PAAVAI ENGINEERING COLLEGE, NAMAKKAL – 637 018 (AUTONOMOUS)

M.E. COMMUNICATION SYSTEMS

REGULATIONS 2023

(CHOICE BASED CREDIT SYSTEM)

CURRICULUM

SEMESTER - 1

S.No	Category	Course Code	Course Title	L	Т	Р	C
Theor	y						
1	FC	PMA23104	Linear Algebra and Optimization Techniques	3	1	0	4
2	FC	PEN23101	Research Methodology and IPR	3	0	0	3
3	PC	PCS23101	Advanced Digital Signal Processing	3	1	0	4
4	PC	PCS23102	Advanced Radiation Systems	3	0	0	3
5	PC	PCS23103	Advanced Wireless Communication	3	0	0	3
6	PE	PCS2315*	Professional Elective I	3	0	0	3
7	AC	PAC23101	English for Research Paper Writing (Audit Course I)	2	0	0	0
Pra	etical						
1	PC	PCS23104	Communication System Laboratory I	0	0	4	2
			TOTAL	20	2	4	22
			SEMESTER - II				
S.No	Category	Course Code	Course Title	L	T	Р	C
		course cour		~		A .3	-
Theory	~ •	Course Cour		L			
Theory 1	~ •	PCS23201	Microwave Integrated Circuits	3	1	0	4
	y ·		Microwave Integrated Circuits Advanced Digital Communication Techniques				4
1	y PC	PCS23201	Advanced Digital Communication	3	1	0	-
1 2	PC PC	PCS23201 PCS23202	Advanced Digital Communication Techniques	3	1	0	3
1 2 3	PC PC PC	PCS23201 PCS23202 PCS23203	Advanced Digital Communication Techniques RF System Design	3 3 3	1 0 0	0 0 0	3
1 2 3 4	PC PC PC PC PC	PCS23201 PCS23202 PCS23203 PCS23204	Advanced Digital Communication Techniques RF System Design Optical Communication and Networks	3 3 3 3	1 0 0 0	0 0 0 0 0	3 3 3 3
1 2 3 4 5	PC PC PC PC PC PE	PCS23201 PCS23202 PCS23203 PCS23204 PCS2325*	Advanced Digital Communication Techniques RF System Design Optical Communication and Networks Professional Elective II	3 3 3 3 3 3	1 0 0 0 0	0 0 0 0 0	3 3 3 3
1 2 3 4 5 6	PC PC PC PC PC PE PE AC	PCS23201 PCS23202 PCS23203 PCS23204 PCS2325* PCS2335*	Advanced Digital Communication Techniques RF System Design Optical Communication and Networks Professional Elective II Professional Elective III	3 3 3 3 3 3 3	1 0 0 0 0 0 0	0 0 0 0 0 0 0	3 3 3 3 3 3
1 2 3 4 5 6 7	PC PC PC PC PC PE PE AC	PCS23201 PCS23202 PCS23203 PCS23204 PCS2325* PCS2335*	Advanced Digital Communication Techniques RF System Design Optical Communication and Networks Professional Elective II Professional Elective III	3 3 3 3 3 3 3	1 0 0 0 0 0 0	0 0 0 0 0 0 0	3 3 3 3 3 3



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PAAVAI ENGINEERING COLLEGE, NAMAKKAL – 637 018

(AUTONOMOUS)

M.E. COMMUNICATION SYSTEMS

REGULATIONS 2023

(CHOICE BASED CREDIT SYSTEM)

CURRICULUM

_			SEMESTER - I				
S.No	Category	Course Code	Course Title	L	T	P	(
Theor	у						-
-1	FC	PMA23104	Linear Algebra and Optimization Techniques	3	1	0	4
2	FC	PEN23101	Research Methodology and IPR	3	0	0	3
3	PC	PCS23101	Advanced Digital Signal Processing	3	1	0	4
4	PC	PCS23102	Advanced Radiation Systems	3	0	0	3
5	PC	PCS23103	Advanced Wireless Communication	3	0	0	3
6	PE	PCS231**	Professional Elective I	3	0	0	3
7	AC	PAC23101	English for Research Paper Writing (Audit Course I)	2	0	0	0
Prac	tical		The second second second second				
1	PC	PCS23104	Communication System Laboratory I	0	0	4	2
			TOTAL	20	2	4	22
			SEMESTER - II				
S.No	Category	Course Code	Course Title	L	T	Р	C
Theory							
1	PC	PCS23201	Microwave Integrated Circuits	3	1	0	4
2	PC	PCS23202	Advanced Digital Communication Techniques	3	0	0	3
3	PC	PCS23203	RF System Design	3	0	0	3
4	PC	PCS23204	Optical Communication and Networks	3	0	0	3
5	PE	PCS231**	Professional Elective II	3	0	0	3
6	PE	PCS231**	Professional Elective III	3	0	0	3
7	AC	PAC23201	Pedagogy Studies (Audit Course II)	2	0	0	0
ractica	ıl						
8	PC	PCS23205	Communication System Laboratory II	0	0	4	2



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			SEMESTER - III				
S.No	Category	Course Code	Course Title	L	T	P	С
Theory	1					- 1	
1	PC	PCS23301	VLSI for Wireless Communication	3	0	0	3
2	PC	PCS231**	Professional Elective IV	3	0	0	3
3	PC	PCS231**	Professional Elective V	3	0	0	3
4	OE	*****	Open Elective I	3	0	0	3
Prac	tical			0	0	12	6
1	PC	PCS23302	Project Work (Phase I)	0	0		
	-		TOTAL	12	0	12	18
			SEMESTER - IV				
S.No	Category	Course Code	Course Title	L	Т	Р	C
Practi	cal		1			24	12
1	PC	PCS23401	Project Work (Phase II)	0	0	24	12
-			TOTAL	0	0	24	12



LIST	OF	PROGRAMME	EL	LECTIVES

S.No	Category	Course Code	Course Title	L	Т	P	C
1	PE	PCS23151	Multimedia Compression Techniques	3	0	0	3
2	PE	PCS23152	Electromagnetic Interference and Compatibility in system design	3	0	0	3
3	PE	PCS23153	Advanced Digital Image Processing	3	0	0	3
4	PE	PCS23154	MEMS and NEMS	3	0	0	3
5	PE	PCS23155	Broadband Wireless Technology	3	0	0	3
6	PE	PCS23156	Millimeter Wave Communication	3	0	0	3
7	PE	PCS23157	Pattern Recognition and Computational Intelligence	3	0	0	3
8	PE	PCS23158	Communication Protocols for IoT	3	0	0	3
9	PE	PCS23159	Satellite Communication and Navigation Systems	3	0	0	3
10	PE	PCS23160	Optimization Techniques	3	0	0	3
11	PE	PCS23161	Digital Communication Receivers	3	0	0	3
12	PE	PCS23162	Soft Computing and Machine Learning	3	0	0	3
13	PE	PCS23163	Cognitive Radio Networks	3	0	0	3
14	PE	PCS23164	High Performance Communication Networks	3	0	0	3
15	PE	PCS23165	Advanced Antenna Design	3	0	0	3
16	PE	PCS23166	Ultra Wide Band Communications	3	0	0	3
17	PE	PCS23167	Real Time Embedded Systems	3	0	0	3
18	PE	PCS23168	Wavelets and Sub-band Coding	3	0	0	3
19	PE	PCS23169	Speech Processing	3	0	0	3
20	PE	PCS23170	Telecommunication System Modeling and Simulation	3	0	0	3

OPEN ELECTIVE

S.No	Category	Course Code	Course Title	L	T	Р	C
1	OE	PED23901	Industrial Safety	3	0	0	3
2	OE	PSE23901	Climate change and Adaptation	3	0	0	3
3	OE	PPS23901	Alternate Energy Sources	3	0	0	3
4	OE	PCS23901	Design of Digital Elements	3	0	0	3
5	OE	PCE23901	Big Data Analytics	3	0	0	3



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COURSE OBJECTIVES			-	
To enable the students to				
	thods in linear algebra to solve system of linear equation	ns and t	he pr	oblems
associated with Li			p.	
	method for solving linear programming problems.			
	ation and assignment in logistics and job allocation.			
	he principle of optimality and sub-optimization,	form	ilatio	n and
	ocedure of PERT and CPM method.			
	y and heuristics of decision making in real time scenario	s.	***	i i i i i i i i i i i i i i i i i i i
	AL OPPRIA			
	ALGEBRA - Inner products – Eigenvalues using QR transformation			12
-	ctors – Jordan Canonical forms – Singular value verse – Least square approximations.	decomp	ositic	on and
UNIT II LINEAR	PROGRAMMING			12
Formulation - Graphical	solution - Simplex method - Big M method - Variants	s of Simp	plex 1	nethod
- Transportation problem	ns – Assignment models.			
UNIT III TRANSP	ORTATION AND ASSIGNMENT MODELS			12
	ORTATION AND ASSIGNMENT MODELS (Minimising and Maximising Problems) – Balance	ed and	unba	
Transportation Models				lancec
Transportation Models Problems – Initial approximation methods -	(Minimising and Maximising Problems) – Balance Basic feasible solution by N-W Corner Rule, Least - Check for optimality –MODI method. Assignment M	t cost a Models (und V (Mini	ilancec /ogel's mising
Transportation Models Problems – Initial approximation methods - and Maximising Problem	(Minimising and Maximising Problems) – Balance Basic feasible solution by N-W Corner Rule, Least - Check for optimality –MODI method. Assignment M as) – Balanced and Unbalanced Problems – Solution by H	t cost a Models (und V (Mini	ilancec /ogel's mising
Transportation Models Problems – Initial approximation methods – and Maximising Problem Travelling salesman prob	(Minimising and Maximising Problems) – Balance Basic feasible solution by N-W Corner Rule, Least - Check for optimality –MODI method. Assignment M (s) – Balanced and Unbalanced Problems – Solution by H olem.	t cost a Models (und V (Mini	ilanced /ogel's mising ethod –
Transportation Models Problems – Initial approximation methods – and Maximising Problem Travelling salesman prob UNIT IV PROJEC	(Minimising and Maximising Problems) – Balance Basic feasible solution by N-W Corner Rule, Least - Check for optimality –MODI method. Assignment M as) – Balanced and Unbalanced Problems – Solution by H blem. T MANAGEMENT BY PERT AND CPM	t cost a Models (Hungaria	ind M (Mini an Me	llanced /ogel's mising ethod – 12
Transportation Models Problems – Initial approximation methods – and Maximising Problem Travelling salesman prob UNIT IV PROJEC Basic Terminologies– C	(Minimising and Maximising Problems) – Balance Basic feasible solution by N-W Corner Rule, Least - Check for optimality –MODI method. Assignment M as) – Balanced and Unbalanced Problems – Solution by H olem. T MANAGEMENT BY PERT AND CPM onstructing a project network– Network computation i	t cost a Models (Hungaria	ind M (Mini an Me	llanced /ogel's mising ethod – 12
Transportation Models Problems – Initial approximation methods – and Maximising Problem Travelling salesman prob UNIT IV PROJEC Basic Terminologies– C Cost crashing – Resource	(Minimising and Maximising Problems) – Balance Basic feasible solution by N-W Corner Rule, Least - Check for optimality –MODI method. Assignment N as) – Balanced and Unbalanced Problems – Solution by H blem. T MANAGEMENT BY PERT AND CPM onstructing a project network– Network computation i e levelling.	t cost a Models (Hungaria	ind M (Mini an Me	lanced /ogel's mising ethod – 12 PERT–
TransportationModelsProblemsInitialapproximationmethodsand MaximisingProblemTravelling salesman probUNIT IVPROJECBasic TerminologiesCCost crashingResourceUNIT VGAME T	(Minimising and Maximising Problems) – Balance Basic feasible solution by N-W Corner Rule, Least - Check for optimality –MODI method. Assignment M as) – Balanced and Unbalanced Problems – Solution by H olem. T MANAGEMENT BY PERT AND CPM onstructing a project network– Network computation i e levelling. HEORY	t cost a Models (Hungaria n CPM	and V (Mini an Me and J	lanced /ogel's mising ethod – 12 PERT– 12
Transportation Models Problems Initial approximation methods - and Maximising Problem Travelling salesman problem UNIT IV PROJEC Basic Terminologies- Cost crashing - UNIT V GAME T Definition of Game -	(Minimising and Maximising Problems) – Balance Basic feasible solution by N-W Corner Rule, Least - Check for optimality –MODI method. Assignment M as) – Balanced and Unbalanced Problems – Solution by H olem. T MANAGEMENT BY PERT AND CPM constructing a project network– Network computation i e levelling. HEORY ayoff and Two Person Zero Sum Game – Maximin P	t cost a Models (Hungaria n CPM Principle	(Mini (Mini an Me and)	lanced /ogel's mising ethod – 12 PERT– 12 inimax
TransportationModelsProblemsInitialapproximationmethods -and MaximisingProblemTravelling salesmanproblemUNIT IVPROJECBasic Terminologies-CCost crashing - ResourceUNIT VUNIT VGAME TDefinition of Game - PPrinciple - Saddle Point -	(Minimising and Maximising Problems) – Balance Basic feasible solution by N-W Corner Rule, Least - Check for optimality –MODI method. Assignment M as) – Balanced and Unbalanced Problems – Solution by H olem. T MANAGEMENT BY PERT AND CPM onstructing a project network– Network computation i e levelling. HEORY ayoff and Two Person Zero Sum Game – Maximin P – 2 X 2 Games without Saddle Point – The Rules of Dor	t cost a Models (Hungaria n CPM Principle	(Mini (Mini an Me and)	lanced /ogel's mising ethod – 12 PERT– 12 inimax
Transportation Models Problems Initial approximation methods - and Maximising Problem Travelling salesman problem UNIT IV PROJEC Basic Terminologies- Cost crashing - UNIT V GAME T Definition of Game -	 (Minimising and Maximising Problems) – Balance Basic feasible solution by N-W Corner Rule, Least - Check for optimality –MODI method. Assignment Mas) – Balanced and Unbalanced Problems – Solution by Holem. T MANAGEMENT BY PERT AND CPM onstructing a project network– Network computation i e levelling. HEORY ayoff and Two Person Zero Sum Game – Maximin P – 2 X 2 Games without Saddle Point – The Rules of Dor x 2 Games. 	t cost a Models (Hungaria n CPM Principle minance	(Mini (Mini an Me and)	/ogel's mising ethod – 12 PERT– 12 inimax aphical
Transportation Models Problems Initial approximation methods - and Maximising Problem Travelling salesman problem Travelling salesman problem UNIT IV PROJEC Basic Terminologies- Cost crashing - UNIT V GAME T Definition Game - Principle - Saddle Method for 2 x n or m x	(Minimising and Maximising Problems) – Balance Basic feasible solution by N-W Corner Rule, Least - Check for optimality –MODI method. Assignment M as) – Balanced and Unbalanced Problems – Solution by H olem. T MANAGEMENT BY PERT AND CPM onstructing a project network– Network computation i e levelling. HEORY ayoff and Two Person Zero Sum Game – Maximin P – 2 X 2 Games without Saddle Point – The Rules of Dor	t cost a Models (Hungaria n CPM Principle minance	(Mini an Me and) – M – Gr	lanced /ogel's mising ethod – 12 PERT– 12 inimax aphical
Transportation Models Problems Initial approximation methods - and Maximising Problem Travelling salesman problem Travelling salesman problem UNIT IV PROJEC Basic Terminologies- Cost crashing - Principle - Saddle Principle - Saddle Method for 2 x n or m x	(Minimising and Maximising Problems) – Balance Basic feasible solution by N-W Corner Rule, Least - Check for optimality –MODI method. Assignment M as) – Balanced and Unbalanced Problems – Solution by H olem. T MANAGEMENT BY PERT AND CPM onstructing a project network– Network computation i e levelling. HEORY ayoff and Two Person Zero Sum Game – Maximin P – 2 X 2 Games without Saddle Point – The Rules of Dor x 2 Games. TOTAL PERIC	t cost a Models (Hungaria n CPM Principle minance DDS BT M.	(Mini (Mini an Me and) – M – Gr	alanced /ogel's mising ethod – 12 PERT– 12 inimax aphical 60 ED
Transportation Models Problems – Initial approximation methods - and Maximising Problem Travelling salesman prob UNIT IV PROJEC Basic Terminologies– C Cost crashing – Resource UNIT V GAME T Definition of Game – P Principle – Saddle Point - Method for 2 x n or m x COURSE OUTCOMES At the end of this course, the	(Minimising and Maximising Problems) – Balance Basic feasible solution by N-W Corner Rule, Least - Check for optimality –MODI method. Assignment M as) – Balanced and Unbalanced Problems – Solution by H olem. T MANAGEMENT BY PERT AND CPM onstructing a project network– Network computation i e levelling. HEORY ayoff and Two Person Zero Sum Game – Maximin P – 2 X 2 Games without Saddle Point – The Rules of Dor x 2 Games. TOTAL PERIC	t cost a Models (Hungaria n CPM Principle minance	(Mini (Mini an Me and) – M – Gr	alanced /ogel's mising ethod – 12 PERT– 12 inimax aphical 60 ED

CO2	apply the sim	plex method for	solving linear pro	ogramming prob	lems. A	Applying (K3)
CO3	examine tra allocation.	nsportation and	l assignment in	n logistics and	d job A	applying (K3)
CO4			of optimality a			Applying (K3)
CO5	apply Game scenarios.	theory and heur	istics of decision	n making in rea	l time	Applying (K3)
REFE	RENCES					
1.			l its Applications ion, Fifteenth Rep		oks/Cole), A	part of Cengage
2.	Friedberg A.H Delhi, 2004.	I, Insel A.J. and	d Spence L, "Li	near Algebra",	Prentice Hal	l of India, New
3.	Bronson, R., Edition, 2011.		n, Schaum's outl	ine series, McG	raw Hill, Ne	w York, Second
4.	Kanti Swarup New Delhi,20	an latar Kang y	l Manmohan, —(Operations Rese	arch, Sultan	Chand and Sons
CO	D-PO MAPPING	÷:				
			tcomes (CO's) with the of correlation)			
60			PO	's		
COs	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	-	1	1	1	1
CO2	2	-	•	-	-	1
CO3	2	-	-	-	-	1
CO4	3	-	1	1	1	1
CO5	3	-	1	1	1	1



PEN23	3101	RESEARCH METHODOLOGY AND IPR 3	0	0 3
COURS	SE OBJ	ECTIVES		
		udents to		
		nd the formulation of research problem		
		ar with data collection and literature survey process		
		e statistical concepts in experimentation	_	
		mowledge in writing research proposal		
		ut patent rights and its importance		
UNIT I		RESEARCH PROBLEM FORMULATION	-	9
	of res	earch, Objectives of Research, Types of research, Significance of Research		
	rch desi	ng the problem, Necessity of defining the problem, Meaning of Research gn, features of a good design, Different research designs. LITERATURE SURVEY		
and the second second second		and Qualitative data, Scaling, Scaling Techniques, Experiments		9
terature nalysis a NIT II	e studie and asse I	DESIGN OF EXPERIMENTS	the li	terature,
iterature analysis a UNIT III Strategy experime	e studie and asse I of Exp ents; Ba	s approaches, Survey for existing literature, Procedure for reviewing essment. DESIGN OF EXPERIMENTS erimentation - Typical applications of experimental design, Guidelines sic statistical concepts - Statistical concepts in experimentation, Regres	the li	terature, 9 esigning
iterature analysis a UNIT III Strategy experime o analysi	e studie and asse I of Exp ents; Ba is of va	s approaches, Survey for existing literature, Procedure for reviewing essment. DESIGN OF EXPERIMENTS erimentation - Typical applications of experimental design, Guidelines sic statistical concepts - Statistical concepts in experimentation, Regres	the li	terature, 9 esigning
literature analysis a UNIT III Strategy experime to analysi UNIT IV Contents Writing a	e studie and asse of Exp ents; Ba is of va / of a re	s approaches, Survey for existing literature, Procedure for reviewing essment. DESIGN OF EXPERIMENTS erimentation - Typical applications of experimental design, Guidelines sic statistical concepts - Statistical concepts in experimentation, Regres riance.	the life for dession a	terature, 9 esigning pproach 9 rencing,
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literature analysis a UNIT III Strategy experime to analysi UNIT IV Contents Writing a ethics. UNIT V Intellectu Term of Developm Software.	e studie and asse of Exp ents; Ba is of va / of a re a biblic nal Prop copyri nents i	s approaches, Survey for existing literature, Procedure for reviewing essment. DESIGN OF EXPERIMENTS erimentation - Typical applications of experimental design, Guidelines sic statistical concepts - Statistical concepts in experimentation, Regress riance. RESEARCH PROPOSAL AND WRITING search proposal, Writing a research report- Research writing in general ography, Presentation and assessment by a review committee, Plagiar INTELLECTUAL PROPERTY RIGHTS erty- Definition, WTO, Fundamentals of Patent, Copyright, The rights ght, Register of trademark, Procedure for trade mark, Term of tra n IPR- Administration of patent system, IPR of Biological Syster TOTAL PERIODS COMES BT 1	the life for de ssion a ssion a l, Refer ism, R of the idemark ms, Co	terature, 9 esigning pproach 9 rencing, cesearch 9 e owner, k; New omputer 45 PED
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	collect and pr	epare suitable da	ta for research		Analyz	ing (K4)
CO3	désign experin	ments for differen	nt statistical cond	cepts	Applyi	ng (K3)
CO4	write research	proposals and re	eports		Applyin	ng (K3)
CO5	apply their res	search work for p	patent through IP	R	Applyin	ng (K3)
REFE	RENCES					
1.	C.R Kothari	and Gaurav Ga	arg, "Research	Methodology N	Aethods and Te	echniques", 4
		Age International				
2.		, "Research Me			ide for beginne	rs, 2 nd Edition
2.	PearsonEduca			p .;p	0	
				<u></u>	n oth the M	I Dublishow
3.	Douglas C. M	ontgomery, "Des	sign and Analysi	s of Experiments	, 9 th edition, W	ney Publishers
5.	J					
5.	2017					
	2017					
4.	2017 Neeraj Pandey	and Khushdeep				
4.	2017 Neeraj Pandey O-PO MAPPINO	v and Khushdeep	Dharni, "Intelled	ctual Property Ri	ghts", PHI Learn	
4.	2017 Neeraj Pandey O-PO MAPPINO Mapp	/ and Khushdeep 5 : ing of Course Ou	Dharni, "Intellec tcomes (CO's) w	ctual Property Ri ith Programme O	ghts", PHI Learr Putcomes (PO's)	ning, 2014
4.	2017 Neeraj Pandey O-PO MAPPINO Mapp	v and Khushdeep	Dharni, "Intelled Itcomes (CO's) w th of correlation)	ctual Property Ri ith Programme C 3 – Strong , 2 – P	ghts", PHI Learr Putcomes (PO's)	ning, 2014
4. C0	2017 Neeraj Pandey O-PO MAPPINO Mapp	/ and Khushdeep 5 : ing of Course Ou	Dharni, "Intelled Itcomes (CO's) w th of correlation)	ctual Property Ri ith Programme O 3 – Strong , 2 – P D's	ghts", PHI Learr Putcomes (PO's) Medium , 1 – Wea	ning, 2014 Nk
4. C0	2017 Neeraj Pandey O-PO MAPPINO Mapp	/ and Khushdeep 5 : ing of Course Ou	Dharni, "Intelled Itcomes (CO's) w th of correlation)	ctual Property Ri ith Programme C 3 – Strong , 2 – P	ghts", PHI Learr Putcomes (PO's)	ning, 2014
4. CO	2017 Neeraj Pandey O-PO MAPPINO Mapp (1/2/3 inc	and Khushdeep 5 : ing of Course Ou licates the strengt	Dharni, "Intelled atcomes (CO's) w th of correlation) P(ctual Property Ri ith Programme O 3 – Strong , 2 – P D's	ghts", PHI Learr Putcomes (PO's) Medium , 1 – Wea	ning, 2014 Nk
4. CO COs CO1	2017 Neeraj Pandey O-PO MAPPINO Mapp (1/2/3 inc PO1	y and Khushdeep G : ing of Course Ou licates the strengt PO2	Dharni, "Intellec atcomes (CO's) w th of correlation) P(PO3	ctual Property Ri ith Programme O 3 – Strong , 2 – P D's	ghts", PHI Learr Putcomes (PO's) Medium , 1 – Wes PO5	ning, 2014 nk PO6
4. CO COs CO1 CO2	2017 Neeraj Pandey O-PO MAPPINO Mapp (1/2/3 inc PO1 3	y and Khushdeep 5 : ing of Course Ou licates the strengt PO2 3	Dharni, "Intellect itcomes (CO's) w th of correlation) PO PO3 -	ctual Property Ri ith Programme O 3 – Strong , 2 – P D's	ghts", PHI Learn Putcomes (PO's) Medium , 1 – Wes PO5 1	ning, 2014 nk PO6
4. C0	2017 Neeraj Pandey O-PO MAPPINO Mapp (1/2/3 inc PO1 3 3	y and Khushdeep G : sing of Course Ou licates the strengt PO2 3 3	Dharni, "Intellect tecomes (CO's) w th of correlation) PO PO3 - -	ctual Property Ri ith Programme O 3 – Strong , 2 – P D's	ghts", PHI Learr Putcomes (PO's) Medium , 1 – Wea PO5 1 1	ning, 2014 nk 1 1

AND BOAPP GINEE APPROVED BOARD OF STUDIES Electronics & Communication Engineering F PRAVAL A RU 2 * AUTONOMOU

COUI	RSE OB	JECTIVES					
To ena	able the s	students to					
1.	know	the design concepts of DSP filters					
2.	under	stand the theory of multi rate DSP.					
3.	gain k	gain knowledge on linear prediction and optimum filters.					
4.	acquire knowledge about various power spectral estimation techniques.						
5.	be fan	niliar with the applications of DSP.					
UNIT	T	DESIGN OF DIGITAL FILTERS				12	
SROWING	~~	Filters - Design of Linear phase FIR filters - Windows, Free	uency Sam	pline	meth	255	
		ilters - IIR filters by Impulse invariance, Bilinear Transformati		Pung	, men		
UNIT		MULTIRATE DIGITAL SIGNAL PROCESSING				12	
		P - Decimators and Interpolators; Sampling rate conversion	- Direct F	orm	FIR fi	ilter	
		phase filters, Time Variant Filter structure; Sampling rate					
	5.0 S.						
UNIT	signals, Arbitrary factor.						
	rward-backward linear prediction filters; Solution of normal equations; AR Lattice and						
Forwar	d-backw			e and	I ARI	12 MA	
				e and	I ARI	0.7	
	Ladder	ard linear prediction filters; Solution of normal equations;		e and	i Ari	0.7	
Lattice UNIT	Ladder I	l ard linear prediction filters; Solution of normal equations; Filters, Wiener Filters for Filtering and Prediction.	AR Lattic			MA 12	
Lattice UNIT Non pa	Ladder I IV arametric	ard linear prediction filters; Solution of normal equations; Filters, Wiener Filters for Filtering and Prediction. POWER SPECTRUM ESTIMATION	AR Lattic			MA 12	
Lattice UNIT Non pa	Ladder I IV arametric d, uncons	ard linear prediction filters; Solution of normal equations; Filters, Wiener Filters for Filtering and Prediction. POWER SPECTRUM ESTIMATION methods - Partlett method, Welch method ; Parametric method	AR Lattic			MA 12	
Lattice UNIT Non pa Method UNIT Applica	Ladder 1 IV arametric d, uncons V ation of	Image: Solution of normal equations; ard linear prediction filters; Solution of normal equations; Filters, Wiener Filters for Filtering and Prediction. POWER SPECTRUM ESTIMATION e methods - Partlett method, Welch method ; Parametric methors; strained Least Squares Method, MA model, ARMA model. DSP APPLICATIONS DSP and Multi rate DSP - Quadrature Mirror Filter, Design of the strained Strai	AR Lattic	Wal	ker, B	MA 12 Surg 12	
Lattice UNIT Non pa Method UNIT Applica	Ladder 1 IV arametric d, uncons V ation of	Image:	AR Lattic	Wal	ker, B	MA 12 Surg 12 and	
Lattice UNIT Non pa Method UNIT Applica	Ladder I IV arametric d, uncons V ation of of speec	ard linear prediction filters; Solution of normal equations; Filters, Wiener Filters for Filtering and Prediction. POWER SPECTRUM ESTIMATION methods - Partlett method, Welch method ; Parametric meth strained Least Squares Method, MA model, ARMA model. DSP APPLICATIONS DSP and Multi rate DSP - Quadrature Mirror Filter, Design of h signals. TOTAL F	AR Lattic nods - Yule of phase shi	Wal	ker, B Subb	MA 12 durg 12 and 60	
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Lattice UNIT Non pa Method UNIT Applica coding	Ladder I IV arametric d, uncons V ation of of speec RSE OU' end of th analyz	ard linear prediction filters; Solution of normal equations; Filters, Wiener Filters for Filtering and Prediction. POWER SPECTRUM ESTIMATION methods - Partlett method, Welch method ; Parametric meth strained Least Squares Method, MA model, ARMA model. DSP APPLICATIONS DSP and Multi rate DSP - Quadrature Mirror Filter, Design of h signals. TOTAL F TCOMES his course, the students will be able to	AR Lattic	Wall ffters, MAI	ker, B Subb PPED Level <4)	12 Burg 12 and 60	
Lattice UNIT Non pa Method UNIT Applica coding COUF At the CO1	Ladder I IV arametric d, uncons V ation of of speec RSE OU end of th analyz elucid	ard linear prediction filters; Solution of normal equations; Filters, Wiener Filters for Filtering and Prediction. POWER SPECTRUM ESTIMATION methods - Partlett method, Welch method ; Parametric methestrained Least Squares Method, MA model, ARMA model. DSP APPLICATIONS DSP and Multi rate DSP - Quadrature Mirror Filter, Design of h signals. TOTAL F TCOMES his course, the students will be able to the different DSP filters	AR Lattic nods - Yule of phase shi PERIODS BT (Hig Analyzi Underst	Wall fters, MAI ghest ing (l	ker, B Subb PPED Level (4)	12 Burg 12 and 60	
Lattice UNIT Non pa Method UNIT Applica coding COUF At the CO1 CO2	Ladder I IV arametric d, uncons V ation of of speec RSE OU' end of th analyz elucida design	ard linear prediction filters; Solution of normal equations; Filters, Wiener Filters for Filtering and Prediction. POWER SPECTRUM ESTIMATION methods - Partlett method, Welch method ; Parametric methestrained Least Squares Method, MA model, ARMA model. DSP APPLICATIONS DSP and Multi rate DSP - Quadrature Mirror Filter, Design of h signals. TOTAL F TCOMES his course, the students will be able to re different DSP filters ate about multi rate digital signal processing.	AR Lattic	Wall fters, mAl shest ing (I andii ng (K	ker, B Subb PPED Level (K) 1g (K)	12 Burg 12 and 60	

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CO-PO MAPPING :

co.		PO's							
COs	PO1	PO2	PO3	PO4	PO5	PO6			
CO1	2	1	2	2	2	1			
CO2	2	1	2	2	2	1			
CO3	2	1	2	2	2	1			
CO4	2	1	2	2	2	1			
CO5	2	1	2	2	2	1			

Flectronics

PCS2	3102	ADVANCED RADIATION SYSTEMS 3	0	0	3
COU	RSE OB.	JECTIVES	_		-
To en	able the s	tudents to			
1.	unders	stand the antenna fundamentals			
2.	learn a	bout signal propagation at radio frequencies, aperture and reflector antenn	as.		
3.	know	the basics of antenna array and its analysis.			
4.	be farr	niliar with its parameters measurement.			_
5.	gain ki	nowledge on special antenna arrays and its applications.			
UNIT	I	ANTENNA FUNDAMENTALS	T		9
Image	, Inductio	ipole, monopole, loop antenna; Mobile phone antenna-base station, han on, reciprocity theorem, Broadband antennas and matching technique former, Introduction to numerical techniques			1.1
UNIT	II	RADIATION FROM APERTURES			9
listrib	ution on	nce principle, Radiation from Rectangular and Circular apertures, Uni an infinite ground plane; Slot antenna; Horn antenna; Reflector ante esign consideration		÷	
listrib blocka JNIT Linear limen	ution on age, and d III · array - u sional un	an infinite ground plane; Slot antenna; Horn antenna; Reflector ante esign consideration ARRAY ANTENNA uniform array, end fire and broad side array, gain, beam width, side lo iform array; Phased array, beam scanning, grating lobe, feed network.	enna,	, apertu	9 wo
istrib locka NIT inear imen	eution on age, and d III • array - t sional un esis techni	an infinite ground plane; Slot antenna; Horn antenna; Reflector ante esign consideration ARRAY ANTENNA uniform array, end fire and broad side array, gain, beam width, side lo	enna,	, apertu	9 wo
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	analyse apertu	re antennas and t	he field associate	ed with it.	Analyz	ing (K4)
CO3	apply concept	s of array antenn	as in real time a	pplications	Applyi	ng (K3)
CO4	design micro s	trip patch antenn	as		Applyi	ng (K3)
CO5	perform measu antennas	irement of anteni	na parameters an	d design special ar	unders	tanding (K2)
REFE	RENCES					
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		JECTIVES					
		students to					
1.	AND TRACES IN	the concepts of wireless communication					
2.		about the various propagation methods, channel models, capacity	/ calculati	ons			
3.	and an and	nowledge on various diversity combining methods					
4.		e knowledge about MIMO					
5.	be familiar with multiple user techniques used in the mobile communication.						
UNIT	`I	WIRELESS CHANNEL PROPAGATION AND MODEL				9	
Propa	gation of	EM signals in wireless channel - Reflection, diffraction and	Scatterin	g; Fro	ee sp	ace.	
	irements,	ing Models - Rayleigh, Rician, Nakagami; 5G Channel m propagation scenarios, METIS channel models, Map-ba					
UNIT	п.	CAPACITY OF WIRELESS CHANNELS		1	242	9	
Capac	acity in AWGN, capacity of flat fading channel, capacity of frequency selective fading channels.						
Capac	ity of M	IISO, SIMO systems.					
	any or wh	SO, Shilo systems.					
	6	DIVERSITY			40.55	9	
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UNIT Realiz Comb knowr	tining, N n at trans	DIVERSITY independent fading paths, Receiver Diversity: Selection		-		nold	
UNIT Realiz Comb known UNIT	TIII tation of ining, M n at trans TIV	DIVERSITY independent fading paths, Receiver Diversity: Selection faximum-ratio Combining, Equal gain Combining. Transmit mitter, Channel unknown at the transmitter. MIMO COMMUNICATIONS	ter Diver	sity:	Char	nold nnel 9	
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UNIT Realiz Comb known UNIT Narro MIMC and co	TIII tation of ining, M n at transf TV wband M D Diversi oding : S7	DIVERSITY independent fading paths, Receiver Diversity: Selection laximum-ratio Combining, Equal gain Combining. Transmit mitter, Channel unknown at the transmitter. MIMO COMMUNICATIONS IIMO model, Parallel decomposition of the MIMO channel, M	ter Diver	sity:	Char	nold nnel 9 city,	
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CO3	use the different		oining methods.		Underst	tanding (K2)
CO4	explain the conc				Underst	tanding (K2)
CO5		epts of multig		iques and their	use in Applyin	ng (K3)
REFF	RENCES					
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4. C COs	5 th edition, 2011 Upena Dalal, "Y O-PO MAPPING Mappir (1/2/3 indic	L. Wireless Comm ing of Course Ou cates the strengt PO2	nunication", Oxfo tecomes (CO's) with of correlation) P(PO3	ord Higher Educa ith Programme O 3 – Strong , 2 – M D's PO4	ntion, 2010 Futcomes (PO's) Aledium , 1 – We:	ak
4. C COs CO1	5 th edition, 2011 Upena Dalal, "V O-PO MAPPING : Mappir (1/2/3 indic	L. Wireless Comm og of Course Ou cates the strengt PO2 2	nunication", Oxfo tcomes (CO's) with of correlation) P(PO3 2	ord Higher Educa ith Programme O 3 – Strong , 2 – M D's PO4 1	ntion, 2010 nutcomes (PO's) Medium , 1 – We: PO5 1	ak
4. C COs	5 th edition, 2011 Upena Dalal, "V O-PO MAPPING Mappir (1/2/3 indic	I. Wireless Comm ing of Course Ou cates the strengt PO2 2 2 2	nunication", Oxfo tecomes (CO's) with of correlation) P(PO3 2 2 2	ord Higher Educa ith Programme O 3 – Strong , 2 – M D's PO4 1	ntion, 2010 nutcomes (PO's) Aedium , 1 – Wes PO5 1 1	ak PO6 1
4. C COs CO1	5 th edition, 2011 Upena Dalal, "V O-PO MAPPING : Mappir (1/2/3 indic	L. Wireless Comm og of Course Ou cates the strengt PO2 2	teomes (CO's) with of correlation) PC PO3 2 2 2 2	ord Higher Educa ith Programme O 3 – Strong , 2 – N D's PO4 1 1 2	ntion, 2010 nutcomes (PO's) Medium , 1 – We: PO5 1 1 2	ak PO6 1 1 1
4. C COs CO1 CO2	5 th edition, 2011 Upena Dalal, "V O-PO MAPPING Mappir (1/2/3 indic	I. Wireless Comm ing of Course Ou cates the strengt PO2 2 2 2	nunication", Oxfo tecomes (CO's) with of correlation) P(PO3 2 2 2	ord Higher Educa ith Programme O 3 – Strong , 2 – M D's PO4 1	ntion, 2010 nutcomes (PO's) Aedium , 1 – Wes PO5 1 1	ak PO6 1



AUDIT COURSE I

PAC23101	ENGLISH FOR RESEARCH PAPER WRITING	2 0	0	0
COURSE O	DBJECTIVES			
To enable th	e students to			
1. unc	lerstand how to improve the writing skills and level of readability.			
2. lea	rn about what to write in each section and to understand the skills needed to	o write	a tit	le.
3. cho	oose and focus on a topic of interest and to learn how to paraphrase, s	umma	rize,	using
cor	rect attribution and following documentation guidelines.			
4. cra	ft a research paper in their discipline.			
5. ens	ure the good quality of paper at first-time submission.			
UNIT 1	PLANNING AND PREPARATION f Words, Breaking up long sentences, Structuring Paragraphs and Se			6
Concise a	nd Removing Redundancy, Avoiding Ambiguity and Vaguenes			
macpenden	thought with grace, clarity and force.			
UNIT 2 Details of a	STRUCTURE OF A PAPER all the parts - Clarifying Who Did What, Highlighting the Findings,			
UNIT 2 Details of a Criticizing, venture out	STRUCTURE OF A PAPER all the parts - Clarifying Who Did What, Highlighting the Findings, Skills to identify something we really need to know -some ways to fin across the swamp of research without losing our bearings - Paraphrasing	nd a t	opic	and - to
UNIT 2 Details of a Criticizing, venture out a Paper, Aba	STRUCTURE OF A PAPER all the parts - Clarifying Who Did What, Highlighting the Findings, Skills to identify something we really need to know -some ways to fin across the swamp of research without losing our bearings - Paraphrasing stract, Introduction. Introduction to Free writing.	nd a t	opic	and - to s of
UNIT 2 Details of a Criticizing, venture out a Paper, Ab: UNIT 3	STRUCTURE OF A PAPER all the parts - Clarifying Who Did What, Highlighting the Findings, Skills to identify something we really need to know -some ways to fin across the swamp of research without losing our bearings - Paraphrasing stract, Introduction. Introduction to Free writing. LITERATURE REVIEWS AND CITATIONS	nd a t g - Se	opic ction	and - to s of 6
UNIT 2 Details of a Criticizing, venture out a Paper, Aba UNIT 3 Key skills	STRUCTURE OF A PAPER all the parts - Clarifying Who Did What, Highlighting the Findings, Skills to identify something we really need to know -some ways to fin across the swamp of research without losing our bearings - Paraphrasing stract, Introduction. Introduction to Free writing.	nd a t g - Se ne rev	opic ction	and - to s of <u>6</u> of the
UNIT 2 Details of a Criticizing, venture out a Paper, Aba UNIT 3 Key skills literature, c	STRUCTURE OF A PAPER all the parts - Clarifying Who Did What, Highlighting the Findings, Skills to identify something we really need to know -some ways to fin across the swamp of research without losing our bearings - Paraphrasing stract, Introduction. Introduction to Free writing. LITERATURE REVIEWS AND CITATIONS required to - write a title, an abstract, write an introduction, write the stract of the stract.	nd a t g - Se ne rev of the	opic ction iew Lite	and - to s of 6 of the rature
UNIT 2 Details of a Criticizing, venture out a Paper, Aba UNIT 3 Key skills literature, c	STRUCTURE OF A PAPER all the parts - Clarifying Who Did What, Highlighting the Findings, Skills to identify something we really need to know -some ways to fin across the swamp of research without losing our bearings - Paraphrasing stract, Introduction. Introduction to Free writing. LITERATURE REVIEWS AND CITATIONS required to - write a title, an abstract, write an introduction, write the onduct a literature review of all current research in their field. Review of all current research in their field.	nd a t g - Se ne rev of the	opic ction iew Lite	and - to s of 6 of the rature, sm.
UNIT 2 Details of a Criticizing, venture out a Paper, Aba UNIT 3 Key skills literature, c Methods, Ra UNIT 4	STRUCTURE OF A PAPER all the parts - Clarifying Who Did What, Highlighting the Findings, Skills to identify something we really need to know -some ways to fin across the swamp of research without losing our bearings - Paraphrasing stract, Introduction. Introduction to Free writing. LITERATURE REVIEWS AND CITATIONS required to - write a title, an abstract, write an introduction, write the onduct a literature review of all current research in their field. Review of esults, Discussion and Conclusions - citing references correctly and avoiding the state of the sta	nd a t g - Se ne rev of the ng plag	opic ction iew Lite giaris	and - to s of of the rature, sm.
UNIT 2 Details of a Criticizing, venture out a Paper, Aba UNIT 3 Key skills literature, c Methods, Ra UNIT 4 Skills requi	STRUCTURE OF A PAPER all the parts - Clarifying Who Did What, Highlighting the Findings, Skills to identify something we really need to know -some ways to finacross the swamp of research without losing our bearings - Paraphrasing stract, Introduction. Introduction to Free writing. LITERATURE REVIEWS AND CITATIONS required to - write a title, an abstract, write an introduction, write the onduct a literature review of all current research in their field. Review of esults, Discussion and Conclusions - citing references correctly and avoidir EDITING AND ORGANISING SKILLS	nd a t g - Sec ne rev of the ng play te Con	opic ction iew Lite giaris	and - to s of of the rature, sm. 6 ions.
UNIT 2 Details of a Criticizing, venture out a Paper, Abs UNIT 3 Key skills literature, c Methods, Ra UNIT 4 Skills requi write about	STRUCTURE OF A PAPER all the parts - Clarifying Who Did What, Highlighting the Findings, Skills to identify something we really need to know -some ways to fin across the swamp of research without losing our bearings - Paraphrasing stract, Introduction. Introduction to Free writing. LITERATURE REVIEWS AND CITATIONS required to - write a title, an abstract, write an introduction, write the onduct a literature review of all current research in their field. Review of esults, Discussion and Conclusions - citing references correctly and avoidir EDITING AND ORGANISING SKILLS red to - write the Methods, write the Discussion, write the Results, write	nd a t g - Sec ne rev of the ng play te Con	opic ction iew Lite giaris	and - to s of of the rature, sm. 6 ions.
UNIT 2 Details of a Criticizing, venture out a Paper, Abs UNIT 3 Key skills literature, c Methods, Ra UNIT 4 Skills requi write about	STRUCTURE OF A PAPER all the parts - Clarifying Who Did What, Highlighting the Findings, Skills to identify something we really need to know -some ways to fin across the swamp of research without losing our bearings - Paraphrasing stract, Introduction. Introduction to Free writing. LITERATURE REVIEWS AND CITATIONS required to - write a title, an abstract, write an introduction, write the onduct a literature review of all current research in their field. Review of esults, Discussion and Conclusions - citing references correctly and avoidir EDITING AND ORGANISING SKILLS red to - write the Methods, write the Discussion, write the Results, write the Methods, write the Discussion and the provide the methods.	nd a t g - Sec ne rev of the ng play te Con	opic ction iew Lite giaris	and - to s of of the rature, sm. 6 ions.
UNIT 2 Details of a Criticizing, venture out a Paper, Aba UNIT 3 Key skills literature, c Methods, Re UNIT 4 Skills requi write about demonstrati UNIT 5	STRUCTURE OF A PAPER all the parts - Clarifying Who Did What, Highlighting the Findings, Skills to identify something we really need to know -some ways to fin across the swamp of research without losing our bearings - Paraphrasing stract, Introduction. Introduction to Free writing. LITERATURE REVIEWS AND CITATIONS required to - write a title, an abstract, write an introduction, write the onduct a literature review of all current research in their field. Review of esults, Discussion and Conclusions - citing references correctly and avoidin EDITING AND ORGANISING SKILLS red to - write the Methods, write the Discussion, write the Results, write what we've learned truthfully so the reader really gets it in thought ng a clear understanding and execution of the research.	nd a t g - Se ne rev of the ng plag te Con and	opic ction iew Lite giaris expre	and - to s of of the rature sm. () ()
UNIT 2 Details of a Criticizing, venture out a Paper, Aba UNIT 3 Key skills literature, c Methods, Re UNIT 4 Skills requi write about demonstrati UNIT 5 Useful phra	STRUCTURE OF A PAPER all the parts - Clarifying Who Did What, Highlighting the Findings, Skills to identify something we really need to know -some ways to fin across the swamp of research without losing our bearings - Paraphrasing stract, Introduction. Introduction to Free writing. LITERATURE REVIEWS AND CITATIONS required to - write a title, an abstract, write an introduction, write the onduct a literature review of all current research in their field. Review of esults, Discussion and Conclusions - citing references correctly and avoidir EDITING AND ORGANISING SKILLS red to - write the Methods, write the Discussion, write the Results, write what we've learned truthfully so the reader really gets it in thought main a clear understanding and execution of the research. WRITING STANDARDS	nd a t g - Sec ne rev of the ng plag te Cor and bmiss	opic ction iew Lite giaris expro	and - to s of of the rature sm. () ions. ession () first
UNIT 2 Details of a Criticizing, venture out a Paper, Abs UNIT 3 Key skills literature, c Methods, Ra UNIT 4 Skills requi write about demonstrati UNIT 5 Useful phra draft, secor	STRUCTURE OF A PAPER all the parts - Clarifying Who Did What, Highlighting the Findings, Skills to identify something we really need to know -some ways to fin across the swamp of research without losing our bearings - Paraphrasing stract, Introduction. Introduction to Free writing. LITERATURE REVIEWS AND CITATIONS required to - write a title, an abstract, write an introduction, write the onduct a literature review of all current research in their field. Review of esults, Discussion and Conclusions - citing references correctly and avoidir EDITING AND ORGANISING SKILLS red to - write the Methods, write the Discussion, write the Results, write what we've learned truthfully so the reader really gets it in thought ng a clear understanding and execution of the research. WRITING STANDARDS ses, to ensure paper is as good as it could possibly be the first – time su	nd a t g - Sec ne rev of the ng plag te Con and bmiss w, dis	opic ction iew Lite giaris expro- ion - serta	and - to s of of the rature sm. 6 ions. ession first tion

imp: op	er use of words.			TOTA	L PERIODS	30
COUR	SE OUTCOMI	ES			BT N	APPED
		e, the students w	ill be able to		(High	est Level)
CO1		rite a research pa		pline.	Understa	nding (K2)
CO2				searcher, reviewi	ng in	- (1/ 4)
02		versus specific an			Analyzir	ig (K4)
<u> </u>				agiarism and liter	rature Applyin	g (K3)
CO3	reviews.	basies of chain	0115, 01011-01	0		
CO4		actual crafting an	d revising of a re	esearch paper.	Applyin	g (K3)
				tion to write fla	wless	
CO5			mai and punctue		Underst	anding (K2)
	piece of writin	g.				
	RENCES			• • • •		
1.		006) Writing for				
2.	Day R (2006)	How to Write an	d Publish a Scie	ntific Paper, Cam	bridge Universit	y Press.
3.	Highman N (1998), Handbool	k of Writing for	the Mathematica	l Sciences, SIA	M. Highman'
	book.					
4.	Adrian Wally	work, English f	or Writing Res	earch Papers, S	pringer New Y	ork Dordreck
	Heidelberg Lo					
C	O-PO MAPPINO	3:				
	Марр	ing of Course Ou	tcomes (CO's) w	ith Programme O	utcomes (PO's)	
	(1/2/3 inc	dicates the streng	th of correlation)	3-Strong, $2-N$	1edium , 1 – Wea	k
60			P	O's		201
COs	PO1	PO2	PO3	PO4	PO5	PO6
CO1	-	3	-	-	1	1
CO2	-	3	-	•	1	1
CO3	-	3	-	-	1	1
CO4	-	3		-	1	I



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1

1

-

3

CO4

CO5

-

PCS23	104 COMMUNICATION SYSTEM LABORATORY I	0	0	4	2
COUF	SE OBJECTIVES				
To ena	ble the students to				
1.	learn about signal transmission and reception				
2.	perform simulation and analysis of various systems				
3.	study the digital communication techniques		_		
4.	know basics of error control				
LIST	OF EXPERIMENTS				
1.	Design and performance analysis of error control encoder and decoder Codes).	CRC,	Conv	olutic	onal
2.	Simulation of Modulation techniques in AWGN Communication Channel	using	MATI	LAB.	
3.	Simulation of Channel Coding in AWGN Communication Channel using	MATL	AB.		
4.	Implementation of Linear and Cyclic Codes using MATLAB.				
5.	Implementation of Adaptive Filters using MATLAB.				
6.	Simulation of power spectral estimation methods using MATLAB.				
7.	Analysis of multistage multirate system using Simulation Packages.				
8.	Characteristics Measurement of directional coupler parameters.				
9.	Measurement of Gain using Horn Antenna.				
10	S parameter measurement using Magic Tee.				
	TOTAL PERI				60
	SE OUTCOMES		ST MA		
At the	end of this course, the students will be able to		lighes	st Lev	el)
CO1	analyze the performance of different modulation schemes, channel codin	ng A	nalyz	ing (K4)
21	techniques and optical communication systems by simulation over AWG	N			
	channel.				
CO2	measure the parameters of micro strip line and components.	A	pplyi	ng (K	.3)
CO3	design and implement signal processing algorithms using simulation software.	A	pplyi	ng (K	.3)
CO4	implement channel coding techniques.	A	pplyi	ng (K	(3)

CO-	PO MAPPINO	;:				
			tcomes (CO's) w th of correlation)			k
co.			PC	D's		
COs _	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	1	1	2	1
CO2	3	2	1	1	2	1
CO3	3	2	1	1	2	1
CO4	3	2	1	1	2	1

ERING COLL 5 BOARD OF STUDIES G 4 Electronics & Communication Engineer VAI AUTONOMOL

SEMESTER II

PCS23201	MICROWAVE INTEGRATED CIRCUITS	3	1	0	4
COURSE OB	IECTIVES				_
To enable the s					
1. famili	arize the different transmission lines used at Microwave frequencies				
0	the impedance matching networks using lumped and distributed elemer	nts			
	stand different microwave components				
	he concepts of mixer and control circuits				
-	e knowledge on measurement techniques				
UNITI	PLANAR TRANSMISSION LINES AND COMPONENTS				12
Review of Tran	Ismission line theory - S parameters-Transmission line equations - refle	ectio	n co	effic	ient
- VSWR - Mic	rostrip lines: Structure, waves in Microstrip, Quasi-TEM approximation	on C	oupl	ed lii	nes:
Even mode and	odd mode analysis - Microstrip discontinuities and components - Strip	p lin	e - S	lot li	ne -
Coplanar wave	guide - Filters - Power dividers and Couplers				
UNIT II	IMPEDANCE MATCHING NETWORKS		1		12
Circuit Repres	entation of two port RF/Microwave Networks - Low Frequency F	arar	neter	s, H	igh
Frequency Par	ameters, Transmission Matrix, ZY Smith Chart, Design of Matchin	ig C	ircui	ts us	ing
	nts, Matching Network Design using Distributed Elements.				
UNIT III	MICROWAVE AMPLIFIER AND OSCILLATOR DESIGN		T	-	12
Characteristics	of microwave transistors - Stability considerations in active	netv	vork	s; G	ain
Consideration	in Amplifiers; Noise Consideration in active networks; Broadband A	Amp	ifier	desi	gn;
Oscillators -	Oscillator versus Amplifier Design, Oscillation conditions, Desig	gn a	ind	stabi	lity
considerations	of Microwave Transistor Oscillators.				
UNIT IV	MIXERS AND CONTROL CIRCUITS		T		12
Mixer Types -	Conversion Loss, SSB and DSB Mixers ; Design of Mixers - Singl	e Er	ided	Mix	ers,
Single Balance	d Mixers, Sub Harmonic Diode Mixers; Microwave Diodes; Phase Shi	ifters	; PII	N Di	ode
Attenuators.					
UNIT V	MICROWAVE IC DESIGN AND MEASUREMENT				12
	TECHNIQUES				
Microwave Inte	egrated Circuits - MIC Materials, Hybrid versus Monolithic MICs; M	lulti	chip	Mod	ule
Technology - 1	Fabrication Techniques, Miniaturization techniques; Introduction to	SOC	, sc	рр, Т	est
fixture measure	ments, probe station measurements, thermal and cryogenic measurement	nts, e	expe	rimer	ntal
field probing te	chniques.				
	TOTAL PERIODS	5			60

COUR	SE OUTCOM	ES			BT	MAPPED
		se, the students w	ill be able to		(Hig	hest Level)
CO1		oncepts of planar		ne	Analyzi	ng (K4)
CO2	design imped	lance matching ci	ircuits using LC	components and stu	bs Applyin	g (K3)
CO3	perform stat	oility analysis a	nd be able to	design amplifiers a	nd Analyzi	ng (K4)
	oscillators at	microwave frequ	iencies			
CO4	estimate the	performance of n	nixer and control	circuits	Applyin	ig (K3)
CO5	utilise the c techniques.	concepts of mic	rowave IC des	ign and measurem	Applyin	ig (K3)
REFE	RENCES					
2. 3. 4.	Wiley & Sons David M. Pozz Reinhold Lud Pearson Educa Thomas H.Lea D-PO MAPPING Mapp	, 2011 ar, "Microwave E lwig and Powel ation Asia, Secon e, "Planar Microv 3 :	Engineering", Jol Bretchko, RF d Edition, 2011 vave Engineerin	Filters for RF/Micr nn Wiley & Sons, 4 th Circuit Design - ⁻ g", Cambridge Univ th Programme Outc	edition, 202 Theory and ersity Press, 2 omes (PO's)	1 Applications`
	(1/2/3 ind)	licates the strengt	h of correlation)		ium , 1 – Wea	k
	(1/2/3 ind	licates the strengt		3 – Strong , 2 – Med	ium , 1 – Wea	k
COs	(1/2/3 ind PO1	licates the strengt		3 – Strong , 2 – Med	ium , 1 – Wea PO5	k PO6
COs CO1			PC	3 – Strong , 2 – Med)'s	PO5	
	PO1	PO2	P(PO3	3 – Strong , 2 – Med)'s PO4	PO5	PO6 1
CO1	PO1 2	PO2	PO3 2	3 – Strong , 2 – Med D's PO4 2 2 2 2	PO5 2 2 2 2	PO6 1 1 1
CO1 CO2	PO1 2 2	PO2 1 1	PC PO3 2 2	3 – Strong , 2 – Med D's PO4 2 2	PO5 2 2	PO6 1

GINEERING COLLEGE APPROVED BOARD OF STUDIES rin * AUTONOMO

PCS23	202	ADVANCED DIGITAL COMMUNICATION TECHNIQU	JES 3	0 0	3
COUR	SE OBJ	IECTIVES			
To ena	ble the s	tudents to			
1.	underst	and the digital modulation methods			
2.	acquire	knowledge about filtering, coding and scrambling			
3.	know th	ne various modulation algorithms			
4.	gain kn	owledge in turbo coding principles			
5.	be fami	liar with the concepts of space time coding			
UNIT	I	DIGITAL MODULATION SCHEMES			9
Repres	entation	of Digitally Modulated signals, Memory less Modulation Metho	ods, Signa	alling Sch	nemes
with M	1emory	- CPFSK, CPM, Power Spectrum of Digitally Modulated Sign	als - PSD	of a dig	gitally
modul	ated sigr	al with memory, PSD of a linear modulated signal, PSD of a di	gitally mo	odulated s	signal
with F	inite mer	mory, PSD of a digitally modulation scheme with a Markov Stru	cture.		
UNIT	П	ORTHOGONAL FREQUENCY DIVISION MULTIPLEX	ING		9
Genera	tion of	sub-carriers using the IFFT; Guard Time and Cyclic Extension	on Windo	owing; O	FDM
2		ng; Peak Power Problem - PAP reduction schemes, Clipping			
Scramt	oling.				
UNIT	ш	TRELLIS CODED MODULATION	-		9
Coded	modulat	ion for bandwidth - constrained channels - Trellis coded modu	lation; Se	et Partitic	oning,
Four -	-state Ti	ellis-coded modulation with 8-PSK signal constellation, Eigh	it-state Ti	rellis cod	le for
coded	8- PSK i	modulation, Eight-state Trellis for rectangular QAM signal const	ellations		
UNIT	IV	TURBO CODING			9
Introdu	iction-Tu	I urbo Encoder, Turbo Decoder, Iterative Turbo Decoding Principl	les; Modi	fications	of the
MAP A	Algorith	m- The Soft-Output Viterbi Algorithm(SOVA); Turbo Coded E	BPSK Per	formance	over
Gaussi	an chanr	nels, Turbo Coding Performance over Rayleigh Channels			
UNIT	v	SPACE-TIME CODING			9
Maxim	um Rat	io combining; Space-time Block codes; Space-time Trellis cod	les- The	4-state, 4	-PSK
Space-	time Tre	llis Encoder, The 4-state, 4-PSK Space-time Trellis Decoder, MI	MO-OFD	M Syster	ms
		TOTAL PE	RIODS		45
COUR	SE OU	TCOMES	BT	MAPPE	D
At the	end of th	his course, the students will be able to	(Hig	hest Leve	el)
CO1		ate the different envelope modulation techniques.	Underst	anding (I	K2)
CO2		n about filtering coding and scrambling.	Underst	tanding (I	K2)
CO3		se the different constellations of Trellis coding.		ing (K4)	
005	anary	se me arreient constentations er trents coung.			

CO4	apply various	algorithm of turl	bo coding for dig	ital communication	Applyin	ig (K3)
005	utilise the con	cepts of design s	space time coding	g.	Applyin	ig (K3)
	RENCES					
1.	John G. Proak Publication, 20		Salehi "Digital (Communication", Fi	fth Edition,	Mc Graw Hill
2.	Simon Haykin	, "Digital comm	unication System	s", John Wiley and	sons, 2014	
3.			Kumar Ray, rson Education,	"Digital Commun 2009	ications Fun	damentals &
4.	Richard Van N Publication, 20 D-PO MAPPING	008.	rasad, "OFDM I	or Multimedia Com	mumcations	Arteen House
	Mapp	ing of Course Ou		th Programme Outc 3 – Strong , 2 – Med		Ŀ
						n
			PC)'s		IN
COs	PO1	PO2	PO3	PO4	PO5	PO6
	PO1	PO2			PO5	
CO1		PO2			PO5 1 1	PO6
CO1 CO2	2	PO2 - -			PO5 1 1 1 1	PO6
COs CO1 CO2 CO3 CO4	2 2	-	PO3 1 1	PO4 1 1 1	PO5 1 1 1 1 1 1 1	PO6

RING COLLEGA AVAL ENDIN BOARD OF STUDIES Electronics & Communication Engly AUTONO

	RF SYSTEM DESIGN 3	PCS23203
	JECTIVES	COURSE OF
	students to	To enable the
	niliar with RF transceiver system design	1. be fa
ystems	the design methods of receivers and transmitters used in communication sys	2. know
	the radio architectures of RF circuits and systems.	
	stand different synchronization methods circuits	4. unde
	int knowledge about the various applications of system design.	5. acqua
	BASICS OF RADIO FREQUENCY SYSTEM DESIGN	UNIT I
neters - Gair	d models of Linear systems and Non-linear system. Specification parame	Definitions ar
	SNR, Characteristic impedance, S-parameters, Impedance matching an	
	igital base band signalling - Complex envelope of band pass signals, Av	
, EVM, BER	rest factor, Sampling, jitter, modulation techniques, filters, pulse shaping,	RMS value, C
	ectivity, dynamic range and, adjacent and alternate channel power leakages	sensitivity, sel
	RADIO ARCHITECTURES AND DESIGN CONSIDERATIONS	UNIT II
pass sampling	ne architecture, direct conversion architecture, Low IF architecture, band-pa	Superheterody
	are, System Design Considerations for an Analog Frontend Receiver in Cog	
0	nterference, Near, In-band, wide-band considerations.	
	AMPLIFIER MODELING AND ANALYSIS	UNIT III
11 1	e equivalent model for Radio frequency device, amplifier noise mod	Noise - Nois
odel, cascado		
	ninimum detectable signal, performance of noisy systems in cascade. Non	performance,
on-Linearity	ninimum detectable signal, performance of noisy systems in cascade. Non er transfer curve, gain compression, AM-AM, AM-PM, polynomial appr	
on-Linearity proximations	er transfer curve, gain compression, AM-AM, AM-PM, polynomial appr	Amplifier pov
on-Linearity pproximations tone analyses	er transfer curve, gain compression, AM-AM, AM-PM, polynomial approximation approximation and Hammerstein model, intermodulation, Single and two to	Amplifier pov Saleh model, '
on-Linearity pproximations tone analyses	er transfer curve, gain compression, AM-AM, AM-PM, polynomial appr Viener model and Hammerstein model, intermodulation, Single and two to rd order distortions and measurements, SOI and TOI points, cascade per	Amplifier pov Saleh model, '
on-Linearity pproximations tone analyses	er transfer curve, gain compression, AM-AM, AM-PM, polynomial appr Viener model and Hammerstein model, intermodulation, Single and two to rd order distortions and measurements, SOI and TOI points, cascade per	Amplifier pov Saleh model, ' second and th
on-Linearity oproximations tone analyses erformance o	er transfer curve, gain compression, AM-AM, AM-PM, polynomial appr Viener model and Hammerstein model, intermodulation, Single and two to rd order distortions and measurements, SOI and TOI points, cascade perf ms	Amplifier pow Saleh model, ' second and th nonlinear syste UNIT IV
on-Linearity oproximations tone analyses erformance o generations spurious	er transfer curve, gain compression, AM-AM, AM-PM, polynomial approximate approximate and Hammerstein model, intermodulation, Single and two to rd order distortions and measurements, SOI and TOI points, cascade performs MIXER AND OSCILLATOR MODELING AND ANALYSIS	Amplifier pow Saleh model, ' second and th nonlinear syste UNIT IV Mixers - Fre
on-Linearity oproximations tone analyses erformance o cies, spurious cts, effects o	er transfer curve, gain compression, AM-AM, AM-PM, polynomial approximate approximate and Hammerstein model, intermodulation, Single and two to rd order distortions and measurements, SOI and TOI points, cascade performs MIXER AND OSCILLATOR MODELING AND ANALYSIS quency translation mechanisms, frequency inversion, image frequencied	Amplifier pow Saleh model, ' second and th nonlinear syste UNIT IV Mixers - Fre calculations, p
on-Linearity oproximations tone analyses erformance o cies, spurious cts, effects o	er transfer curve, gain compression, AM-AM, AM-PM, polynomial appression wiener model and Hammerstein model, intermodulation, Single and two to rd order distortions and measurements, SOI and TOI points, cascade performs MIXER AND OSCILLATOR MODELING AND ANALYSIS quency translation mechanisms, frequency inversion, image frequencies rinciples of mixer realizations ; Oscillators - phase noise and its effects	Amplifier pow Saleh model, ' second and th nonlinear syste UNIT IV Mixers - Fre calculations, p
on-Linearity oproximations tone analyses erformance o cies, spurious cts, effects o	er transfer curve, gain compression, AM-AM, AM-PM, polynomial appression wiener model and Hammerstein model, intermodulation, Single and two to rd order distortions and measurements, SOI and TOI points, cascade performs MIXER AND OSCILLATOR MODELING AND ANALYSIS quency translation mechanisms, frequency inversion, image frequencies rinciples of mixer realizations ; Oscillators - phase noise and its effects	Amplifier pow Saleh model, ' second and th nonlinear syste UNIT IV Mixers - Fre calculations, p oscillator spur NCO.
on-Linearity oproximations tone analyses erformance o cies, spurious cts, effects o y synthesizers	er transfer curve, gain compression, AM-AM, AM-PM, polynomial approvement of the provided and Hammerstein model, intermodulation, Single and two to rd order distortions and measurements, SOI and TOI points, cascade performs MIXER AND OSCILLATOR MODELING AND ANALYSIS quency translation mechanisms, frequency inversion, image frequencies rinciples of mixer realizations ; Oscillators - phase noise and its effects ous components, frequency accuracy, Oscillator realizations - Frequency s	Amplifier pow Saleh model, ' second and th nonlinear syste UNIT IV Mixers - Fre calculations, p oscillator spur NCO. UNIT V
on-Linearity oproximations tone analyses erformance o cies, spurious cts, effects o synthesizers	er transfer curve, gain compression, AM-AM, AM-PM, polynomial apprendent of the second structure of th	Amplifier pow Saleh model, ' second and th nonlinear syste UNIT IV Mixers - Fre calculations, p oscillator spur NCO. UNIT V Multimode and
on-Linearity oproximations tone analyses erformance o cies, spurious cts, effects o synthesizers	er transfer curve, gain compression, AM-AM, AM-PM, polynomial approvement of the provided and Hammerstein model, intermodulation, Single and two to rd order distortions and measurements, SOI and TOI points, cascade performs MIXER AND OSCILLATOR MODELING AND ANALYSIS quency translation mechanisms, frequency inversion, image frequencies rinciples of mixer realizations ; Oscillators - phase noise and its effects ous components, frequency accuracy, Oscillator realizations - Frequency s	Amplifier pow Saleh model, ' second and th nonlinear syste UNIT IV Mixers - Fre calculations, p oscillator spur NCO. UNIT V Multimode and

OUR	SE OUTCOME	CS			BT	MAPPED
	end of this course		ill be able to		(Higl	hest Level)
CO1			ansceiver module	es.	Understa	anding (K2)
02	design transc considerations.				sign Applyin	g (K3)
CO3	COLORADO DE COLORADO DE COLORADO DE COL		se and amplif	ier non-linearity	of Analyzi	ng (K4)
CO4	•	nixer and oscillat	tor modelling.		Underst	anding (K2)
CO5	1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.	oncepts of tran		s and aid to s	elect Applyin	ıg (K3)
	RENCES					
1.	Qizheng Gu, "	'RF System Des	sign of Transceiv	vers for Wireless	Communicatio	ons", Springer,
	2005.					
2	Kevin McCla	ning "Wireless	Receiver Desi	en for Digital	Communication	ns," Yes Dee
	Nevin Miccia	mile. Wholess				
2.				8		
	Publications, 2	.012.				
	Publications, 2 M C Jeruchim	012. 1, P Balapan an	d K S Shanmug	am, "Simulation	of Communic	ation systems:
	Publications, 2 M C Jeruchim	012. 1, P Balapan an	d K S Shanmug	am, "Simulation	of Communic	ation systems
	Publications, 2 M C Jeruchim	012. 1, P Balapan an	d K S Shanmug		of Communic	ation systems
3.	Publications, 2 M C Jeruchim Modeling, Me 2000.	012. n, P Balapan an thodology and T	d K S Shanmug Techniques'', Klu	am, "Simulation wer Academic/Pl	of Communic enum Publishe	ation systems: rs, 2 nd Edition
	Publications, 2 M C Jeruchim Modeling, Me 2000. Thomas H. L	012. h, P Balapan an thodology and T ee, "The Desigr	d K S Shanmug Techniques'', Klu	am, "Simulation	of Communic enum Publishe	ation systems rs, 2 nd Edition
3.	Publications, 2 M C Jeruchim Modeling, Me 2000. Thomas H. Lu University Pre	012. n, P Balapan an thodology and T ee, "The Design ess, 2004.	d K S Shanmug Techniques'', Klu	am, "Simulation wer Academic/Pl	of Communic enum Publishe	ation systems: rs, 2 nd Edition
3.	Publications, 2 M C Jeruchim Modeling, Me 2000. Thomas H. Lu University Pre O-PO MAPPING	012. n, P Balapan an thodology and T ee, "The Design ess, 2004.	d K S Shanmug Fechniques", Klu n of CMOS Rad	am, "Simulation wer Academic/Pl lio-Frequency Int	of Communic enum Publishe regrated Circui	ation systems: rs, 2 nd Edition
3.	Publications, 2 M C Jeruchim Modeling, Me 2000. Thomas H. L University Pre O-PO MAPPING Mapp	012. n, P Balapan an thodology and T ee, "The Design ess, 2004. ing of Course Ou	d K S Shanmug Fechniques", Klu n of CMOS Rad	am, "Simulation wer Academic/Pl lio-Frequency Int th Programme Ou	of Communic enum Publishe egrated Circui tcomes (PO's)	ation systems: rs, 2 nd Edition ts" Cambridge
3.	Publications, 2 M C Jeruchim Modeling, Me 2000. Thomas H. L University Pre O-PO MAPPING Mapp	012. n, P Balapan an thodology and T ee, "The Design ess, 2004. ing of Course Ou	d K S Shanmug Techniques", Klu n of CMOS Rad tcomes (CO's) wi	am, "Simulation wer Academic/Pl lio-Frequency Int th Programme Ou 3 – Strong , 2 – M	of Communic enum Publishe egrated Circui tcomes (PO's)	ation systems: rs, 2 nd Edition ts" Cambridge
3. 4.	Publications, 2 M C Jeruchim Modeling, Me 2000. Thomas H. L University Pre O-PO MAPPING Mapp	012. n, P Balapan an thodology and T ee, "The Design ess, 2004. ing of Course Ou	d K S Shanmug Fechniques", Klu n of CMOS Rad ttcomes (CO's) wi th of correlation)	am, "Simulation wer Academic/Pl lio-Frequency Int th Programme Ou 3 – Strong , 2 – M	of Communic enum Publishe regrated Circui tcomes (PO's) edium , 1 – Wes	ation systems: rs, 2 nd Edition ts" Cambridge ak
3.	Publications, 2 M C Jeruchim Modeling, Me 2000. Thomas H. L University Pre O-PO MAPPING Mapp	012. n, P Balapan an thodology and T ee, "The Design ess, 2004. ing of Course Ou	d K S Shanmug Techniques", Klu n of CMOS Rad tcomes (CO's) wi	am, "Simulation wer Academic/Pl lio-Frequency Int th Programme Ou 3 – Strong , 2 – M	of Communic enum Publishe egrated Circui tcomes (PO's) edium , 1 – Wes PO5	ation systems rs, 2 nd Edition ts" Cambridge ak
3. 4.	Publications, 2 M C Jeruchim Modeling, Me 2000. Thomas H. L University Pre O-PO MAPPING Mapp (1/2/3 ind	012. h, P Balapan an thodology and T ee, "The Design ess, 2004. ; : ing of Course Ou licates the strengt	d K S Shanmug Fechniques", Klu n of CMOS Rad ttcomes (CO's) wi th of correlation)	am, "Simulation wer Academic/Pl lio-Frequency Int th Programme Ou 3 – Strong , 2 – M	of Communic enum Publishe regrated Circui tcomes (PO's) edium , 1 – Wes	ation systems: rs, 2 nd Edition ts" Cambridge ak PO6
3. 4. Cos	Publications, 2 M C Jeruchim Modeling, Me 2000. Thomas H. Lu University Pre O-PO MAPPING Mapp (1/2/3 ind PO1	012. h, P Balapan an thodology and T ee, "The Design ess, 2004. ; : ing of Course Ou licates the strengt	d K S Shanmug Fechniques", Klu n of CMOS Rad ttcomes (CO's) wi th of correlation)	am, "Simulation wer Academic/Pl lio-Frequency Int th Programme Ou 3 – Strong , 2 – M)'s PO4	of Communic enum Publishe egrated Circui tcomes (PO's) edium , 1 – Wes PO5	ation systems: rs, 2 nd Edition ts" Cambridge nk PO6 1 1
3. 4. C0 C0s C01	Publications, 2 M C Jeruchim Modeling, Me 2000. Thomas H. La University Pre O-PO MAPPING Mapp (1/2/3 ind PO1 2	012. h, P Balapan an thodology and T ee, "The Design ess, 2004. a: ing of Course Ou licates the strengt PO2 -	d K S Shanmug Fechniques", Klu n of CMOS Rad tcomes (CO's) wi th of correlation) PC PO3 1	am, "Simulation wer Academic/Pl lio-Frequency Int th Programme Ou 3 – Strong , 2 – M)'s PO4 1	of Communic enum Publishe egrated Circui tcomes (PO's) edium , 1 – Wes PO5 1	ation systems: rs, 2 nd Edition ts" Cambridge ak PO6
3. 4. CO CO S CO 1 CO 2	Publications, 2 M C Jeruchim Modeling, Me 2000. Thomas H. Lu University Pre O-PO MAPPING Mapp (1/2/3 ind PO1 2 2	012. h, P Balapan an thodology and T ee, "The Design ess, 2004. ing of Course Ou licates the strengt PO2 - -	d K S Shanmug Fechniques", Klu n of CMOS Rad tcomes (CO's) wi th of correlation) PC PO3 1 1	am, "Simulation wer Academic/Pl lio-Frequency Int th Programme Ou 3 – Strong , 2 – M D's PO4 1 1	of Communic enum Publishe egrated Circuir tcomes (PO's) edium , 1 – Wes PO5 1 1	ation systems: rs, 2 nd Edition ts" Cambridge nk PO6 1 1

GINEERING COLLEGE APPROVED BOARD OF STUDIES Electronics & Communication Engine Electronics & Communication Engineering 0 * AUTONOMO

PCS23204	OPTICAL COMMUNICATION AND NETWORKS	-	3 0	0	3
COURSE OF	BJECTIVES				_
To enable the	students to				
1. learn t	he concepts of basic optical system components.				-
2. know	about optical network architecture.				
3. explor	e the fundamental concepts on wavelength routing networks.			_	-
4. enrich	their knowledge about packet switching and access networks.				
5. unders	stand the concepts of network management and survivability.				
UNIT I	OPTICAL SYSTEM COMPONENTS				9
Light propaga	ation in optical fibers - Loss and bandwidth, System limitatic	ns, Non-	Linear	effe	cts;
Solitons; Opt	ical Network Components - Couplers, Connectors, Splicing	, Isolato	rs, Cir	culat	ors,
Multiplexers,F	Filters, Optical Amplifiers, Switches, Wavelength Converters.				
UNIT II	OPTICAL NETWORK ARCHITECTURE				9
Introduction to	o Optical Networks; SONET / SDH - Elements of a SONET/SI	DH Infra	structu	re; N	eed
for multilayer	ed architecture - Layers, Sub layers, spectrum Partitioning; O	ptical No	etwork	node	2s -
Stations; Over	lay Processor - Logical network overlays.				
UNIT III	WAVELENGTH ROUTING NETWORKS				9
WDM Netwo	rk Elements; WDM Network Design - Cost tradeoffs - Virt	ual Topo	logy I	Desig	n -
Routing and w	vavelength assignment, Statistical Dimensioning Models.				
UNIT IV	PACKET SWITCHING AND ACCESS NETWORKS				9
Photonic Pack	ket Switching - OTDM, Multiplexing and Demultiplexing, S	ynchroni	zation,	Hea	der
Processing, Bu	affering, Burst Switching, Test beds; Access Networks.				
UNIT V	NETWORK MANAGEMENT AND SURVIVABILITY				9
Control and M	lanagement - Network management functions, Configuration ma	inagemen	t, Perf	ormai	nce
and Fault ma	nagement, Optical safety, Service interface; Network Surviv	ability -	Prote	ction	in
SONET / SDH	I, Point-to-Point Links; Optical layer Protection, Interworking bet	ween lay	ers.		
	TOTAL PE	RIODS			45
COURSE OU	TCOMES	BT	MAP	PED	_
At the end of t	his course, the students will be able to	(Hig	hest L	evel)	
CO1 elucid	late the concepts of basic optical system components	Unders	tandir	ıg (K	2)
CO2 analyz	ze the various modules for design of optical communication	Analyz	ing (K	(4)	
syster	ns		848807A		
CO3 develo	op various routing networks.	Applyi	ng (K	3)	-
CO4 estima	ate the power spectrum using various parametric methods	Analyz	ing (K	.4)	

CO5	utilise the con	cepts learnt to de	evelop various ap	plications.	Applyin	ng (K3)
	RENCES					
1.	R.Ramaswami Edition 2010.	, K. N. Sivaraja	n, "Optical Net	works: A Practi	cal Perspective"	, Elsevier; 3"
		Acouthy and Mol	an Gurusamy "	WDM Ontical N	letworks: Concer	ot. Design and
2.				WDW Optical 1		.,
	Algorithms", I	Prentice Hall of I	ndia, 2002.			at stars st
3.	Gerd Keiser,	"Optical Fiber	Communication	" McGraw Hill	International, S	Singapore, 5
	Edition 2017.					
4.	John M. Senio	or, " Optical Fib	er communicatio	ns Principles an	d Practices", Pre	entice Hall, 3'
	Edition 2009					
-	Edition Boos					
	O DO MAPPING					
C	D-PO MAPPING		tcomes (CO's) wi	th Programme O	utcomes (PO's)	
C	Марр	ing of Course Ou				ık
	Марр	ing of Course Ou	th of correlation)	3 – Strong , 2 – N	utcomes (PO's) Medium , 1 – Wea	k
COs	Mapp (1/2/3 ind	ing of Course Ou licates the streng	th of correlation) PC	3 – Strong , 2 – N		k PO6
COs	Mapp (1/2/3 ind PO1	ing of Course Ou	th of correlation) PC PO3	3 – Strong , 2 – M)'s PO4	vledium , 1 – Wea	
	Mapp (1/2/3 ind PO1 1	ing of Course Ou licates the streng	th of correlation) PC PO3 1	3 – Strong , 2 – M D's	vledium , 1 – Wea	PO6 1
COs	Mapp (1/2/3 ind PO1	ing of Course Ou licates the streng	th of correlation) PC PO3	3 – Strong , 2 – M)'s PO4	vledium , 1 – Wea	PO6 1 1
COs CO1	Mapp (1/2/3 ind PO1 1	ing of Course Ou licates the streng	th of correlation) PC PO3 1	3 – Strong , 2 – M)'s PO4	vledium , 1 – Wea	PO6 1
COs CO1 CO2	Mapp (1/2/3 ind PO1 1 2	ing of Course Ou licates the streng	th of correlation) PC PO3 1	3 – Strong , 2 – M)'s PO4	vledium , 1 – Wea	PO6 1 1

RING COLLEG BOARD OF STUDIES GINGIN ation Engla Electronics & Connell NAI AUTONON

(Audit Course II)

	PEDAGOGY STUDIES	2	0	0	0
COURSE OBJ	ECTIVES				
To enable the st	udents to				
1. understa	and the aims, objectives and educational philosophies of education				
2. acquire	the knowledge of Instructional objectives of teaching and teaching	g skills.			-
3. apply th	e knowledge of methods and strategies of teaching in real classroo	om situa	tion.		
4. utilize th	ne instructional aids and tools for effective classroom teaching.		-	-	_
5. acquain	t with the knowledge of professional development of teachers.				
UNIT I	EDUCATION AND ITS PHILOSOPHY				6
	inition, Aims, Objectives, Scope, Educational philosophy of	Swami	Vive	kana	nda.
	hi, Rabindranath Tagore, Sri Aurobindo and J.Krishnamoorthy				
	eau, Friedrich Froebel and John Dewey. Current trends and i				
175	orms and National policy on Education - 1968 and 1986 - its object				
UNIT II	INSTRUCTIONAL OBJECTIVES AND DESIGN				6
need and impor introducing les integrating ICT	ructional design: Planning and designing the lesson, Writing of les tance, format of lesson plan. Types of lesson plan Skills of teac sons, explaining skills, problem solving skills, illustrative skil skills, questioning skills, Reinforcement skills, skill of probi fon and computation skills.	hing: va Ils, scaf	rious foldir	way ng sł	s o cills
UNIT III	INSTRUCTIONAL METHODS AND STRATEGIES				(
Inquiry method Learning by de Problem - based	rategies Lecture, demonstration, laboratory, Inductive method , seminar, panel discussion, symposium, problem solving, project oing, workshop, role - play (socio-drama), Recent trends: Co d learning - Brain - based learning - Collaborative learning - Flipp arning trends -Videoconferencing.	based le	arnin /ist_lo	ig (P earni	BL) ng -
UNIT IV	INSTRUCTIONAL MEDIA		T		(
	et Switching - OTDM, Multiplexing and Demultiplexing, Syn	nchroniz	ation	, He	ade
	ffering, Burst Switching, Test beds; Access Networks.				
UNIT V	TEACHER PREPARATION				(
Teacher - roles	and the second second by the second				~ f

				то	TAL PERIODS	30
PRAG	CTICUM					
	✓ Writing of	three lesson plar	IS			
	✓ Practice tea	aching for 15 day	/S			
	✓ Preparation	of one teaching	aid			
	✓ A seminar	on one education	al philosophy			
	✓ Assignmen	t on any of these	five units			
COU	RSE OUTCOM	IES			BT N	APPED
At the	end of this cou	rse, the students	will be able to		(High	est Level)
C01	explain the e	ducational philo	sophies of educa	tion.	Understa	anding (K2)
CO2	write instruc	tional and specif	ic objectives in l	esson plan.		anding (K2)
CO3	utilize the tea	aching skills and	methods effectiv	velv.	Applying	
CO4		onal media effici			Analyzir	
CO5			of professional	dovialaniment		• • •
	RENCES	serves in the area	of professional	development.	Understa	anding (K2)
2. 3. 4.	Siddiqui, Muj Jeffrey Benne	loometal.(1987) ibul Hasan(2005). Techniques of aching Science:	classroom teach	tives. Longman Gro ing A.P.H. Strategies That Eve	
	D-PO MAPPINC		e. Boulder, CO	-		
	Mapp	ing of Course Ou		3 – Strong , 2 – N	Outcomes (PO's) Medium , 1 – Weak	
cos 🛓	DC:			D's		
107	PO1	PO2	PO3	PO4	PO5	PO6
201	1	-	-	-	-	1
CO2 CO3	-	1	-	-	-	1
203		- 2	-	-	-	1
	-	2	-	170		1
05			-	-	-	1



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PCS23	205 COMMUNICATION SYSTEM LABORATORY II		0	0	4	2
COUR	SE OBJECTIVES				10.75	
To enal	ble the students to					
1.	analyze the performance of microwave components and passive	RF sub	sys	tem.		
2.	design and analyze the performance of wireless communication	System				
3.	design and determine the characteristics of optical communication	n syste	m.			-
4.	apply various transforms to observe the performance of Audi compression	o, Spe	ech	anc	l Im	age
LIST C	OF EXPERIMENTS					
1.	Study the Characteristics of Microwave Components - Circulator		-			
2.	Simulation and performance evaluation of passive RF Low noise ampli	fier.				
3.	Study the Spectral Characterization of wireless communication signals	using N	1AT	LAF	3	
4.	Simulation of spatially separated Signal in the presence of Additive C White Noise using MATLAB.	orrelate	d /	Unc	orrela	ated
5.	Analysis of performance of the Estimation techniques - MLE, MMSE, Estimator, Expectation Maximization (EM) algorithm using MATLAB		Esti	mate	or, N	IAP
6.	Simulation and performance evaluation of a CDMA System using MAT	LAB.		÷1		
7.	Study of BER and eye pattern in the optical system simulation.			2000		
8.	Design of EDFA for DWDM link using optical system simulation					
9.	Simulation and performance evaluation of Wi-Fi LAN.					
10.	Design and performance analysis of DCT Transform based compression	n techni	que	- JP	EG.	
	TOTAL PE	RIODS	;	-		60
COUR	SE OUTCOMES		BT	° MA	APPE	ED
At the	end of this course, the students will be able to		(Hi	ghes	t Lev	/el)
CO1	determine the characteristics of microwave components		App	lyin	g (K	3)
CO2	design and simulate passive RF subsystem		App	lyin	g (K	3)
CO3	develop compression algorithms for data like audio, speech and image		App	lyin	g (K	3)
CO4	analyze the performance of various transforms.		Ana	lyzi	ng (k	(4)

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CO-	PO MAPPINO	G :				
			tcomes (CO's) w th of correlation)		Outcomes (PO's) Medium , 1 – Wes	ık
COs			PC)'s		
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	1	1	2	1
CO2	3	2	1	1	2	1
CO3	3	2	1	1	2	1
CO4	3	2	1	1	2	1

GINEERING COLLE GINE APPROVED BOARD OF STUDIES Electronics & Communication 4 **Communication** Engineering INN AUTONOMO

	51	MULT	FIME	DIA COI	MPRES	SSION	TEC	HND	QUES		3	0	0	
COURSE	OBJECT	IVES										-		-
To enable	the student	s to									1777 - 27			
1. u	nderstand t	he concep	pts of a	multimed	dia techi	niques.	0							-
2. g	et familiari:	zed with t	text co	mpressio	on conce	epts.					- 10-2			
-	et acquainte						es for	audio	source	es.				-
4. le	arn the bas	ics of ima	age co	mpressio	on									-
5. ki	now about	video con	mpress	ion conce	cepts.			1.2.10						
												-		_
UNIT I	MU	LTIMED	DIAC	ONCEP	TS									1
Special fea	atures of M	lultimedia	a; Gra	phics and	d Image	Data	Repre	senta	ions ;	Funda	menta	l Cor	cepts	i
Video and	Digital Au	idio; Stor	rage re	equireme	ents for	multin	iedia	applic	ations	; Need	for C	ompi	essio	n
Taxonomy	of compre	ession tecl	chnique	es ; Over	rview of	f sourc	e coc	ing; s	ource	models	s; scal	ar an	d vec	to
quantizatio	on theory; E	Evaluation	n techr	niques ; E	Error and	alysis a	and m	ethod	ologie	s.				
UNIT II	TEX	T COMI	PRES	SION				Ū.						(
Compressi	on principl	es - sourc	ce enc	oders and	d destin	nation e	encod	ers; L	ossles	s and I	Jossy	comp	ressi	on
Entropy en	coding : S	ource enc	coding	Text or	omnress	sion - S	Static	11	nan C	oding	Dynai	nic H	luffn	ar
				, icht et	ompress	Sion - L	Junio	Hum	nan C	0 0 0 0 0			runni	
Coding ; A											pressi	on; S		01
	Arithmetic										pressi	on; S		.01
Coding ; A	Arithmetic g.		Lemp	bel-Ziv (I							pressi	on; S		
Coding ; A Fano codin UNIT III	Arithmetic Ig. AUD	coding;	Lemp MPRE	ssion	(LZ)cod	ing ; I	Lemp	el Ziv	-Wels	h Com			Shanr	9
Coding ; A	Arithmetic ig. AUD apression m	coding; DIO COM nethods –	Lemp MPRE - ADPO	ssion CM codir	(LZ)cod	ing ; I	Lemp redict	el Ziv	-Wels	h Com	xcited	LPC	Shanr	9 tic
Coding ; A Fano codin UNIT III Audio com	Arithmetic g. AUD apression m on technique	coding; DIO COM nethods – es - μ-Lav	Lemp MPRE - ADPO aw and	SSION CM codir A-Law ((LZ)cod ng ; Lin Compar	ing ; I near pr nding, 1	_emp redict Frequ	el Ziv	-Wels ding, domai	h Com Code e n and f	xcited	LPC g, Ba	Shanr , Au sic si	9 tic
Coding ; A Fano codin UNIT III Audio com compressio	Arithmetic g. AUD pression m on techniqueng, Applica	coding; DIO COM nethods – es - μ-Lav ation to	Lemp MPRE - ADPO aw and speec	SSION SSION CM codin A-Law (h coding	(LZ)cod ng ; Lin Compar	ing ; I near pr nding, 1	_emp redict Frequ	el Ziv	-Wels ding, domai	h Com Code e n and f	xcited	LPC g, Ba	Shanr , Au sic si	9 tic
Coding ; A Fano codin UNIT III Audio com compressio band codir compressio	Arithmetic g. AUD pression m on technique ng, Applica on technique	coding; DIO COM nethods – es - μ-Lav ation to	Lemp MPRE ADP(aw and speec and C	SSION SSION CM codir A-Law (h coding ELP.	(LZ)cod ing ; Lin Compar g, Appli	ing ; I near pr nding, 1	_emp redict Frequ	el Ziv	-Wels ding, domai	h Com Code e n and f	xcited	LPC g, Ba	Shanr , Au sic si	9 tic
Coding ; 4 Fano codin UNIT III Audio com compressio band codin compressio UNIT IV	Arithmetic g. AUD apression m on technique ng, Applica on technique IMA	coding; DIO COM nethods – es - μ-Lav ation to es – LPC GE COM	Lemp MPRE - ADP(aw and speech and C MPRE	SSION CM codin A-Law (h coding ELP. SSION	(LZ)cod ing ; Lin Compar g, Appli	ing ; I near pr nding, ication	Lemp redict Frequ to a	ive co ency udio	-Wels ding, domai codin;	h Com Code e n and f g, MP	xcited ilterin; EG at	LPC g, Ba idio,	Shanr , Au sic su Spee	9 tic 1b cl
Coding ; A Fano codin UNIT III Audio com compressio band codir compressio UNIT IV Predictive	Arithmetic g. AUD apression m on technique ng, Applica on technique IMA coding - L	coding; DIO COM nethods – es - μ-Lav ation to es – LPC GE COM Lossless p	Lemp MPRE ADPO w and speec and C MPRE predict	SSION CM codin A-Law (h coding ELP. SSION tive codi	(LZ)cod ng ; Lin Compar g, Appli	ing ; I near pr nding, 1 ication	emp redict Frequ to a	ive co ency udio	-Wels ding, domai codin; s; JP	h Com Code e n and f g, MP EG los	xcited ilterin; EG au ssless	LPC g, Ba idio,	Shanr , Au sic su Spee	9 dic 1b cch
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COUI	RSE OUTCOM	IES			ВТ	MAPPED
At the	end of this cour	rse, the students	will be able to		(Hi	ghest Level)
CO1	analyze the v	arious multimed	lia techniques		Analyz	ing (K4)
CO2	ellaborate va	rious text compr	ession technique	s.	Unders	standing (K2)
CO3	evaluate the compression.	io Analyz	ring (K4)			
CO4	interpret vari	ous techniques i	nvolved in image	e compression.	Applyi	ng (K3)
CO5	analyze the d	ifferent standard	ls applicable for	video compression.	Analyz	ing (K4)
REFE	RENCES					
	Tay Vaughan, Peter Symes," KR. Rao,Z S I Standards, and D-PO MAPPINC Mapp	Digital Video C Bojkovic, D A M d Networks", Per G : ing of Course Ou	Making It Work" ompression", Mo Milovanovic, "Mo arson Education atcomes (CO's) w	McGraw-Hill Profess cGraw Hill, FirstEditio altimedia Communica 2007 ith Programme Outcom 3 – Strong , 2 – Mediu	on,2003. tion System mes (PO's)	s: Techniques
co.			PO	D's		
COs -	PO1	PO2	PO3	PO4	PO5	PO6
COI	2	-	-	-	1	1
1	2		-	-	1	-1
CO2				and the second se		
_	2	-	-	-	1	1
CO2 CO3 CO4	2	-		-	1	1

EERING COLLEGE APPROVED BOARD OF STUDIES VALENC. Electronics & Com n Englueering J AUTONOMO

PCS23	5152	ELECTROMAGNETIC INTERFERENCE AND	3	0	0	3
		COMPATIBILITY IN SYSTEM DESIGN				
		JECTIVES				
	0	students to				
1.		y the various types and mechanisms of electromagnetic interference				
2.	find so	lution to EMI problems in PCB level / subsystem and system level de	esign			
3.	realize	the different types of shielding, grounding methods and material used	d for t	he sa	me	
4.	be fam	iliar with EMC design circuits.				
5.	unders equipm	tand the different types of EMI/EMC measurement techniquenents	es ar	nd n	neasu	rin
UNIT	T	EMI/EMC CONCEPTS				
		initions; Sources and Victims of EMI; Conducted and Radiated El	MI E	nicci	on ar	
		Units of Parameters; Sources of EMI; Case Histories, Radiation Haza				i ci
UNIT		EMI COUPLING MECHANISMS				9
		of Coupling Mechanisms - Conductive coupling, Capacitive c	1.		In -1	
Differe	ential-mo	Radiated coupling; Conductive coupling - Common mode Co ode conduction; Near field cable to cable coupling; Field to cable cou ply coupling				ing
Differe and Po	ential-mo wer sup	ode conduction; Near field cable to cable coupling; Field to cable couply coupling.				ing ain
Differe and Po UNIT	ential-mo wer sup	ode conduction; Near field cable to cable coupling; Field to cable couply coupling. EMI CONTROL METHODS AND FIXES	pling;	, Pow	ver m	ing ain
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CO2	design coupli	ing systems in EM	MIC.		Applyi	ng (K3)
CO3	evaluate the	various EMI cont	trol methods		Analyz	ing (K4)
CO4	implement E	MC circuit desig	n for various app	olications.	Applyi	ng (K3)
CO5	explain the m	neasurement conc	cepts of EMIC.		Unders	standing (K2)
REFE	RENCES					
1.	V Prasad Kod	ali, "Engineering	g Electromagneti	c Compatibility"	, IEEE Press, No	ew York, 2001.
2.	Henry W. Ott. York, 2009	, "Electromagnet	ic Compatibility	Engineering", Jo	ohn Wiley & Sou	ns Inc, New
3.		and William ", Elsevier Scien		DN's Designer's y Books, 2002.	s Guide to I	Electromagnetic
1	C R Paul Intr	aduction to Elect	tromagnetic Con	anatibility John	Wiley and Sons	Inc. 2006
	C.R.Paul, Intr D-PO MAPPINC		tromagnetic Con	npatibility, John '	Wiley and Sons,	Inc, 2006
	D-PO MAPPINO Mapp	G : ing of Course Ou	tcomes (CO's) w	ith Programme O 3 – Strong , 2 – N	utcomes (PO's)	
	D-PO MAPPINO Mapp (1/2/3 inc	G : bing of Course Ou licates the strengt	tcomes (CO's) w th of correlation)	ith Programme O 3 – Strong , 2 – M D's	utcomes (PO's) Aedium , 1 – We	ak
COs	D-PO MAPPINO Mapp (1/2/3 inc PO1	G : ing of Course Ou licates the strengt PO2	tcomes (CO's) w th of correlation) P(PO3	ith Programme O 3 – Strong , 2 – M D's PO4	utcomes (PO's)	ak PO6
COs COs CO1	D-PO MAPPINO Mapp (1/2/3 inc PO1 2	G : bing of Course Ou licates the strengt	tcomes (CO's) w th of correlation) P(PO3 1	ith Programme O 3 – Strong , 2 – M D's	utcomes (PO's) Aedium , 1 – We	ak PO6 1
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COLL ING E G APPROVED BOARD OF STUDIES Engh 4 Electronics IAN AUTONO
		NCED DIGITAL IMAG	E FROCESSING	3	0	0	3
COURSE O	BJECTIVES						
To enable the	e students to						
1. know	the concepts of d	igital image processing					
2. unde	rstand the various	models used in image proc	essing.				
3. be fa	miliar with the con	cepts of morphological im	age processing.				
4. posse	ess knowledge on s	egmentation and its repres	entation.				
5. learn	about object recog	nition and its applications.					
UNIT I	FUNDAMEN	TALS OF DIGITAL IM	AGE PROCESSIN	G			9
Elements of '	Visual Perception-	Image acquisition; digitiza	tion; Histogram; Im	age enhand	cement	t, Spa	tial
filters for sm	oothing and sharp	ening, Discrete2D transform	ns-DFT; DCT; Wals	sh- Hadam	ard, Sl	lant, k	ΚL,
Wavelet Tran	nsform, Haar wave	let.					
UNIT II	COLOUR IN	AGE PROCESSSING					9
Colour Image	e Fundamentals, (Colour Models - RGB;CM	Y;CMYK and HIS	Colour N	lodels.	Psei	ıdo
		ensity Slicing, Intensity to					
		ansformation, Colour I					
image 110cc	asing, Colour II						
			mage Smoothing a	ind ondip	ening,	CON	oui
Segmentation	n -Noise in Colour	Images.		ind onarp		CON	oui
Segmentation	a -Noise in Colour	Images. GICAL IMAGE PROCE	ESSING				9
Segmentation UNIT III Basic Concep	A -Noise in Colour	Images. GICAL IMAGE PROCH ry, Logic Operations Invo	SSING	es, Dilation	1 and	Erosi	9 on,
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CO2	explain the va	arious models us	ed in image proc	essing.	Unders	tanding (K2)
CO3	apply morpho	ological image p	rocessing algorith	nms.	Applyi	ng (K3)
CO4	analyze and e	extract potential	features of intere	st from the image	Analyz	ing (K4)
C05	implement the	e image processi	ng for various ap	oplications.	Applyi	ng (K3)
REFE	RENCES					
-	1. Rafael C. G	onzalez, "Digita	l Image Processi	ng", Pearson Edu	cation, Inc.,3 rd E	dition, 2008.
	2. Milman So	nka,VaclavHlav	ac, Roger Boyle	e, "Image Proces	sing, Analysis	and Machine
	Vision",					
		ood."DataComp	ression".Morgan	Kaufmann Publ	shers (Elsevier	r).,3rd Edition,
3	2006	oou, Dundoonip			•••••••	
		Conzolaz Dichor	de E Woode St	even Eddins, "Di	nital Image Pro	cessing using
3				even Eddins, Di	gital image i te	Jeessing using
	MATLAB"	,Pearson Educat	tion,Inc.,2004.			
C	D-PO MAPPING					
		A STATE OF A THE CONTRACT OF A DATE		ith Programme Ou		
	(1/2/3 ind	licates the streng	th of correlation)	3 – Strong , 2 – M	ledium , 1 – Wea	ak
00			PO	D's		
COs	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	-	1	1	1	1
CO2	2	•	1	1	1	1
CO3	2	-	1	1	1	1
CO4	2	-	1	1	1	1
CO5	2	-	1	1	1	1

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PCS	23154		MEMS AND NEMS	3	0	0	3
COU	RSE OR	JECTIVES			-		
		tudents to					
1.			icro and nano electromechanical devices				
2.							
3.							-
4.							
5.				systems			
	•	e concepts of micro and nano electromechanical devices e fabrication process of Microsystems nd the design concepts of micro sensors and micro actuators iar about micro actuators knowledge about the concepts of quantum mechanics and nano systems INTRODUCTION TO MEMS AND NEMS Design of MEMS and NEMS, Overview of Nano and Micro electro cations of Micro and Nano electromechanical systems, Materials for silicon compounds, polymers, metals. MEMS FABRICATION TECHNOLOGIES y, Ion Implantation, Diffusion, Oxidation, CVD, Sputtering Etching g: Bulk Micromachining, Surface Micromachining, LIGA. MICRO SENSORS			-		
UNIT	'I	INTRODUC	TION TO MEMS AND NEMS	_			9
Introd	uction to	Design of M	EMS and NEMS, Overview of Nano and M	ficro elec	trom	echar	nical
Syster	ns, App	ications of Mi	cro and Nano electromechanical systems, Ma	terials for	r ME	MS	and
NEMS	S: Silicor	, silicon compo	unds, polymers, metals.				
UNIT	'II	MEMS FAB	RICATION TECHNOLOGIES		-		9
Photo	lithograp	hy, Ion Implar	tation, Diffusion, Oxidation, CVD, Sputterir	ng Etchin	g teo	chniq	ues,
Micro	machinir	ig: Bulk Microm	achining, Surface Micromachining, LIGA.				
UNIT	'III	MICRO SEN	SORS				9
MEM	S Sensor	s: Design of Ac	oustic wave sensors, Vibratory gyroscope, Capa	citive Pre	essure	sens	sors,
Case s	study: Pie	zoelectric energ	y harvester				
UNIT	'IV	MICRO ACT	TUATORS				9
Desig	n of Actu	ators: Actuation	using thermal forces, Actuation using shape me	mory Allo	oys, A	Actua	tion
using	piezoeleo	etric crystals, Ac	tuation using Electrostatic forces, Case Study: R	F Switch.			
UNIT	'V	NANO DEVI	CES				9
Atom	ic Structu	ires and Quantui	m Mechanics, Shrodinger Equation, ZnO nanoro	ds based 1	NEM	S dev	/ice:
Gas se	ensor.		e.				
			TOTAL PE	RIODS			45
COU	RSE OU	TCOMES			MAP		
At the	end of the	nis course, the st	udents will be able to	(Higl	_		
CO1	interp	ret the basics of	micro/nano electromechanical systems.	Understa	andin	g (K	2)
CO2	elucid	ate the use of m	aterials in micro fabrication process.	Understa	andin	g (K	2)
CO3	design	the key perform	nance aspects of electromechanical transducers.	Applyin	g (K.	3)	
CO4	demo	nstrate the actuat	tors and actuation using different forces.	Applyin	g (K.	3)	
CO5	comp	rehend the theor	retical foundations of quantum mechanics and	Understa	andin	g (K	2)
	nano :	systems.					

REFERENCES

- 1. Marc Madou, "Fundamentals of Microfabrication", CRC press 1997.
- 2. Stephen D. Senturia, "Micro system Design", Kluwer Academic Publishers, 2001
- 3. Tai Ran Hsu, "MEMS and Microsystems Design and Manufacture", Tata Mcraw Hill, 2002.
- 4. Sergey Edward Lyshevski, "MEMS and NEMS: Systems, Devices, and Structures" CRC Press, 2002.

CO-PO MAPPING :

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) (1/2/3 indicates the strength of correlation) 3 – Strong , 2 – Medium , 1 – Weak

cos 🛓			PC)'s		
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2			-	1	1
CO2	2	-	_	-	1	1
CO3	2	-	-	-	1	1
CO4	2	-	-	-	1	1
CO5	2	-	-	-	1	1

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		students to									
1.	know a	bout MIMO c	hannel model c	apacity							
2.			of MIMO diver	1801 Seto	patial mul	iplexing	-		-	-	
3.	learn al	bout Massive 1	MIMO system								-
4.	inculca	te knowledge	on millimeter	wave com	municatio	n			7		
5.	be fam	iliar with soft	ware defined rad	dio and cog	gnitive ra	lio					
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and ou	utage cap	bacity, capacit	e and correlate y bounds and i	nfluence o	of channe	properti	es on the o			Erogo	
UNIT			VERSITY ANI sity, analysis u								9
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	design massiv	ve MIMO system	15.		Applyi	ng (K3)
CO4	implement th	e concepts of mi	llimeter wave co	mmunication.	Applyi	ng (K3)
CO5	explain about	software define	d and cognitive r	adios	Unders	tanding (K2)
REFE	RENCES					
			ath, "Fundament	als of Wireless	Communication	", Cambridge
	Jniversity Press		Coding: Theor	y and Practices",	Cambridge Un	iversity Press
	005.	n, space - rink	countries.	y und Practices ,	cullion age on	
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	-	Kokar, Lezek Leo ARTECH Hous		tive Radio Interc	pperability throu	gh Waveform
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R	Reconfiguration" D-PO MAPPING Mapp	ARTECH Hous G : ing of Course Ou	te 2016. (CO's) with of correlation	ith Programme O 3 – Strong , 2 – M	utcomes (PO's)	
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COUR	SE OB.	JECTIVES	5																	
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1.	learn th	e fundame	ntals o	of	fmi	illime	eter v	wave	e devi	ices	and	circ	cuits	s.						
2.	know a	bout the mi	llime	ete	er de	levice	es an	nd cir	cuits	5				-						
3.	underst	and the var	ious c	co	omp	ponen	nts of	of mil	limet	ter w	vave	coi	mm	unic	ation	syste	ems.			
4.	acquire	knowledge	e abou	out	t mn	m wa	ve N	MIM	O sys	stem	s.					1				
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CO4	10 K	illimeter wave M			Understa	nding (K2)
CO4		as using millimet		gy.	Applyin	g (K3)
REFE	RENCES					
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1.						
	2011.		La Lamas N. T.	neodore S Rann	aport, Murdock,	"Millimeter
2.					aport, manager,	
	Wave Wireless	s Communication	n", Prentice Hall,	2014.		
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3.			Marian, Tree of			
	New Delhi, 20	017.			2016	
4.	Xiang, W; Zhe	eng, K; Shen, X.	S; "5G Mobile Co	ommunications:	Springer, 2016.	
C	O-PO MAPPING	:				
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GINEERING COLLEGE APPROVED BOARD OF STUDIE Electronics & Communi-SHEE APPROVED BOARD OF STUDIES Electronics & Communication Engineering * AUTONOMO

PCS23	157	PATTERN RECOGNITION AND COMPUTATIONAL INTELLIGENCE	3	0	0	3
COUR	SE OBJ	ECTIVES				
To ena	ble the s	tudents to				
1.	learn th	e fundamentals of pattern classifier.				
2.	know a	bout the various clustering concepts.				
3.	underst	and the structural pattern recognition and feature extraction.	-			
4.	acquire	knowledge about concept learning and decision trees.	-			
5.	be fami	liar with recent advances in pattern recognition techniques.			10000	
UNIT	I	PATTERN CLASSIFIER		T		9
approad UNIT I		ern classification by distance functions ; Minimum distance pattern class	sifie	er.		9
Cluster	ing for	unsupervised learning and classification Image segmentation and co	omr	press	ion ·	An
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CO3	analyze the given data set to extract and select features for pattern recognition.	Analyzing (K4)
CO4	apply the decision tree and concept learning techniques.	Applying (K3)
CO5	use the concepts of recent advances in various applications.	Applying (K3)
2.	C.M.Bishop, "Pattern Recognition and Machine Learning", Springer, 2 Morton Nadier and Eric Smith P., "Pattern Recognition Engineerin New York, 1993.	g", John Wiley & Sons,
3.	Tom M. Mitchell, "Machine Learning", McGraw-Hill Education, 201	3.
4	Tou and Gonzalez, Pattern Recognition Principles, Wesley Publica	tion Company, London

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's)

(1/2/3 indicates the strength of correlation) 3 - Strong , 2 - Medium , 1 - Weak

		PC)'s		
PO1	PO2	PO3	PO4	PO5	PO6
2	-	1	1	1	1
2	-	1	1	1	1
2	-	1	1	1	1
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		To enable the
	the IoT data link protocol.	
	about the different concepts of network layer link protocol.	
	stand the theory of session layer protocols.	Contract Second Addition
	the IoT solutions for various services.	
	re knowledge about IoT in hardware and software.	
	IoT DATA LINK PROTOCOL	5. acquir
Smart Energy	4; IEEE 802,11; Wireless HART; Z-Wave; Bluetooth Low Energy; Zigbee Sn valuation A; LORAWAN.	
9	NETWORK LAYER LINK PROTOCOL	UNIT II
	col for Low power Lossy Networks; CORPL; 6LoWPAN; Dynamic Host Co	
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	neuing Telemetry Transport; Advanced Message Queuing Protocol;	1070 45
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tocols - MAC	Protocol Extensible Messaging and Presence Protocol; Security in IoT Protocol WPAN, Application Layer	Application P 802.15.4, 6Lo UNIT IV Raspberry PI
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4.		Learning Interne			015.	
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	(1/2/0/110)'s		
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CO1	2	-	1	1	1	1
CO2	2	-	1	1	1	1
CO3	2		1	1	1	1
CO4	2	-	1	1	1	1
CO5	2	-	1	1	1	1



CO5

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			and deep space network	5. understa
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CO2	design antenna	for various app	lications.		Applyin	ng (K3)
CO3	analyse the IP	v6 environment.			Analyz	ing (K4)
CO4	explain about :	satellite navigati	on and GPS.		Unders	tanding (K2)
C05	analyse the dif	ferent case studi	ies of satellite mi	ission.	Analyz	ing (K4)
REFE	RENCES					
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1.					·	
		09, No. 6, 1054				
2.	Anil K. Maini,	, Varsha Agraw	al, 'Satellite Te	chnology: Princ	iples and Appli	cations', Thir
	Edition, Wiley,	2014.				
3			Satellite Commu	inication and Sate	ellite Technology	v" Wiley, 201
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4. C COs	Daniel Minoli' Daniel Minoli, Edition, 2009. O-PO MAPPING Mapp	"Innovations in "Satellite Syste : ing of Course Ou	ems Engineering atcomes (CO's) w th of correlation)	g in an IPv6 En ith Programme O 3-Strong, 2-N O's	vironment", CR outcomes (PO's) Medium , 1 – Wea	RC Press, Firs
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4. C COs CO1	Daniel Minoli' Daniel Minoli, Edition, 2009. O-PO MAPPING Mapp (1/2/3 ind PO1 2	"Innovations in "Satellite Syste : ing of Course Ou licates the streng PO2 -	ems Engineering atcomes (CO's) w th of correlation) PO3 1	g in an IPv6 En ith Programme O 3 – Strong, 2 – P O's PO4 1	vironment", CR Putcomes (PO's) Medium , 1 – Wes PO5 1	RC Press, Firs
4. C COs CO1 CO2	Daniel Minoli' Daniel Minoli, Edition, 2009. O-PO MAPPING Mapp (1/2/3 ind PO1 2 2	"Innovations in "Satellite Syste "Satellite Syste ing of Course Ou licates the strenge PO2 - -	ems Engineering atcomes (CO's) w th of correlation) PO3 1 1	g in an IPv6 En with Programme O 3 – Strong, 2 – N O's PO4 1 1	vironment", CR Putcomes (PO's) Medium , 1 – Wes PO5 1 1	ak PO6 1



1002	3160	OPTIMIZATION TECHNIQUES 3	0 0	0 3
COUR	SE OBJ	ECTIVES		
To ena	ble the s	udents to		
1.	explain	the theory of classical optimization techniques.		
2.	learn ab	out linear programing.		
3.	underst	and the concepts in non-linear programing.		
4.	acquire	knowledge about dynamic programing process.		
5.	be fami	liar with modern optimization methods.		
UNIT	I	CLASSICAL OPTIMIZATION TECHNIQUES		
prograi	nming p		traints; c	
UNIT		LINEAR PROGRAMMING d - Definitions and Theorems , Solution of a System of Linear Simultaneous		9
		at optimality Analysis; Karmarkar's Interior Method.		
UNIT Elimin method	III ation me ls- Indir	st optimality Analysis; Karmarkar's Interior Method. NON-LINEAR PROGRAMMING thods; Interpolation methods; Unconstrained optimization techniques - ect search methods; Constrained Optimization methods - Direct met		searc
UNIT Elimin methoc methoc	III ation me ls- Indir ls.	NON-LINEAR PROGRAMMING thods; Interpolation methods; Unconstrained optimization techniques - ect search methods; Constrained Optimization methods - Direct met		searc ndirec
UNIT Elimina methoc methoc UNIT	III ation me ls- Indir ls. IV	NON-LINEAR PROGRAMMING thods; Interpolation methods; Unconstrained optimization techniques - ect search methods; Constrained Optimization methods - Direct met DYNAMIC PROGRAMMING	thods, Ir	searc ndirec
UNIT Elimin methoc methoc UNIT Multist proced	III ation me ls- Indir ls. IV age deci ure in d	NON-LINEAR PROGRAMMING thods; Interpolation methods; Unconstrained optimization techniques - ect search methods; Constrained Optimization methods - Direct met	thods, Ir	ndirec
UNIT Elimin methoc methoc UNIT Multist procedu Contin	III ation me ls- Indir ls. IV age deci ure in d	NON-LINEAR PROGRAMMING thods; Interpolation methods; Unconstrained optimization techniques - ect search methods; Constrained Optimization methods - Direct met DYNAMIC PROGRAMMING sion process; Concept of sub optimization and principle of optimality; ynamic programming; Linear Programming as a Case of Dynamic	thods, Ir	searc ndirec ationa
UNIT Elimin methoc unit Multist procedi Contin	III ation me ls- Indir ls. IV age deci ure in d uous Dyn V	NON-LINEAR PROGRAMMING thods; Interpolation methods; Unconstrained optimization techniques - ect search methods; Constrained Optimization methods - Direct met DYNAMIC PROGRAMMING sion process; Concept of sub optimization and principle of optimality; ynamic programming; Linear Programming as a Case of Dynamic namic Programming.	thods, Ir computa Program	searc ndirec ationa
UNIT Elimin method UNIT Multist procedu Contin UNIT Genetic Practic	III ation me ls- Indir ls. IV age deci ure in d uous Dyn V c Algori al Aspec	NON-LINEAR PROGRAMMING thods; Interpolation methods; Unconstrained optimization techniques - ect search methods; Constrained Optimization methods - Direct met DYNAMIC PROGRAMMING sion process; Concept of sub optimization and principle of optimality; ynamic programming; Linear Programming as a Case of Dynamic namic Programming. MODERN OPTIMIZATION METHODS	thods, Ir computa Program	searc ndirec ationa nming zatior
UNIT Elimin method UNIT Multist procedu Contin UNIT Genetic Practic	III ation me ls- Indir ls. IV age deci ure in d uous Dyn V c Algori al Aspec	NON-LINEAR PROGRAMMING thods; Interpolation methods; Unconstrained optimization techniques - ect search methods; Constrained Optimization methods - Direct met DYNAMIC PROGRAMMING sion process; Concept of sub optimization and principle of optimality; ynamic programming; Linear Programming as a Case of Dynamic namic Programming. MODERN OPTIMIZATION METHODS thms; Simulated annealing; Particle Swarm optimization; Ant colony ets of Optimization; Reduction of Size of an Optimization Problem, Factor	thods, Ir computa Program	searc ndirec ationa nming zatior nalysi
UNIT Elimin methoc methoc UNIT Multist proced Contin UNIT Genetic Practic Techni	III ation me ls- Indir ls. IV age deci ure in d uous Dyn V c Algori al Aspec ques, De	NON-LINEAR PROGRAMMING thods; Interpolation methods; Unconstrained optimization techniques - ect search methods; Constrained Optimization methods - Direct met DYNAMIC PROGRAMMING sion process; Concept of sub optimization and principle of optimality; ynamic programming; Linear Programming as a Case of Dynamic namic Programming. MODERN OPTIMIZATION METHODS thms; Simulated annealing; Particle Swarm optimization; Ant colony ets of Optimization; Reduction of Size of an Optimization Problem, Farivatives of Eigenvalues and Eigenvectors. TOTAL PERIODS	thods, Ir computa Program	searc ndirec ationa nming zatior nalysi 4
UNIT Elimin methoc methoc UNIT Multist proced Contin UNIT Genetic Techni COUR	III ation me ls- Indir ls. IV age deci ure in d uous Dyn V c Algori al Aspec ques, De SE OUT	NON-LINEAR PROGRAMMING thods; Interpolation methods; Unconstrained optimization techniques - ect search methods; Constrained Optimization methods - Direct methods; Constrained Optimization methods - Direct methods DYNAMIC PROGRAMMING sion process; Concept of sub optimization and principle of optimality; ynamic programming; Linear Programming as a Case of Dynamic mamic Programming. MODERN OPTIMIZATION METHODS thms; Simulated annealing; Particle Swarm optimization; Ant colony ets of Optimization; Reduction of Size of an Optimization Problem, Farivatives of Eigenvalues and Eigenvectors. TOTAL PERIODS FCOMES BT	thods, Ir computa Program / optimiz	searc ndirec ationa nming zatior nalysi 4 ED
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UNIT Elimin method UNIT Multist proced Contin UNIT Genetic Techni COUR	III ation me ls- Indir ls. IV age deci ure in d uous Dyn V c Algori al Aspec ques, De SE OUT end of th elucida	NON-LINEAR PROGRAMMING thods; Interpolation methods; Unconstrained optimization techniques - ect search methods; Constrained Optimization methods - Direct methods; Constrained Optimization methods - Direct methods DYNAMIC PROGRAMMING sion process; Concept of sub optimization and principle of optimality; ynamic programming; Linear Programming as a Case of Dynamic mamic Programming. MODERN OPTIMIZATION METHODS thms; Simulated annealing; Particle Swarm optimization; Ant colony ets of Optimization; Reduction of Size of an Optimization Problem, Farivatives of Eigenvalues and Eigenvectors. TOTAL PERIODS From Example It is course, the students will be able to	thods, Ir computa Program ' optimiz 'ast Rear MAPPE thest Lev anding (searc ndirec ationa nming zatior nalysi 4 ED vel) (K2)

CO4	apply the cor	ncepts of dynami	c programming.		Applyi	ng (K3)			
CO5	execute modern optimization methodologies. Applying (K3)								
REFE	RENCES								
1.	Singiresu S R and Sons, 200		g Optimization:	Theory and Pra-	ctice", 4 th Editio	n, John Wiley			
2.	Xin-Sie Yang,	, "Nature Inspire	d Optimization T	echniques", Else	evier, 2014.				
4.	Wiley and Son Chander Moha D-PO MAPPINO Mapp	ns, 2013 an, Kusum Deep 5 : oing of Course Ou	law S Zak, "An l ," Optimization 7 itcomes (CO's) with of correlation)	Techniques" Nev ith Programme O	v Age Science, 2 Putcomes (PO's)	009			
1				D's					
COs -	PO1	PO2	PO3	PO4	PO5	PO6			
CO1	2	+	1	1	1	1			
CO2	2		1	1	1	1			
CO3	2	-	1	1	1	1			
001	2	-	1	1	1	1			
CO4									

GINEERING COLLEGE APPROVED BOARD OF STUDIES Electronics & Communication Engineer NALEN. INC * AUTONOMO

PCS2		DIGITAL COMMUNICATION RECEIVERS	3	0	0	3			
COUR	SE OBJ	IECTIVES							
To ena	ble the st	tudents to							
1.	understa	and the baseband communication concepts.							
2.	know al	bout the pass band communication over time invariant channels.							
3.	acquire	knowledge about the synchronization algorithms.							
4.	learn ab	out the performance of synchronizers with feedback systems.							
5.	explore	about the characterization of selective fading channels.							
UNIT	I	BASEBAND COMMUNICATION				9			
circuits synchro	s; Error t onizers.	Digital baseband communication-Baseband PAM; Clock Synchro racking and spectral - line generating synchronizers; Squaring an	nd Muell			ulle			
UNIT	11	PASSBAND COMMUNICATION OVER TIME INVARIA	NT			9			
		CHANNELS	-						
Passba		ismission-Transmission methods, Channel Transceiver mod							
	Receivers for PAM-Timing Recovery, Phase Recovery; Optimum ML receivers; Synchronized								
detection; Digital matched filter.									
222.001/22200712									
UNIT	III	SYNTHESIS OF SYNCHRONIZATION ALGORITHMS				9			
UNIT ML sy	III nchroniz	SYNTHESIS OF SYNCHRONIZATION ALGORITHMS ation algorithms - NDA Timing Parameter Estimation -DD an	d NDA;	Tim	ing E				
UNIT ML sy Feedba	III nchroniz ack Syste	SYNTHESIS OF SYNCHRONIZATION ALGORITHMS ration algorithms - NDA Timing Parameter Estimation -DD an rms - Phasor-Locked Loop; NDA Carrier Phasor Estimation.	d NDA;	Tim	ing E				
UNIT ML sy Feedba UNIT	III nchroniz ack Syste IV	SYNTHESIS OF SYNCHRONIZATION ALGORITHMS ation algorithms - NDA Timing Parameter Estimation -DD an ms - Phasor-Locked Loop; NDA Carrier Phasor Estimation. PERFORMANCE ANALYSIS OF SYNCHRONIZERS				Erro			
UNIT ML sy Feedba UNIT Perforr Trackin	III nchroniz ack Syste IV nance an ng Perfo	SYNTHESIS OF SYNCHRONIZATION ALGORITHMS ration algorithms - NDA Timing Parameter Estimation -DD an rms - Phasor-Locked Loop; NDA Carrier Phasor Estimation.	mbol Sy	nchro	oniza	Erro			
UNIT ML sy Feedba UNIT Perforr Trackin	III nchroniz nck Syste IV nance an ng Perfo ition of o	SYNTHESIS OF SYNCHRONIZATION ALGORITHMS aation algorithms - NDA Timing Parameter Estimation -DD an ems - Phasor-Locked Loop; NDA Carrier Phasor Estimation. PERFORMANCE ANALYSIS OF SYNCHRONIZERS aalysis of carrier and symbol synchronizers; Decision-Directed Sy permance Comparison; Feedback and feed forward synchronizers	mbol Sy nizers; C	nchro	oniza	Erro tion pin;			
UNIT ML sy Feedba UNIT Perforr Trackin Acquis UNIT	III nchroniz ack Syste IV nance an ng Perfo ition of c V	SYNTHESIS OF SYNCHRONIZATION ALGORITHMS ration algorithms - NDA Timing Parameter Estimation -DD an rms - Phasor-Locked Loop; NDA Carrier Phasor Estimation. PERFORMANCE ANALYSIS OF SYNCHRONIZERS ratios of carrier and symbol synchronizers; Decision-Directed Sy permance Comparison; Feedback and feed forward synchronic carrier phase and symbol timing. PARAMETER SYNCHRONIZATION FOR SELECTIVE 1	ombol Sy nizers; C FADINC	nchro Cycle	oniza slip	Erro 9 tion ping			
UNIT ML sy Feedba UNIT Perforr Trackin Acquis UNIT Fading	III nchroniz nck Syste IV nance an ng Perfo ition of o V	SYNTHESIS OF SYNCHRONIZATION ALGORITHMS aation algorithms - NDA Timing Parameter Estimation -DD an ems - Phasor-Locked Loop; NDA Carrier Phasor Estimation. PERFORMANCE ANALYSIS OF SYNCHRONIZERS aalysis of carrier and symbol synchronizers; Decision-Directed Sy permance Comparison; Feedback and feed forward synchronicerrier phase and symbol timing. PARAMETER SYNCHRONIZATION FOR SELECTIVE TO CHANNELS	mbol Sy nizers; C FADINC ling chan	nchro Cycle	oniza slip Opt	Erro 9 tion pinţ ima			
UNIT ML sy Feedba UNIT Perforr Trackin Acquis UNIT Fading receive	III inchroniz ack Syste IV mance an ing Perfo ition of c V channel ers for da	SYNTHESIS OF SYNCHRONIZATION ALGORITHMS ration algorithms - NDA Timing Parameter Estimation -DD an rms - Phasor-Locked Loop; NDA Carrier Phasor Estimation. PERFORMANCE ANALYSIS OF SYNCHRONIZERS ralysis of carrier and symbol synchronizers; Decision-Directed Sy pormance Comparison; Feedback and feed forward synchronic carrier phase and symbol timing. PARAMETER SYNCHRONIZATION FOR SELECTIVE TO CHANNELS ls; Statistical characterization; Flat and frequency selective fad	mbol Sy nizers; C FADINC ling chan	nchro Cycle	oniza slip Opt	Erro 9 tion ping 9			
UNIT ML sy Feedba UNIT Perforr Trackin Acquis UNIT Fading receive	III inchroniz ack Syste IV mance an ing Perfo ition of c V channel ers for da	SYNTHESIS OF SYNCHRONIZATION ALGORITHMS ration algorithms - NDA Timing Parameter Estimation -DD an rms - Phasor-Locked Loop; NDA Carrier Phasor Estimation. PERFORMANCE ANALYSIS OF SYNCHRONIZERS ralysis of carrier and symbol synchronizers; Decision-Directed Sy pormance Comparison; Feedback and feed forward synchronic carrier phase and symbol timing. PARAMETER SYNCHRONIZATION FOR SELECTIVE TO CHANNELS ls; Statistical characterization; Flat and frequency selective fad ata detection and synchronization parameter estimation; Realization	rmbol Sy hizers; C FADINC ling chan able rece	nchro Cycle	oniza slip Opt	Erro ! tion pin; ima			
UNIT ML sy Feedba UNIT Perforr Trackin Acquis UNIT Fading receive for syn	III nchroniz ack Syste IV nance an ng Perfo ition of c V channel ers for da achronize	SYNTHESIS OF SYNCHRONIZATION ALGORITHMS aation algorithms - NDA Timing Parameter Estimation -DD an ams - Phasor-Locked Loop; NDA Carrier Phasor Estimation. PERFORMANCE ANALYSIS OF SYNCHRONIZERS aalysis of carrier and symbol synchronizers; Decision-Directed Sy permance Comparison; Feedback and feed forward synchronic carrier phase and symbol timing. PARAMETER SYNCHRONIZATION FOR SELECTIVE I CHANNELS ls; Statistical characterization; Flat and frequency selective fad ata detection and synchronization parameter estimation; Realizated detection.	mbol Sy nizers; C FADINC ling chan able rece RIODS	nchro Cycle	oniza slip Opt	Erro 9 tion ping ima ture 4:			
UNIT ML sy Feedba UNIT Perforr Trackin Acquis UNIT Fading receive for syn	III inchroniz ack Syste IV mance an ing Perfo ition of o V channel ers for da achronize	SYNTHESIS OF SYNCHRONIZATION ALGORITHMS aation algorithms - NDA Timing Parameter Estimation -DD an ams - Phasor-Locked Loop; NDA Carrier Phasor Estimation. PERFORMANCE ANALYSIS OF SYNCHRONIZERS aalysis of carrier and symbol synchronizers; Decision-Directed Sy permance Comparison; Feedback and feed forward synchronic carrier phase and symbol timing. PARAMETER SYNCHRONIZATION FOR SELECTIVE I CHANNELS Is; Statistical characterization; Flat and frequency selective fad ata detection and synchronization parameter estimation; Realizated ad detection.	mbol Sy nizers; C FADINC ling chan able rece RIODS	nchro Cycle G nnels; iver :	Optiza Opt Opt	Erro 9 tion pinţ iima ture 4:			
UNIT ML sy Feedba UNIT Perforr Trackin Acquis UNIT Fading receive for syn	III nchroniz ack Syste IV mance an ng Perfo ition of c V channel ers for da achronize RSE OUT end of th	SYNTHESIS OF SYNCHRONIZATION ALGORITHMS aation algorithms - NDA Timing Parameter Estimation -DD an ems - Phasor-Locked Loop; NDA Carrier Phasor Estimation. PERFORMANCE ANALYSIS OF SYNCHRONIZERS alysis of carrier and symbol synchronizers; Decision-Directed Sy permance Comparison; Feedback and feed forward synchronic carrier phase and symbol timing. PARAMETER SYNCHRONIZATION FOR SELECTIVE TO CHANNELS ls; Statistical characterization; Flat and frequency selective fad ata detection and synchronization parameter estimation; Realizated ad detection. TOTAL PEF FCOMES	rmbol Sy nizers; C FADINC ling chan able rece RIODS BT	nchro Cycle G iver : MAF	oniza slip Opt struct PPED Level	Erro 9 tion ping 9 ima ture 4!			
UNIT ML sy Feedba UNIT Perforr Trackin Acquis UNIT Fading receive for syn COUR At the	III nchroniz ack Syste IV mance an ng Perfo ition of c V channel ers for da achronize RSE OUT end of th	SYNTHESIS OF SYNCHRONIZATION ALGORITHMS aation algorithms - NDA Timing Parameter Estimation -DD an ams - Phasor-Locked Loop; NDA Carrier Phasor Estimation. PERFORMANCE ANALYSIS OF SYNCHRONIZERS aalysis of carrier and symbol synchronizers; Decision-Directed Sy permance Comparison; Feedback and feed forward synchronic carrier phase and symbol timing. PARAMETER SYNCHRONIZATION FOR SELECTIVE I CHANNELS ls; Statistical characterization; Flat and frequency selective fad ata detection and synchronization parameter estimation; Realizated detection. TOTAL PEF TCOMES nis course, the students will be able to ate the generation and detection of digital baseband system.	rmbol Sy nizers; C FADINC ling chan able rece RIODS BT (Hig	nchro Cycle G g iver : MAF hest l	Optical Slip Optical Struct PPED Level	Erro tion ping ima ture 4:)			

CO3	use the synchronization algorithms for various applications.	Applying (K3)
CO4	analyze the generation and detection of symbol synchronizers.	Analyzing (K4)
CO5	design the parameters of flat and frequency selective fading channels.	Applying (K3)

H.Meyer, M. Moeneclaey, and S. A. Fechtel, "Digital Communication Receivers", Wiley, 1998.

- 2. U.Mengali, A.N.D.Andrea, "Synchronization Techniques for Digital Receivers", Kluwer, 1997.
- 3. H.Meyer, G.Ascheid, "Synchronization in Digital Communications", John Wiley, 1990.
- N.Benuveruto, G.Cherubini, "Algorithms for Communication Systems and its Applications", Wiley, 2002.

CO-PO MAPPING :

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's)

(1/2/3 indicates the strength of correlation) 3 - Strong , 2 - Medium , 1 - Weak

			PC	D's		
COs	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	-	1	1	1	1
CO2	2	-	1	1	1	1
CO3	2	-	1	1	1	1
CO4	2	-	1	1	1	1
C05	2	-	1	1	1	1

PPROVED BOARD OF STUDIES Flectronic tion Engl

PCS231	2 SOFT COMPUTING AND MACHINE LEARNING	3	3	0 0	3
COUDER	OBJECTIVES				_
	the students to				
	derstand the basics of artificial neural network.				
	rn the concepts of modelling and control of neural and fuzzy contro	schemes	5.	_	
	ow about fuzzy set theory.			1-12-21	
	familiar with concepts of machine learning.				
5. ac	uire knowledge about linear methods for classification.				
UNIT I	ARTIFICIAL NEURAL NETWORK			-	9
Review o	fundamentals - Biological neuron, artificial neuron, activation fu	inction, a	and s	single	layer
perceptro	Limitation; Multi-layer perceptron - Back Propagation Algor	ithm; R	ecuri	ent 1	Veural
Network;	Adaptive Resonance Theory based network; Radial basis function r	etwork ;	Onl	ine le	arning
algorithm	; BP through time; RTRL algorithms; Reinforcement learning.				
UNIT II	NEURAL NETWORKS FOR MODELING AND CONTR	OL		Τ	9
Modelling	of non-linear systems using ANN - Generation of training data; Op	imal arcl	hitec	ture; 1	Mode
validation	Control of non-linear systems using ANN; Direct and indirect	neuro c	ontro	ol sch	emes:
Adaptive	leuro controller; Familiarization with neural network toolbox.				
UNIT III	FUZZY SET THEORY			1	9
Modelling	of non-linear systems using fuzzy models; TSK model; Fuzzy logic	controll	er; F	uzzifi	catior
Knowledg	e base; Decision making logic; Defuzzification ; Adaptive fuzzy s	systems ;	Fan	niliari	zation
with fuzz	logic toolbox.				
UNIT IV	INTRODUCTION TO MACHINE LEARNING			Τ	9
Introducti	n to Machine Learning; Supervised Learning - Support Vector Mac	hines - K	erne	l Met	hods -
Instance b	used Methods - K-Nearest Neighbours ; Unsupervised Learning - Cl	ustering	Algo	rithm	s -K -
Means F	erarchical Clustering, Cluster Validity; Reinforcement Learning -	Element	ts, N	lodel	based
Learning	Femporal Difference Learning				
UNIT V	LINEAR METHODS FOR CLASSIFICATION			T	9
Linear R	gression of an Indicator Matrix; Linear Discriminant Analysi	s; Logis	stic	Regre	ssion
Separatin					
0.815 4 19450 6850.00	- Hyper planes; Wavelet Smoothing.				
	- Hyper planes; Wavelet Smoothing. TOTAL Pl	ERIODS			45
COURSE				APPE	45 D
	TOTAL PI	B	Γ M.	APPE at Lev	D
At the end	TOTAL PL OUTCOMES	B	Γ MA	t Lev	D el)
At the end	TOTAL PL OUTCOMES of this course, the students will be able to	B) (Hi	Γ M/	t Lev ling (D el)

CO3	elaborate the	e modelling and c	control of neural	networks.	Underst	anding (K2)			
CO4									
C05	classify the	different methods	s for linear mode	els.	Analyzi	ng (K4)			
REFE	RENCES								
1.	Neural Netwo	rks and Learning	Machines, 3rd e	edition, Simon Ha	aykin, PHI Learr	ing, 2011.			
2.	C. Timothy J.	Ross, "Fuzzy Lo	gic with Engine	ering Application	ns", McGraw Hil	l Inc., 2021.			
3.	T. Hastie, R.	Tibshirani, J. F	riedman. "The	Elements of Stat	tistical Learning	", 2 nd edition			
	2017.								
4.	Christopher B	sishop, "Pattern R	Recognition and l	Machine Learnin	g", 2016.				
cc	-PO MAPPINO	3:							
		ing of Course Ou							
	11/// 10/	tiestes the strengt	h of correlation)	$3 - Strong \cdot 2 - M$	ledium, 1 – Wea	k			
	(1/2/3 Inc	licates the strengt		3 – Strong , 2 – N D's	1edium, 1 – Wea	k			
COs	PO1	PO2		100 m	PO5	k PO6			
			PC	D's					
CO1	PO1		PC PO3	D's	PO5	PO6			
CO1 CO2	PO1 2	PO2	PO3 -	PO4 -	PO5 1	PO6 1			
COs - CO1 CO2 CO3 CO4	PO1 2 2	PO2 - -	PO3 - -	D's PO4 - -	PO5 1 1	PO6 1 1			



PC			COGNITIVE R					
CO	URSE OBJ	ECTIVES						
To e	enable the st	tudents to						
1.	unders	tand the fundame	ental concepts of	f cognitive radi	o networks.			
2.	develo	p the cognitive r	adio, as well as t	techniques for	spectrum holes d	etection that	t cog	nitive
	radio t	akes advantages	in order to explo	oit it.				
3.	unders	tand the function	ns of MAC layer	r and Network	layer and its vari	ous protoco	ls.	
4.		tand fundament ement and tradir	1000	rding dynamie	c spectrum acc	ess, the r	adio-1	resou
5.	interpr	et the basics of s	ecurity manager	ment and the va	arious attacks &	its counterr	neasu	res.
J		INTROD	CTION TO C	COGNITIVE	RADIO		1	
Cog	nitive Radi	o : Techniques a	nd signal proce	essing History	and background	, Communi	catio	n pol
and	Spectrum M	Management, Co	gnitive radio cy	cle, Cognitive	radio architectu	re, SDR ar	chited	ture
cogr	itive radio,	Spectrum sensi	ng Single node	sensing: energ	y detection, cycl	o stationary	and	wave
base	d sensing-	problem formul	ation and perfo	rmance analys	is based on pro	bability of	detec	tion
CNID			and perio	analys	the second second business to the second sec			
DIVIC	. Cooperati	ve sensing: diffe	5.	5				
	Cooperati IT II	· · · · · · · · · · · · · · · · · · ·	5.5	s, wideband sp	ectrum			
UN	тп	· · · · · · · · · · · · · · · · · · ·	rent fusion rules	s, wideband sp	ectrum			• Otł
UN	IT II oduction	SPECTRU	rent fusion rules I M SENSING A ng – Multiband	s, wideband sp AND TRADIN d Spectrum Se	ectrum G ensing – Sensin	g Techniq	ues -	
UN Intro algo	IT II oduction – orithms –	SPECTRU Spectrum Sensin Comparison –	rent fusion rules I M SENSING A ng – Multiband Performance M	s, wideband sp AND TRADIN d Spectrum So leasure & De	ectrum G ensing – Sensin sign Trade-Offs	g Techniq : Receive	ues – er op	erati
UN Intro algo char	IT II oduction – orithms – acteristics	SPECTRU Spectrum Sensin	rent fusion rules IM SENSING A ng – Multiband Performance M rformance meas	s, wideband sp AND TRADIN d Spectrum So leasure & De sure –Fundame	ectrum G ensing – Sensin sign Trade-Offs ntal limits and th	g Techniq : Receive rade-off. Int	ues – er op	erati
UN Intro algo char spec	IT II oduction – orithms – cacteristics ctrum tradi	SPECTRU Spectrum Sensin Comparison – – Throughput Pe ng, classificatio	rent fusion rules IM SENSING A ng – Multiband Performance M rformance meas n to spectrum	s, wideband sp AND TRADIN d Spectrum So leasure & De sure –Fundame trading, radio	ectrum G ensing – Sensin sign Trade-Offs ntal limits and to resource pricir	g Techniq : Receive rade-off. In ng, brief di	ues – er op troduc	erati ction
UN Intro algo char spec ecor	IT II oduction – orithms – cacteristics etrum tradi nomics theo	SPECTRU Spectrum Sensin Comparison – – Throughput Pe	rent fusion rules M SENSING A ng – Multiband Performance M rformance meas n to spectrum lity, auction the	s, wideband sp AND TRADIN d Spectrum So leasure & De sure –Fundame trading, radio	ectrum G ensing – Sensin sign Trade-Offs ntal limits and to resource pricir	g Techniq : Receive rade-off. In ng, brief di	ues – er op troduc	erati ction
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				TOT	AL PERIODS	45
COUR	SE OUTCOM	ES			ВТ	MAPPED
		se, the students	will be able to		(Hi	ghest Level)
CO1			cepts of cognitive	e radio networks.	Analyz	zing (K4)
CO2	interpret the algorithms.	es and Unders	standing (K2)			
CO3	evaluate the various proto		AAC layer and l	Network layer a	and its Analy:	zing (K4)
CO4	apply the co	ncepts of coop	perative spectrum	a sensing and h	andoff Apply	ing (K3)
CO5	the radio-res	ource managem	ues regarding dyr nent and trading, better spectrum e	as well as a nun		standing (K2)
REFE	RENCES					
1.	Cognitive Rad	lio, Software D	efined Radio and	Adaptive Wire	less Systems",	Hüseyin Arslan.
			541-6 (HB), 200'			
2.	Linda Doyle, '	Essentials of C	ognitive Radio", (Cambridge Univ	ersity Press, 200	19.
3.	Kwang-Cheng	chen, Ramjee	Prasad, "Cognit	tive radio netwo	rks", John Wild	ey & Sons Ltd.
	2009.					
4.	Cognitive Rad	io Technology"	, by Bruce A. Fet	te, Elsevier, ISB	N 10: 0-7506-79	952-2, 2006.
	-PO MAPPING					
	Марр	ing of Course O	utcomes (CO's) w	ith Programme C	outcomes (PO's)	
	(1/2/3 ind	icates the streng	th of correlation)	3 – Strong , 2 – 1	Medium , 1 – We	ak
COs			PC	D's		
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	1	1	1	1	1
CO2	1	1	1	1	1	1
CO3	1	1	1	1	1	1
CO4	1	1	1	1	1	1
CO5	1	1	1	1	1	4



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applica	licatio	8
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differen LS-oper networł	erentia operati vorksI	ions ions ion P21
differen LS-oper networł	operati vorksI ian FI	ions ateo ion P2I
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	explain the a	pplications of m	ultimedia networ	·ks.	Applyi	ing (K3)
CO3				ng connection-or ence to MPLS, VI	Unders	standing (K2)
CO4	analyze perfo	ormance of packe	et queues and its	related analysis	Analyz	zing (K4)
CO5	explore the c	oncepts of netwo	ork management.	2002 	Unders	standing (K2)
REFE	CRENCES					
	Internet", Pear	rson, 6th Edition	, 2012.	orking- A Top I n Networks", Pe		
4.	Peter Dordal , Walrand .J. publishers, 2 r D-PO MAPPING	Varatya, "High nd Edition, 2000 5 :	Performance C	etworks", Releas	Network", Mor	
4.	Peter Dordal, Walrand .J. publishers, 2 r D-PO MAPPINO Mapp	Varatya, "High nd Edition, 2000 G : ing of Course Ou	Performance C		Network", Mor utcomes (PO's)	gan Kaufman
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PCS23	5165	ADVANCED ANTENNA DESIGN	3	0	0
COUR	SE OBJ	ECTIVES			
To enab	ole the st	udents to		0	
1.	underst	tand the antenna radiation characteristics and arrays.			
2.	enhanc	e the student knowledge in the area of various antenna design.			
3.	enhanc	e the student knowledge in the area of antenna for practical applications.			
4.	learn th	ne concept of mutual coupling on antennas, applications and numerical to	echn	ique	s.
5.	underst	and about adaptive array concept.			
UNIT	I	FUNDAMENTAL CONCEPTS			
Physica	l concep	t of radiation, Radiation pattern, near- and far-field regions, reciprocity	y, dii	ecti	vity a
gain, e	ffective	aperture, polarization, input impedance, efficiency, Friis transmi	issio	n e	quati
radiatio	n integra	als and auxiliary potential functions.			1.2.0000
UNIT	п	THIN LINEAR ANTENNAS AND ARRAYS		Т	
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commu grating	inication lobes, L		spaci	ng	withe
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commu grating arrays v UNIT	Inication lobes, L with d =	, small circular loop, N-Element Linear Array, Antenna element s inear broadside array with non-uniform distributions, Gain of regularl $\lambda/2$, Tchebyscheff Array antennas.	spaci ly sp	ng acec	withc I plar
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COUR	SE OUTCOME	DS			BT M	APPED
		e, the students w	ill be able to		(Highe	est Level)
CO1	acquire the know	owledge about ba	sic antenna parar	neters.	Understan	nding (K2)
CO2	theoretically a	nalyze wire anter	nnas and arrays.		Understar	nding (K2)
CO3	identify secon independent an		aperture, broad	band and frequency	Applying	(K3)
CO4	apply the kno and numerical		al coupling on a	intennas, applications	Applying	(K3)
CO5	acquire brief k	nowledge about	adaptive array co	oncept.	Understar	nding (K2)
REFE	RENCES					
		ntennas, John Wi	ley and sons (200	17) 3 rd		
3.	Cambridge Ur Neelakanta,	vidson, Computa hiversity Press 20 Perambur S., a	005.	agnetics for RF and		Diffusering
	Press Ltd. (20	n Exposition on 04).	Outdoor and I	Rajeswarı, Antennas Indoor Wireless Ante	for Inforn ennas, Rese	nation Supe earch Studies
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COs CO1 CO2	Press Ltd. (20 O-PO MAPPING Mapp (1/2/3 ind PO1 2 2 2	PO2 2 2	tcomes (CO's) with th of correlation) PO PO3 1 1	th Programme Outcom 3 – Strong , 2 – Medium 's PO4 1 1	ennas, Rese es (PO's) n , 1 – Weak PO5 2 2 2	PO6 2 2

RING COLLE UNGIN GINEE APPROVED BOARD OF STUDIES Electronics & Communication Engineering G VAL Þ R AUTONOMOUS

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COUR	SE OBJ	ECTIVE	5																			
To enal	ble the st	tudents to			-																	
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2.	underst	and the cha	innel	el n	m	nod	lel an	nd si	gna	al pro	ocess	sing	for U	WE	B.							
3.	acquire	knowledg	e abo	out	ut	U	WB a	ante	enna	is an	id reg	gulat	ions.								_	
4.	underst	and UWB	signa	nal	ıl p	pro	cessi	ing.														
5.	learn U	WB anteni	na ap	ppl	pli	icat	tions	5,													_	
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Responder Respon	nse Moo s, Time : III Modulati	deling of and freque	UW ncy r SIGN es, U	WB mc NA UV	B noo IAI JW	Ul W odel L WB	tra Virele ling PRC Mu	Wid ess OCF ultip	Cha ESS	Band anne SING Acce	d W els, G ess l	/irele IEEI Mod	ess C E U' ulatio	WB	B cl	els (hann ER,	Chan el m Rake	odel,	Path	r, Tr	, D	ela:
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Respon profile UNIT Data M Refere Wirele Error, UNIT	nse Moo s, Time a III Modulati nce (T-I ss Loca Locatio IV	deling of and freque UWB S on schem () Technic tioning: Po ning with UWB 2	UW ncy r SIGN es, U jue, U ositic OFD	WB mC NA U' U' U ion DM	, B noo IAI JW UV on M EN	Ul W odel JL WB Lo	tra Virelo Iing PRC Mu B Rai ocatio	Wid ess OCH ultip nnge- onin	Cha ESS Ile A - Da	Band anne SING Acce ata I Meth	d W els, ess l Rate nods,	/irele IEEI Mod Peri	ess C E U ulatio forma ne of	WB on, anco	BI BI e, U	els (hann ER, UWI /al E	Chan el m Rake 3 Ch stima	e Rec annel	Path ceive Cap NL	r, Tr pacity OS L	rans v, U	ela: smit JWI atio
Respon profile UNIT Data 1 Refere Wirele Error, UNIT Antenn	nse Moo s, Time a III Modulati nce (T-I ss Loca Locatio IV na Requi	deling of and freque UWB 5 on schem () Technic tioning: Pe ning with UWB 2 rements, F	UW ncy r SIGN es, U jue, 1 ositic OFD NT	WB mc NA U ^V U U ion DM TEI	B noo IAI JW UV on M EN	Uli Wodel L WB Lo NN.	tra Vireld Iing PRC Mu 3 Ra Docation AS Meccl	Wid ess OCF ultip unge- onin	Cha ESSS Me A - Da ng N	Band anne GING Acco ata I Meth	d W els, G ess I Rate nods,	/ireld IEEI Mod Peri Tin	ess (E U ¹ ulation formation ne of	WB on, ance An	BI BI e, U rrriv	ER, UWI val E	Chan el m Rake 3 Ch stim: es of	e Rec annel ation,	Path ceive Cap NL	r, Tr pacity OS L	rans vans v, U .oca	ela; smit JWI ation
Respon profile UNIT Data I Refere Wirele Error, UNIT Antenn Param	nse Moo s, Time a III Modulati nce (T-I ss Locatio Locatio IV na Requi eters, A	deling of and freque UWB S on schem () Technic tioning: Po ning with UWB 2	UW ncy r IGN es, U ue, 1 ue, 1 ositic OFD ANT tadia	WB mc NA U ^V U U ion DM TEI	B noo IAI JW UV on M EN	Uli Wodel L WB Lo NN.	tra Vireld Iing PRC Mu 3 Ra Docation AS Meccl	Wid ess OCF ultip unge- onin	Cha ESSS Me A - Da ng N	Band anne GING Acco ata I Meth	d W els, G ess I Rate nods,	/ireld IEEI Mod Peri Tin	ess (E U ¹ ulation formation ne of	WB on, ance An	BI BI e, U rrriv	ER, UWI val E	Chan el m Rake 3 Ch stim: es of	e Rec annel ation,	Path ceive Cap NL	r, Tr pacity OS L	rans vans v, U .oca	ela; smit JWI ation
Respon profile UNIT Data I Refere Wirele Error, UNIT Antenn Param	nse Moo s, Time a III Modulati nce (T-I ess Loca Locatio IV na Requi eters, A band UV	deling of and freque UWB S on schem () Technic tioning: Pe ning with () UWB 2 rements, F nalysis of	UW ney r FIGN es, U ue, ¹ uue, ¹ UV tadia	WB mc NA UV UV U U U OM	, D B noo IAI JW UV on M EN tio VB	Uli Wodel L WB Lo NN.	tra Vireld Iing PRC Mu 3 Raio catio AS Mecl	Wid ess OCH ultip ange- onin	Cha ESS ile , - Da ng N ism s, L	Band anne SING Acco ata I Meth of tl	d W els, ess I Rate nods, he U Bud	/ireld IEEI Mod Peri Tin	ess C E UV ulatio forma ae of for	WB on, An enn UV	BI BI e, U rriv	ER, UWI val E	Chan el m Rake 3 Ch stim: es of	e Rec annel ation,	Path ceive Cap NL	r, Tr pacity OS L	rans vans v, U .oca	ela; smit JWI ation
Respon profile UNIT Data 1 Refere Wirele Error, UNIT Antenn Param broad	nse Moo s, Time a III Modulati nce (T-I ss Locatio IV na Requi eters, A band UV V	deling of and freque UWB S on schem () Technic tioning: Pe ning with UWB 2 rements, F nalysis of VB antenna UWB 2	UW ncy r r FIGN es, U OFD COFD CANT Cadia CUV as.	WB mc NA UV UV OM TEI iation	B noo IAI JW UV on M EN tio VB	Uli Wodel JL WB Lo NN.	Itra Vireld Iing PRC Mu 3 Ran ocatio AS Mecl Anter	Wid ess OCF ultip unge- onin hani mnas	Cha ESS ble - Da ng M ism s, L	Band anne GING Accce ata I Meth Link	d W els, G ess I Rate nods, Bud REG	/ireld IEEI Mod Peri Tin JWB dget	ess (E UV ulation formane of for	wB on, ance Ar enna UV	BI BI e, U rriv aas, WB	ER, UWI Zypp Sy	Chan el m Rake 3 Ch stima es of stem	e Rec annel ation, De	Path ceive Cap NL	r, Tr pacity OS L und ar exam	rans rans v, U coca	ela; smit JWI ation nnas
Respon profile UNIT Data 1 Refere Wirele Error, UNIT Antenn Param broad UNIT	nse Moo s, Time a III Modulati nce (T-I ss Locatio IV na Requi eters, A band UV V wideband	deling of and freque UWB 5 on schem () Technic tioning: Pe ning with () UWB 4 rements, F nalysis of VB antenna () UWB 4 d receiver	UW ney r IIGN es, U ue, 1 ositic OFD ANT Radia COFD Radia APPI arch	WB mc NA UV UV ion OM TEI iatio WI	B IAI JW UV on M EN tio VB	Uli Wodel L WB Lo NN. On 1 3 A	tra Vireld ling PRC B Mu B Rai ocatio AS Mecl Anter ATIC	Wid ess OCF ultip unge- onin chani c	Cha ESS ole A - Da ism ism s, L - AN eles	Band anne GING Accco ata I Meth Link	d W els, G ess I Rate nods, Bud Bud	/ireld IEEI Mod Peri Tin JWB dget ULA	ess (E U ¹ ulatio forma ae of for Anto for	WB on, anco 'Ar UV DNS rkir	BI BI e, U rriv as, W W B S ng,	els (hann ER, UWI /al E Typ 3 Sy UW	Chan el m Rako 3 Ch stima es of stem	e Rec annel ation, Broa De	Path ceive l Cap NL	r, Tr pacity OS L and ar exam	rans rans , U Loca nter nple	eelay smit JWI ation nnas es o
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Respon profile UNIT Data N Refere Wirele Error, UNIT Antenn Param broad UNIT Ultra V Consu	nse Moo s, Time a III Modulati nce (T-I ss Locatio IV na Requi eters, A band UV V wideband mer Ele	deling of and freque UWB 5 on schem () Technic tioning: Po ning with 0 UWB 2 rements, F nalysis of VB antenna UWB 2 d receiver ctronics a	UW ney r SIGN es, U ue, I ositic OFD CADIA	WB ma NA UV UV ion DM TEI iati WI VI	B MAI JW UV M EN tio VB	Uli We MB Lo NN. 3 A CA ectu	tra Vireld Iing PRC Mu 3 Rato S Rato	Wid ess OCE ultip ange- onin chani c	Charles and the second	Band anne SING Acco ata I Meth Link ND F	d W els, ess I Rate nods, he U Bud REG	/ireld IEEI Mod Peri Tin JWB dget ULA	ess C E UV ulatio forma ne of for Anto for Anto for dical	WB on, anco Ar UV DNS rkir l ap Stan	BI BI e, U rriv WB S ng, ppli nda	els (hann ER, UWI /al E 3 Sy UW icatio rdiza	Chan el m Rake 3 Ch stima es of stem 'B W ons, ution	e Rec annel ation, Broa De	Path ceive Cap NL ad ba sign sss Sc 3 Re	r, Tr pacity OS L and ar exam	rans rans , U Loca nter nple	eelay smit JWI ation nnas es o
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	understand t	he basic concept	S OI O WD teenine	ingres.	unders	tanding (K2)
CO3	assess the pe	erformance of U	WB channels.		Applyi	ng (K3)
C O 4	apply the UV	WB signal proces	ssing.		Applyi	ng (K3)
CO5	design UWE	3 antenna for var	ious applications		Applyi	ng (K3)
REFE	RENCES					
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4.			John Wiley and I		York 2008.	
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	Huseyin A	rslan,Zhi Ning munication" Wil	John Wiley and I	Gabriella Di	York 2008.	
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1.		at the basics of embedded system and ARM architecture.				
2.		tand the RTOS concepts like scheduling and memory manageme ded system.	ent re	lated	d to	th
3.	learn a	bout the programming aspects of RTOS.	-			7
4.	learn t	he different protocols of embedded wireless application.		-		-
5.	study c system	concepts involved in the design of hardware and software components	for a	an er	nbed	de
UNIT	ГІ	INTRODUCTION				9
Real '	Time Sys	tem - Embedded Systems - Architecture of Embedded System - Simp	le Pro	ogra	mmir	ng
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		ccess Devices - Smart Cards - Microcontrollers - ARM Process				
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COU	RSE OUTCOM	AES				BT MAPPED
At the	end of this cou	rse, the students	will be able to			Highest Level)
CO1	make a choic	e of suitable em	bedded processor	r for a given appl	ication. Unde	erstanding (K2)
CO2	design the ha	rdware and soft	ware for the emb	edded system.	Appl	ying (K3)
CO3			time kernel/oper nd analyze differ		nctions, Anal	yzing (K4)
CO4	17	different types ion techniques.	of inter task	c communicatio	on and Appl	ying (K3)
CO5	know about t	he aspects embe	dded connectivit	y in real time sys	stems. Unde	erstanding (K2)
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2. 3. 4.	David E-Simo C.M.Krishna, B.P.Douglass, Edition Addis D-PO MAPPINO Mapp	on, "An Embedda Kang G.Shin, "F , "Real Time on-Wesley, 2004 G : ing of Course Ou	ed Software Prim Real Time System Uml - Advance 4. utcomes (CO's) w th of correlation)	ns", Mc-Graw H s In the UML ith Programme C	ill, 2010. for Real-Tim Putcomes (PO's)
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PCS2	3168	WAVELETS AND SUB-BAND CODING		3
COUL	RSE OB	JECTIVES		
To ena	ble the	students to		
1.	introdu	ice the fundamentals concepts of wavelet transforms.		
2.		nultiresolution concept and Discrete Wavelet Transform.		
3.		ystem design using Wavelets.		
4.	learn th	he different wavelet families & their applications.		
5.	study s	ignal compression and sub-band coding.		
UNIT		INTRODUCTION TO WAVELETS		9
Subba Conti	und codi nuous	o Multirate signal processing- Decimation and Interpolation, Quadrature ng, Limitations of Fourier transform, Short time Fourier transform and Wavelet transform, Time frequency representation, Wavelet Sy c, Orthogonal and Orthonormal functions and function space	d its drawb	backs,
UNIT		MULTIRESOLUTION CONCEPT AND DISCRETE	1	9
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CO3	understand sy	stem design usin	g wavelets.		Underst	tanding (K2)
CO4	compare diffe	rent wavelet fam	ilies.		Underst	tanding (K2)
CO5	analyze signal	l compression an	d sub-band codir	ng,	Analyz	ing (K4)
REFE	RENCES					
1.		rus, Ramesh Go entice Hall, 1998		Guo, "Introduc	ction to wavelet	s and wavele
2.	G.Strang and T	Nguyen, "Wave	elet and filter bar	nks", Wesley and	Cambridge Pres	s, 1996.
3. 4.	Metin Akay, ' Press, October M.Vetterli and					
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PCS2	23169	SPEECH PROCESSING		3	0) 0	
COU	RSE OBJ	ECTIVES		-	_		_
To ena	able the st	udents to					
1.	introdu	ce speech production and related parameters of speech.					10 - 10 A.
2.	illustra	te the concepts of speech signal representations and coding.					
3.	underst issues.	tand different speech modeling procedures such Markov an	d their	in	iple	ment	tatio
4.	gain kr	owledge about text analysis.					
5.	learn a	bout speech synthesis.					
UNIT	ſ I	FUNDAMENTALS OF SPEECH PROCESSING			1		9
		- Probability, Statistics and Information Theory - Probabiliticance Testing - Information Theory.		ory	- 1	Estim	atic
UNIT	II I	SPEECH SIGNAL REPRESENTATIONS AND COD	ING				9
		del of Speech Production - Linear Predictive Coding - Cepstra The Role of Pitch - Speech Coding - LPC Coder, CELP, Vocoder		ssir	ıg -	· For	man
UNIT	III I	SPEECH RECOGNITION					
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-	ations. Ac	coustic Modeling - Variability in the Speech Signal - Extract	ing Fea	tur	es -	- Pho	meti
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CO4		n recognition sys			Applyin	ng (K3)
CO5			peech synthesis t	echniques.	Analyz	ing (K4)
REFE	RENCES					
1.			gan, "Speech ar ic", Wiley- India	nd Audio Signal Pro Edition, 2006	ocessing, P	Processing and
2.				Speech Recognition	", John Wi	iley and Sons,
3.				and Language Proce		
4	Pearson Educ	ation, 2002.		nal Linguistics, an ech Recognition", MI		
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3.	learn th	ne Monte (Carlo S	Sim	nulatic	on.										
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	simulate a phenomena so as to depict the characteristics that may be observed in a real experiment. Applying (K3)								
CO4	apply knowledge of the different simulation techniques for designing a communication system or channel. Applying (K3)								
CO5	validate a simulated system performance so as to match a realistic Applying (K3) scenario.								
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s for digital systems.	design and model the V	
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CO2	design the Ve	Applyir	Applying (K3)			
CO3	model and d HDL.	erilog Applyir	Applying (K3)			
CO4	analyze and a	. Applyir	Applying (K3)			
CO5	explore the d	ne the Applyir	Applying (K3)			
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CO2	3	3	2	2	<u>_</u>	-
CO3	3	3	3	-	2	-
CO4	3	3	2	2	-	-
C05	3	-	-			

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