELECTRIC	VEHICLE	S AND	VEHIC	LE MECHAI	NICS			09 hours
					ehicles (HEV)			<u> </u>	Comparisons of nechanics
Unit- 2	ARCHITEC COMPONE	-	OF E	V's	AND POV	VER	TRA	AIN	09 hours
				-	n Hybrid Elect Transmission			(PHI	EV)- Power train
Unit- 3	CONTROL	OF DC AN	D AC D	RIVES					09 hours
	Operation (m	otoring and	braking	) of indu	action motor d	rive sys	tem -	- Indu	verter based V/f uction motor and ce motor (SRM)
Unit- 4	BATTERY H	ENERGY S	TORA	GE SYS	TEM				09 hours
	-					tery mo	delin	g, Tr	action Batteries
Unit- 5	ALTERNAT								09 hours
	Fuel cell – Cl capacitors	haracteristic	es- Type	s – hydr	ogen Storage	System	s and	Fuel	cell EV – Ultra
<b>Text Books:</b>									
1.	-				les: Design Fu				
2.		,	,		Gay, Ali Ema entals, Theory	,			
3.	<ul> <li>Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, C</li> <li>Chris Mi, M. AbulMasrur and David WenzhongGao, Hybrid Electric</li> <li>and Applications with Practical Perspectives, John Wiley and Sons, 2</li> </ul>								nicles: Principles

Reference Books:	
1.	Ali Emadi, MehrdadEhsani, John M.Miller Vehicular Electric Power Systems, Marceldekker, 2004
2.	James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003
3.	L. E. Carmichael, Hybrid and Electric Vehicles, ABDO Publishing Company, 2013

### PEE 701 –Electric Vehicles and Power Management Course Outcomes (COs)

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

- 1. **Specify** the key components of a vehicle propulsion system and their functions
- 2. Select appropriate hybrid electric power-train architecture
- 3. Determine appropriate type and size of hybrid electric power-train components and ESS
- 4. **Design** hybrid electric power-train system by combining appropriate power-train architecture,key power-train components, and energy storage system
- 5. Perform vehicle operation performance and energy efficiency **evaluation** for given drivingcycle, power-train design, and vehicle data through computer simulation
- 6. **Apply** the learnt modeling, simulation and analysis methods to similar transportation applications.

Department	Electrical & Electronics Engineering	s Course Cod		603	Sub. Code	PEE 702	Sub. Name	Power System Operation and Control		
Year	IV	Semes	ter	VII	Regulation	2015	Max Mark	100		
MODE OF I	EVALUATIO	N & WEIG	HTAGI	E(%)	Cree	dit		Hours/ Week		
CA 1	CA 2	CA 3	CA 4	Total	L T 3 0	<b>P</b> 0	3			
15%	15%	20%	50%	100%	L = 45; T	= 0; P	= 0;	Total = 45 hrs		
Objective (s)	The objectives of this course are to have an overview of power system operation and control. To model load-frequency dynamics and to design load-frequency controller; To model reactive power-voltage interaction and the control actions to be implemented for maintaining the voltage profile against varying system load; To study the economic operation of power system; To teach about SCADA and its application for real time operation and control of power systems.									
Unit- 1	INTRODUC	TION						09 hours		
	Importance of forecasting –	f load forec plant level a	asting - and syste	· quadra em level	tic and expon controls.			ves, hot reserves - ing techniques for		
Unit- 2	<b>REAL POW</b>	ER - FREQ	QUENC	Y CON	FROL			09 hours		
	Basics of speed governing mechanism and modeling - speed-load characteristics sharingbetween two synchronous machines in parallel - concept of control area control of a single-area system: static and dynamic analysis of uncontrolled controlled cases - two-areasystem: modeling - static analysis of uncontrolled case line with frequency bias control - state variable model									
Unit- 3	REACTIVE	POWER-V	<u>OLTA</u>	<u>GE CO</u>	NTROL			09 hours		
Unit- 3	Generation a excitation sys methods of v	nd absorpti stems – mo voltage cont	on of a deling - rol: tap	reactive static a -changin	power - bas nd dynamic a	nalysis , inject	- stabili	09 hours power control - ty compensation - tive power - SVC		
Unit- 3 Unit- 4	Generation a excitation sys methods of y (TCR + TSC)	nd absorpti stems – mo voltage cont and STAT(	on of a deling - rol: tap- COM – a	reactive static a -changin seconda	power - bas nd dynamic a g transformer	nalysis , inject trol.	- stabili	power control - ty compensation -		

Unit –5	COMPUTER CONTROL OF POWER SYSTEMS	00 hours						
UIIIt –5		09 hours						
	Need for computer control of power systems - concept of energy control centre – functions - system monitoring - data acquisition and control - system hardware configuration – SCADA and EMSfunctions - network topology - state estimation – WLSE - Contingency Analysis - state transitiondiagram showing various state transitions and control strategies.							
Text Books:								
1.	Olle.I.Elgerd, _Electric Energy Systems theory - An introduction', Tat Education Pvt. Ltd., New Delhi, 34th reprint, 2010.	a McGraw Hill						
2.	Allen. J. Wood and Bruce F. Wollenberg, _Power Generation, Operation John Wiley & Sons, Inc., 2003.	on and Control',						
3.	Kundur P., _Power System Stability and Control, Tata McGraw Hill, reprint, 2008.	New Delhi, 5th						
Reference Books:								
1.	Nagrath I.J. and Kothari D.P., _Modern Power System Analysis', Tata Fourth Edition,2011.	a McGraw-Hill,						
2.	HadiSaadat, _Power System Analysis', Tata McGraw Hill Education Delhi, 21 <sup>st</sup> reprint, 2010.	Pvt. Ltd., New						
3.	AbhijitChakrabarti, SunitaHalder, _Power System Analysis Operation an learning Pvt. Ltd., New Delhi, Third Edition, 2010.	d Control', PHI						

## PEE 702 – Power System Operation and Control Course Outcomes (COs)

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

- 1. **Know** power system load characteristics and generation reserve requirements.
- 2. **Understand** AGC and tie-line control for constant frequency operation.
- 3. **Apply** the mathematical knowledge to model and analysis of power system for frequency control.
- 4. **Indentify** fundamental aspects of reactive power and its effect on system voltage.
- 5. **Select** the suitable voltage control method for the system operating condition.
- 6. **Formulate** economic dispatch problem and its solution.
- 7. **State** unit commitment problem and its effect on economic dispatch problem.
- 8. **Apply** computer control methods for power system operation and control.

# Mapping of Course Outcomes (COs) with Programme Outcomes (POs)

# PEE 701 – Electric Vehicles and Power Management

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	2	-	2	-	3	-	2	1	-	-
CO2	-	-	-	1	-	-	-	-	2	1	2	-
CO3	2	-	-	-	1	-	-	-	-	-	-	-
<b>CO4</b>	-	-	2	1	-	-	-	-	2	1	2	-
CO5	-	-	-	-	-	-	3	-	3	2	1	-
CO6	1	1	2	-	2	-	3	-	2	1	-	-
- Slightly 2 – Supportive							3 – Hi	ghly rel	ated			

# PEE 702– Power System Operation and Control

	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	<b>PO8</b>	PO9	PO10	PO11	PO12		
CO1	3	3	1	1	2	-	-	-	-	1	-	-		
CO2	2	3	2	2	2	-	-	-	1	2	1	-		
CO3	2	3	3	2	2	-	-	-	1	1	1	-		
<b>CO4</b>	2	3	2	2	3	-	-	-	-	1	-	-		
CO5	2	2	2	3	3	-	-	-	1	1	1	-		
CO6	2	3	2	3	2	-	-	-	-	-	-	-		
<b>CO7</b>	2	2	3	3	2	-	-	-	-	1	-	-		
<b>CO8</b>	1	2	2	2	2	-	-	-	-	-	-	1		
1- Slig	htly		2 – Supportive							3 – Highly related				