E.G.S. PILLAY ENGINEERING COLLEGE (Autonomous)

Approved by AICTE, New Delhi

Affiliated to Anna University, Chennai | Accredited by | NAAC with 'A++' Grade

Accredited by | NBA T1 (B.E. – CIVIL, CSE, ECE, EEE, MECH & B. Tech – IT) NAGAPATTINAM – 611002



M.E. COMMUNICATIONSYSTEMS R2024 - FIRST YEAR CURRICULUM

SEMESTER II

SI. No	Course Code	Course Title	Category		iods j week		Credits	Total contact periods
				L	Т	P	C	
1	2402CO201	Microwave integrated Circuits (Regular/NPTEL)	PCC	3	0	0	3	3
2	2402CO202	Advanced wireless communication	PCC	3	0	0	3	3
3	2402CO203	Advanced Digital Signal Processing	PCC	3	0	0	3	3
4	2403CO009	Wireless Sensor Networks (Professional Elective – II)	PEC	3	0	0	3	3
5	2403CO011	Mobile Adhoc Networks (Professional Elective – III)	PEC	3	0	0	3	3
6		Audit Course - II	AC	2	0	0	0	2
Lab	oratory Cours	Ses	1					
7	2402CO204	Wireless Communication and Networks Laboratory	PCC	0	0	4	2	4
8	2404CO205	Mini Project/Internship with seminar	EEC	0	0	4	2	4
		TOTAL		11	0	8	19	25

CROV	VAVE	INTE	GRAT	ED C	IRCU	ITS (R	REGUI	LAR/N	PTEL)	L	Т	P	C
						, ,				/	3	0	0	3
										I			1	1
1.														
. Mic	crowav	e Engi	neering	5										
. Lin	ear Inte	egrated	l Circu	its										
TIVE	' C .													
<u>_ 11VE</u>	.													
o under	rstand t	the fun	damen	tals of	RF rac	lio sys	tem de	sign						
								<u> </u>	adio s	ystem	n for	wire	less	
					ues ne	eded fo	or evalu	lating	the per	form	ance	e of a	n RF	rad
stem I	or wire	eless aj	opiicati	lons										
OMES	5:													
									1	1.	·			
							r speci	ficatio	ns and	arch	itecti	ures.		
						lixer.								
						nd amp	lifiers.							
	-													
APPIN	G:													
PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO1	1 PC)12		
1 3	3	2	-	-	-	-	-	-	-	-				
2 3	3	2	-	-	-	-	-	-	-	-				
_			-	-	-	-	-	-	-	-				
			-	-	-	-	-	-	-	-				
<u> </u>	5	2	_	_	-	-	-	_	-	-		5		
A DDI														
	10.													
				COs	PSO1	PSO2]							
				-		-								
				-		-	-							
				-		-								
						-								
				003	5		1							
ENTS:	:													
RCHI	ГЕСТ	URES												
	n over	a con	nmiinia	notter	Innk 1	ransce	Num Δ	rchite	ctures:	Кес	eive	r: Ho	mod	-
													otor	17.00
ge reje													step	up
	E: I. Mic 2. Lin CTIVE o under o u	E: I. Microwav C. Linear Into CTIVES: o understand to o understand to	E: Microwave Engin Linear Integrated CTIVES: o understand the fun o understand the var o understand the saic ana ystem for Wireless ap COMES: Increaseful completion ntify the concept of of plain about the RF fi issect the concept of of about the RF fi issect the concept of of plain about the RF fi issect the concept of of about the RF fi issect the concept of about the RF fi issect the	E: I. Microwave Engineering 2. Linear Integrated Circu CTIVES: o understand the fundamen o understand the various co ommunications o know the basic analysis to ystem for Wireless application in ccessful completion of the ntify the concept of CMOS plain about the RF filter, os sect the concept of microw assify the different matching sign the microwave IC and APPING: S PO1 PO2 PO3 PO4 1 3 3 2 - 2 3 3 2 - 3 3 2 - 4 3 3 2 - 5 3 3 3	E: Microwave Engineering Linear Integrated Circuits CTIVES: o understand the fundamentals of o understand the various compon- communications o know the basic analysis techniq ystem for Wireless applications COMES: Increaseful completion of the course ntify the concept of CMOS physic plain about the RF filter, oscillato issect the concept of microwave cir- issify the different matching networks isgin the microwave IC and measures APPING: S PO1 PO2 PO3 PO4 PO5 1 3 3 2 2 3 3 2 3 3 2 4 3 3 2 5 3 3 2 4 3 3 2 5 3 3 2 4 3 3 2 5 3 3 -	E: 1. Microwave Engineering 2. Linear Integrated Circuits CTIVES: o understand the fundamentals of RF radio understand the various components the communications o know the basic analysis techniques nerrowstem for Wireless applications COMES: cccessful completion of the course, stude ntify the concept of CMOS physics, transplain about the RF filter, oscillator and nessect the concept of microwave circuits. assect the concept of microwave circuits. assify the different matching networks arisign the microwave IC and measurement APPING: S PO1 PO2 2 3 3 2 3 2 3 2 2 3 3 2 4 3 3 2 5 3 3 2 4 3 3 2 5 3 6 PO1 PO2 PO3 PO4 PO5 PO6 3 3 2 2 3	E: 1. Microwave Engineering 2. Linear Integrated Circuits CTIVES: o understand the fundamentals of RF radio sys o understand the various components that consommunications o know the basic analysis techniques needed for system for Wireless applications COMES: tecessful completion of the course, students wintify the concept of CMOS physics, transceive plain about the RF filter, oscillator and mixer. seed the concept of microwave circuits. ussify the different matching networks and amp sign the microwave IC and measurement techn APPING: IAPPING: IAPPING: </td <td>E: 1. Microwave Engineering 2. Linear Integrated Circuits CTIVES: o understand the fundamentals of RF radio system de o understand the various components that constitute a communications o know the basic analysis techniques needed for evaluation of the course, students will be at number of Wireless applications COMES: tecessful completion of the course, students will be at ntify the concept of CMOS physics, transceiver speciplain about the RF filter, oscillator and mixer. ssect the concept of microwave circuits. ussign the microwave IC and measurement techniques. APPING: S APPING: APPING: <td>2: 1. Microwave Engineering 2. Linear Integrated Circuits CTIVES: o understand the fundamentals of RF radio system design o understand the various components that constitute an RF normunications o understand the various components that constitute an RF normunications o understand the various components that constitute an RF normunications o who we to basic analysis techniques needed for evaluating system for Wireless applications COMES: tecessful completion of the course, students will be able to ntify the concept of CMOS physics, transceiver specificatio plain about the RF filter, oscillator and mixer. teses the concept of CMOS physics, transceiver specification sign the microwave IC and measurement techniques. APPING: APPING: Impose PO6 PO7 PO8 PO9 1 0 0 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 1 3 3 2</td><td>S: 1. Microwave Engineering 2. Linear Integrated Circuits CTIVES: o understand the fundamentals of RF radio system design o understand the various components that constitute an RF radio system do system for Wireless applications o know the basic analysis techniques needed for evaluating the persistem for Wireless applications OMES: trecessful completion of the course, students will be able to ntify the concept of CMOS physics, transceiver specifications and plain about the RF filter, oscillator and mixer. sign the microwave IC and measurement techniques. APPING: S PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 1 3 3 2 -</td><td>1. Microwave Engineering 2. Linear Integrated Circuits CTIVES: o understand the fundamentals of RF radio system design o understand the various components that constitute an RF radio system for momunications o know the basic analysis techniques needed for evaluating the perform system for Wireless applications OMES: OMES: uccessful completion of the course, students will be able to ntify the concept of CMOS physics, transceiver specifications and archiplain about the RF filter, oscillator and mixer. useet the concept of microwave circuits. ussify the different matching networks and amplifiers. sign the microwave IC and measurement techniques. APPING: COS PO6 PO7 PO8 PO9 PO10 PO1 1 3 3 2 -</td><td>3 5: 1. Microwave Engineering 2. Linear Integrated Circuits CTIVES: o understand the fundamentals of RF radio system design o understand the various components that constitute an RF radio system for ommunications o understand the various components that constitute an RF radio system for ommunications o understand the various components that constitute an RF radio system for ommunications o understand the various components that constitute an RF radio system for ommunications o understand the various components that constitute an RF radio system for ommunications o understand the various components that constitute an RF radio system for ommunications o understand the various components that constitute an RF radio system for ommunications OMES: toccessful completion of the course, students will be able to ntify the different matching networks and amplifiers. sign the microwave IC and measurement techniques. APPING: IAPPING: IAPPING: IAPPING: IAPPING: ENTS: MOS PMSICS, TRANSCEIVER</td><td>3 0 2: 1. Microwave Engineering 2. Linear Integrated Circuits CTIVES: o understand the fundamentals of RF radio system design o understand the various components that constitute an RF radio system for wirel ommunications o know the basic analysis techniques needed for evaluating the performance of an system for Wireless applications OMES: uccessful completion of the course, students will be able to ntify the concept of CMOS physics, transceiver specifications and architectures. plain about the RF filter, oscillator and mixer. sect the concept of microwave circuits. using the microwave IC and measurement techniques. APPING: IAPPING: IAPPING:</td><td>3 0 0 3::::::::::::::::::::::::::::::::::::</td></td>	E: 1. Microwave Engineering 2. Linear Integrated Circuits CTIVES: o understand the fundamentals of RF radio system de o understand the various components that constitute a communications o know the basic analysis techniques needed for evaluation of the course, students will be at number of Wireless applications COMES: tecessful completion of the course, students will be at ntify the concept of CMOS physics, transceiver speciplain about the RF filter, oscillator and mixer. ssect the concept of microwave circuits. ussign the microwave IC and measurement techniques. APPING: S APPING: APPING: <td>2: 1. Microwave Engineering 2. Linear Integrated Circuits CTIVES: o understand the fundamentals of RF radio system design o understand the various components that constitute an RF normunications o understand the various components that constitute an RF normunications o understand the various components that constitute an RF normunications o who we to basic analysis techniques needed for evaluating system for Wireless applications COMES: tecessful completion of the course, students will be able to ntify the concept of CMOS physics, transceiver specificatio plain about the RF filter, oscillator and mixer. teses the concept of CMOS physics, transceiver specification sign the microwave IC and measurement techniques. APPING: APPING: Impose PO6 PO7 PO8 PO9 1 0 0 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 1 3 3 2</td> <td>S: 1. Microwave Engineering 2. Linear Integrated Circuits CTIVES: o understand the fundamentals of RF radio system design o understand the various components that constitute an RF radio system do system for Wireless applications o know the basic analysis techniques needed for evaluating the persistem for Wireless applications OMES: trecessful completion of the course, students will be able to ntify the concept of CMOS physics, transceiver specifications and plain about the RF filter, oscillator and mixer. sign the microwave IC and measurement techniques. APPING: S PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 1 3 3 2 -</td> <td>1. Microwave Engineering 2. Linear Integrated Circuits CTIVES: o understand the fundamentals of RF radio system design o understand the various components that constitute an RF radio system for momunications o know the basic analysis techniques needed for evaluating the perform system for Wireless applications OMES: OMES: uccessful completion of the course, students will be able to ntify the concept of CMOS physics, transceiver specifications and archiplain about the RF filter, oscillator and mixer. useet the concept of microwave circuits. ussify the different matching networks and amplifiers. sign the microwave IC and measurement techniques. APPING: COS PO6 PO7 PO8 PO9 PO10 PO1 1 3 3 2 -</td> <td>3 5: 1. Microwave Engineering 2. Linear Integrated Circuits CTIVES: o understand the fundamentals of RF radio system design o understand the various components that constitute an RF radio system for ommunications o understand the various components that constitute an RF radio system for ommunications o understand the various components that constitute an RF radio system for ommunications o understand the various components that constitute an RF radio system for ommunications o understand the various components that constitute an RF radio system for ommunications o understand the various components that constitute an RF radio system for ommunications o understand the various components that constitute an RF radio system for ommunications OMES: toccessful completion of the course, students will be able to ntify the different matching networks and amplifiers. sign the microwave IC and measurement techniques. APPING: IAPPING: IAPPING: IAPPING: IAPPING: ENTS: MOS PMSICS, TRANSCEIVER</td> <td>3 0 2: 1. Microwave Engineering 2. Linear Integrated Circuits CTIVES: o understand the fundamentals of RF radio system design o understand the various components that constitute an RF radio system for wirel ommunications o know the basic analysis techniques needed for evaluating the performance of an system for Wireless applications OMES: uccessful completion of the course, students will be able to ntify the concept of CMOS physics, transceiver specifications and architectures. plain about the RF filter, oscillator and mixer. sect the concept of microwave circuits. using the microwave IC and measurement techniques. APPING: IAPPING: IAPPING:</td> <td>3 0 0 3::::::::::::::::::::::::::::::::::::</td>	2: 1. Microwave Engineering 2. Linear Integrated Circuits CTIVES: o understand the fundamentals of RF radio system design o understand the various components that constitute an RF normunications o understand the various components that constitute an RF normunications o understand the various components that constitute an RF normunications o who we to basic analysis techniques needed for evaluating system for Wireless applications COMES: tecessful completion of the course, students will be able to ntify the concept of CMOS physics, transceiver specificatio plain about the RF filter, oscillator and mixer. teses the concept of CMOS physics, transceiver specification sign the microwave IC and measurement techniques. APPING: APPING: Impose PO6 PO7 PO8 PO9 1 0 0 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 1 3 3 2	S: 1. Microwave Engineering 2. Linear Integrated Circuits CTIVES: o understand the fundamentals of RF radio system design o understand the various components that constitute an RF radio system do system for Wireless applications o know the basic analysis techniques needed for evaluating the persistem for Wireless applications OMES: trecessful completion of the course, students will be able to ntify the concept of CMOS physics, transceiver specifications and plain about the RF filter, oscillator and mixer. sign the microwave IC and measurement techniques. APPING: S PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 1 3 3 2 -	1. Microwave Engineering 2. Linear Integrated Circuits CTIVES: o understand the fundamentals of RF radio system design o understand the various components that constitute an RF radio system for momunications o know the basic analysis techniques needed for evaluating the perform system for Wireless applications OMES: OMES: uccessful completion of the course, students will be able to ntify the concept of CMOS physics, transceiver specifications and archiplain about the RF filter, oscillator and mixer. useet the concept of microwave circuits. ussify the different matching networks and amplifiers. sign the microwave IC and measurement techniques. APPING: COS PO6 PO7 PO8 PO9 PO10 PO1 1 3 3 2 -	3 5: 1. Microwave Engineering 2. Linear Integrated Circuits CTIVES: o understand the fundamentals of RF radio system design o understand the various components that constitute an RF radio system for ommunications o understand the various components that constitute an RF radio system for ommunications o understand the various components that constitute an RF radio system for ommunications o understand the various components that constitute an RF radio system for ommunications o understand the various components that constitute an RF radio system for ommunications o understand the various components that constitute an RF radio system for ommunications o understand the various components that constitute an RF radio system for ommunications OMES: toccessful completion of the course, students will be able to ntify the different matching networks and amplifiers. sign the microwave IC and measurement techniques. APPING: IAPPING: IAPPING: IAPPING: IAPPING: ENTS: MOS PMSICS, TRANSCEIVER	3 0 2: 1. Microwave Engineering 2. Linear Integrated Circuits CTIVES: o understand the fundamentals of RF radio system design o understand the various components that constitute an RF radio system for wirel ommunications o know the basic analysis techniques needed for evaluating the performance of an system for Wireless applications OMES: uccessful completion of the course, students will be able to ntify the concept of CMOS physics, transceiver specifications and architectures. plain about the RF filter, oscillator and mixer. sect the concept of microwave circuits. using the microwave IC and measurement techniques. APPING: IAPPING: IAPPING:	3 0 0 3::::::::::::::::::::::::::::::::::::

MODULE IIINTRODUCTION TO RF FILTER, OSCILLATOR AND MIXER9 Hours

Overview –basic resonator and filter configuration-special filter realization-filter implementation. Basic oscillator model-high frequency oscillator configuration-basic characteristics of mixer- phase locked loops-RF Directional Couplers - hybrid couplers –detector and demodulator circuits.

MODULE III INTRODUCTION TO MICROWAVE CIRCUITS

Definitions – Frequency Bands – Lumped versus Distributed Circuits - Behavior of finite length transmission lines – General Characteristics of PC Boards – Transmission Lines on PC Boards – Passives made from Transmission Lines – Resonators - Combiners, Splitters and Couplers

MODULE IV MATCHING NETWORKS AND AMPLIFIERS

Circuit Representation of two port RF/Microwave Networks: Low Frequency Parameters, High Frequency Parameters, Transmission Matrix, ZY Smith Chart, Design of Matching Circuits using Lumped Elements, Matching Network Design using Distributed Elements, Amplifiers: Stability considerations in active networks – Gain Consideration in Amplifiers – Noise Consideration in active networks – Broadband Amplifier design – Low Noise Amplifier Design.

MODULE V MICROWAVE IC DESIGN AND MEASUREMENT TECHNIQUES

Microwave Integrated Circuits – MIC Materials- Hybrid versus Monolithic MICs – Multichip Module Technology - Fabrication Techniques, Miniaturization techniques, Introduction to SOC, SOP, Test fixture measurements, probe station measurements.

TOTAL: 45 HOURS

9 Hours

9 Hours

9 Hours

REFERENCES:

- 1. T. Lee, "Design of CMOS RF Integrated Circuits", Cambridge, 2004
- 2. B.Razavi, "RF Microelectronics", Pearson Education, 1997.

3. Jan Crols, Michiel Steyaert, "CMOS Wireless Transceiver Design", Kluwer Academic Publications, 1997

4. B. Razavi, Design of analog CMOS Integrated Circuits", McGraw Hill, 2001

5. D. Robertson &S. Lucy szyn, "RFIC and MMIC Design and Technology", IEE Circuits, Devices and Systems series 13, London, UK, 2001

2402CO202		AI	OVAN	CED V	VIREI	LESS (COMN	IUNI	CATIO	DN			L	T	P	C
													3	0	0	3
REREQUI	SITE:															
	1	Car			1											
	1.		nmunic eless C			n										
	2.	** 11		ommu	meane	11										
COURSE O	BJEC	ГІVЕ	S:													
			earn th													
	2.		know a													tion
		mul	tiple ar	itennas	and m	ultiple	e user t	echniq	ues us	ed in t	he mo	bile c	omr	nunic	ation	
COURSE O	UTCO	MES	5:													
			_													
On t CO1:	the suc		<u>ıl comp</u> wirele							ole to						
CO1: CO2:			capaci						21.							
C02:			concep						nicatio	n						
CO4:			e diffe						meano							
CO5:			conce													
	•															
COs Vs PC)s MAl	PPIN	G:													
[COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1(PO	11 P	012		
-	CO1	3	3	2	-	-	-	-	-	-	-	-		3		
-	CO2	3	3	2	-	-	-	-	-	-	-	-		3		
	CO3	3	3	2	-	-	-	-	-	-	-	-		3		
	CO4	3	3	2	-	-	-	-	-	-	-	-		3		
	CO5	3	3	2	-	-	-	-	-	-	-	-		3		
COs Vs PS	Os MA	APPI	NG:													
							1		٦							
							PSO1		-							
						CO1 CO2	-	3								
								3	-							
						CO3 CO4		3								
						C04		3								
						05	-	3]							
COURSE C	ONTE	NTS:														
		DDL					C A TH			ODEI					0.11	
AODULE I			ESS C										200-		9 Ho	
Propagation																
mall scale f																
						-1 <u>5</u> 11,	meiail	, ₁ var	ugann	,	nposit	~ T'd	a milit	5 51	14400	, mg
)istributions	Link	nowe	r hudoe	et Anal	vsis											
oistributions IODULE I						SS CH	ANNF	LS							9 Hoi	urs

MODULE III DIVERSITY

Realization of independent fading paths, Receiver Diversity: selection combining, Threshold Combining, Maximum-ratio Combining, Equal gain Combining. Transmitter Diversity: Channel known at transmitter, channel unknown at the transmitter

MODULE IV MIMO COMMUNICATIONS

Narrowband MIMO model, Parallel decomposition of the MIMO channel, MIMO channel capacity, MIMO Diversity Gain: Beam forming, Diversity-Multiplexing trade-offs, Space time Modulation and coding : STBC,STTC, Spatial Multiplexing and BLAST Architectures.

MODULE V MULTI USER SYSTEMS

Review of Multiple Access Techniques, Scheduling, power control, Uplink and Downlink channel capacity, multiuser diversity, MIMO-MU systems.

TOTAL: 45 HOURS

REFERENCES:

- 1. Andrea Goldsmith, Wireless Communications, Cambridge University Press, 2007.
- 2. Harry R. Anderson, Fixed Broadband Wireless System Design John Wiley India, 2003. Education 2009.
- 3. Andreas.F. Molisch, Wireless Communications, John Wiley India, 2006.
- 4. Simon Haykin& Michael Moher, Modern Wireless Communications^{II}, Pearson Education, 2007.
- 5. Rappaport. T.S., Wireless communications, Pearson Education, 2003.
- 6. Gordon L. Stuber, Principles of Mobile Communication, Springer International Ltd., 2001.
- 7. UpenaDalal, —Wireless Communication Oxford Higher

9 Hours

9 Hours

9 Hours

2402CO203		А	DVAN	NCED	DIGI	FAL S	IGNA	L PRO	DCESS	SING			L 3	T 0	P 0	C 3
DDEDEAU	ISITE.												3	U	U	3
PREREQUI	1511E:															
	1.		nals an													
	2.	Digi	tal Sig	nal Pro	ocessin	ıg										
COURSE O	BJEC	TIVE	S:													
	1.	Тое	vnlore	the co	ncents	of mu	lti rate	signal	nroces	sing a	nd mi	ilti rat	te fi	lters		
	2.					of mu				sing a	nu mu	4111 I au		11015.		
	3.	To k	now al	bout Li	inear a	nd Pre	diction	conce	epts.							
	4.					lters ar										
	5.	Tol	earn fu	ndame	ental co	oncepts	s on sig	gnal pro	ocessir	ıg ın p	owers	spectr	um	estima	ation.	
COURSE O	UTCC	OMES	:													
On	the suc	aasti	1.0000	lation	oftho	2011#22	atuda	nta wi	ll bo ok	lata						
	Design															
CO2:	Design	n multi	i rate fi	ilter ba	nk and	l acqui	res kno	wledg	ge of ho	ow a m	ulti ra	ate sys	sten	1 work		
	Compu															
												channe	el e	qualiza	ation.	
CO5:	Constr	uct di	fferent	Power	spect	rum est	timatic	n metr	lods ar	id solu	tions					
COs Vs PC	Ds MA	PPIN	G:													
	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1) PO1	1 P	012		
	CO1	3	3	3	-	-	-	-	-	-	-	-		3		
	CO2	3	3	3	-	-	-	-	-	-	-	-		3		
	CO3 CO4	3	3	3	-	-	-	-	-	-	-	-	_	3		
	C04	3	3	3	-	-	-	-	-	-	-	-		3		
COs Vs PS	SOs MA	APPIN	NG:													
						COs	PSO1	PSO2	I							
						C03	-	-	-							
						CO2	-	-								
						CO3	-	-								
						CO4		-								
						C05	-	-								
COURSE C	ONTE	NTS:														
MODULE I	Μ	JLTH	RATE	DIGI	TAL S	IGNA	L PRO	OCESS	SING					0) Hou	irs
Introduction factor – inter structures – 1 Multistage d	-Sampl polatio FIR stru	ing an on by a ucture	d Sign in integ s with	al Rec ger fact time va	onstru tor –Sa arying	ction-S ampling coeffic	amplin g rate o	ng rate convers	conve sion by	a rati	onal fa	actor -	– pc	y an in oly-pha	teger ase FI	R

MODULE II MULTIRATE FIR FILTER DESIGN

Design of FIR filters for sampling rate conversion – Applications of Interpolation and decimation in signal processing – Filter bank implementation – Two channel filter banks-OMF filter banks – Perfect Reconstruction Filter banks – tree structured filter banks - DFT filter Banks – M-channel filter banks-octave filter banks. 9 Hours

MODULE III LINEAR ESTIMATION AND PREDICTION

Linear prediction- Forward and backward predictions, Solutions of the Normal equations- Levinson-Durbin algorithms. Least mean squared error criterion -Wiener filter for filtering and prediction, FIR Wiener filter and Wiener IIR filters, Discrete Kalman filter.

MODULE IV DESIGN OF ADAPTIVE FILTERS

FIR Adaptive filters - Newton's steepest descent method – Adaptive filters based on steepest descent method -LMS Adaptive algorithm – other LMS based adaptive filters- RLS, Exponentially weighted RLS - Sliding window RLS – Simplified IIR Application: channel equalization, noise cancellation, prediction.

POWER SPECTRAL ESTIMATION MODULE V

Estimation of spectra from finite duration observations of a signal – The Period gram-Use of DFT in Power spectral Estimation - Non-Parametric methods for Power spectrum Estimation - Bartlett. Welch and Blackman–Tukey methods – Comparison of performance of Non – Parametric power spectrum Estimation methods –Parametric Methods - Relationship between auto correlation and model parameters, Yule-Walker equations, solutions using Durbin's algorithm, AR, MA, ARMA model based spectral estimation.

TOTAL: 45 HOURS

REFERENCES:

H. Monson Hayes, Statistical Digital Signal Processing and Modeling, John Wiley and Sons, Inc., 2008. 1.

G.. John Proakis and G. DimitrisManolakis, Digital Signal Processing, Pearson Education, 2006. 2.

P.P.Vaidyanathan, Multirate Systems and Filter Banks, Pearson Education, 2008. 3.

N.J.Filege, Multirate Digital Signal Processing, John Wiley and Sons, 2000. 4.

G..JohnProakis, Algorithms for Statistical Signal Processing, Pearson Education, 2002. 5.

Sophoncles J. Orfanidis, Optimum Signal Processing, McGraw Hill, 2007. 6.

9 Hours

9 Hours

9 Hours

M.E. Communication systems | E.G.S. Pillay Engineering College (Autonomous) Regulations 2024 Approved in 11th Academic Council Meeting Held on 09.01.2024

2403CO009				VIRE	LESS :	SENS	OR NE	TWO	RKS			Ι	T	P	C
1				V INE		SEIIS		1.00	INING			3		0	3
														U	U
PREREQUI	ISITE	:													
1		<u> </u>		NT - 4											
	1.		nputer] eless C			'n									
	3.		bedded												
	<u> </u>		sor Net				cessin	σ							
	т.	Jent		works			00055111	5							
COURSE O	BJEC	TIVE	S:												
			nake sti								or Netv	vorks.			
			amiliar												
			ndersta												
	4.		-	e desig	n cons	ideratio	on of to	opolog	y conti	ol and	soluti	on to th	ne vario	ous	
		1	olems.	.1 .	1		0		0	1.	1				
	5.	10 ii	ntroduc	e the h	hardwa	re and	softwa	ire plat	torms	and to	ol in W	SN.			
COURSE O)MES	•												
		21111120	•												
On 1	the suc	cessfi	ıl com	oletion	of the	course	, stude	nts wi	ll be at	le to					
CO1:			erstand								vorks				
CO2:			erstand												
CO3:	3.	Desc	ribe th	e com	nunica	tion, e	nergy o	efficie	ncy, co	mputi	ng, sto	rage an	d trans	missio	n
CO4 :			blishing												
CO5:	5.	Expl	ain the	conce	pt of p	rogran	ming	the in V	WSN e	nviron	ment				
COs Vs PC)e MA	DDIN	C.												
	75 WIA	1 1 111	U .												
Γ	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		
-	CO1	3	3	3	3	3	-	-	3	3	-	3	3		
r	CO2	3	3	3	3	3	-	-	3	3	-	3	3		
	CO3	3	3	3	3	3	-	-	3	3	-	3	3		
-		2		3	3	3	-	-	3	3		3	3		
	CO4				3	3	-	_	3	3	-	3	3		
		3	3	3	3	3	-	-	3	3	-	3	3		
COs Vs PS	CO4 CO5	3	3		3	3	-	-	3	3	-	3	3		
COs Vs PS	CO4 CO5	3	3		3	3	-	-	3	3	-	3	3		
COs Vs PS	CO4 CO5	3	3			3 Os PS	- 01 PS	- 02 PS		3	-	3	3		
COs Vs PS	CO4 CO5	3	3		C	Os PS O1	O1 PS	- 3		3	-	3	3		
COs Vs PS	CO4 CO5	3	3		C C C	Os PS 01 02	01 PS	- 3 - 3		3	-	3	3		
COs Vs PS	CO4 CO5	3	3		C C C C	Os PS 01 02 03	-	- 3 - 3 - 3		3	-	3	3		
COs Vs PS	CO4 CO5	3	3			Os PS O1 O2 O3 O4	01 PS	- 3 - 3 - 3 - 3		3	-	3	3		
COs Vs PS	CO4 CO5	3	3			Os PS 01 02 03	-	- 3 - 3 - 3		3	-	3	3		
	CO4 CO5	3 APPIN	3 NG:			Os PS O1 O2 O3 O4	-	- 3 - 3 - 3 - 3		3	-	3	3		
COs Vs PS	CO4 CO5	3 APPIN	3 NG:			Os PS O1 O2 O3 O4	-	- 3 - 3 - 3 - 3		3	-	3	3		
	CO4 CO5 Os M	3 APPIN	3 NG:	3		Os PS O1 O2 O3 O4 O5	- · · · · · · · · · · · · · · · · · · ·	- 3 - 3 - 3 - 3 - 3	03		-	3	3	9 Ho	urs
COURSE C MODULE I		3 APPIN ENTS: VERV	3 NG: : :	3 DF WI	C C C C C C RELE	Os PS O1 O2 O3 O4 O5 SS SE	- - - - - -	- 3 - 3 - 3 - 3 - 3 - 3	O3	KS	que co				
COURSE C	CO4 CO5 Os M ONTI	3 APPIN ENTS: VERV tecture	3 NG: : : : : : :	3 DF WI vare Co	C C C C C C RELF ompon	Os PS O1 O2 O3 O4 O5 CSS SE ients N	- - - - - - - - - - - - - - - - - - -	- 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3	O3	KS ics uni		nstrair			
COURSE C MODULE I Single Node	CO4 CO5 OS M ONTI ONTI Archit	3 APPIN ENTS: VERV VERV tecture gies fo	3 NG: : : : : : :	3 DF WI vare Co less Se	C C C C C C RELF ompon	Os PS O1 O2 O3 O4 O5 CSS SE ients N	- - - - - - - - - - - - - - - - - - -	- 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3	O3	KS ics uni		nstrair			nges,
COURSE C MODULE I Single Node Enabling Tec	CO4 CO5	3 APPIN ENTS: VERV tecture gies fo RCHIT ure Ser	3 NG: IEW (Hardv or Wire FECTI nsor No	3 DF WI vare Co less Se URES etwork	C C C C C C C C C C C C C C C C C C C	Os PS O1 O2 O3 O4 O5 CSS SE tents N Vetwor arios I	- - - - NSOR etwork ks Typ Design	- 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3	O3 WORI acterist vireless ole, Ph	KS ics uni s senso ysical	or netw Layer	onstrair orks.	tts and ansceiv	challer 9 Hou er Des	nges, urs

M.E. Communication systems | E.G.S. Pillay Engineering College (Autonomous) Regulations 2024 Approved in 11th Academic Council Meeting Held on 09.01.2024

Execution Environments introduction to Tiny OS and nesC Internet to WSN Communication.	
MODULE III NETWORKING SENSORS	9 Hours
MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts	s – SMAC,
BMAC Protocol, IEEE 802.15.4 standard and ZigBee, the Mediation Device Protocol, Wak	eup Radio
Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protoco	ols Energy
Efficient Routing, Geographic Routing.	
MODULE IV INFRASTRUCTURE ESTABLISHMENT	9 Hours

Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control. 9 Hours

MODULE V SENSOR NETWORK PLATFORMS AND TOOLS

Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node level software platforms, Node level Simulators, State centric programming.

TOTAL: 45 HOURS

REFERENCES:

1. Holger Karl & Andreas Willig, "Protocols And Architectures for Wireless Sensor Networks", John Wiley, 2005.

2. Feng Zhao & Leonidas J.Guibas, "Wireless Sensor Networks An Information Processing Approach", Elsevier, 2007.

3. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks Theory and Practice", John Wiley & Sons Publications, 2011

4. Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks Technology, Protocols, and Applications", John Wiley, 2007.

5. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003

M.E. Communication systems | E.G.S. Pillay Engineering College (Autonomous) Regulations 2024 Approved in 11th Academic Council Meeting Held on 09.01.2024

3 0 0 : PREREQUISITE: 1. Computer Networks	2403CO011				М	OBIL	E ADH	IOC N	ETW	ORKS				TJ	P	C	
1. Computer Networks 2. Wireless Communication 3. Mobile Communication 4. Network Routing and Protocols COURSE OBJECTIVES: 1. Understand the basics of Ad-hoc & Sensor Networks 2. Describe various fundamental and emerging protocols of all layers 3. Report the issues pertaining to major obstacles in establishment and efficient management of Ad-hoc and sensor networks 4. Restate the nature and applications of Ad-hoc and Sensor Networks 5. Discuss various security practices and protocols of Ad-hoc and Sensor Networks COURSE OUTCOMES: On the successful completion of the course, students will be able to COURSE OUTCOMES: On the successful completion of the course, students will be able to CO2: Report different protocols developed for ad hoc and sensor networks CO2: Restate the security threats in ad hoc and sensor networks CO3: Restate importance of MAC & TCP in networks CO3: Restate importance of MAC & TCP in networks CO3: S as 3 3 3 3 3 3 3 3 CO3 NO4 PO5 PO6 PO7 PO8 PO9 PO10[PO11[PO11] CO3: S a 3 3 3 3 3 3 3 3 CO3: S a 3 3 3 3 3 3 3 3 CO3: S a 3 3 3 3	240300011				1,1	DIL										3	
1. Computer Networks 2. Wireless Communication 3. Mobile Communication 4. Network Routing and Protocols COURSE OBJECTIVES: 1. Understand the basics of Ad-hoc & Sensor Networks 2. Describe various fundamental and emerging protocols of all layers 3. Report the issues pertaining to major obstacles in establishment and efficient management of Ad-hoc and sensor networks 4. Restate the nature and applications of Ad-hoc and Sensor Networks 5. Discuss various security practices and protocols of Ad-hoc and Sensor Networks COURSE OUTCOMES: On the successful completion of the course, students will be able to COURSE OUTCOMES: On the successful completion of the course, students will be able to CO2: Report different protocols developed for ad hoc and sensor networks CO2: Restate the security threats in ad hoc and sensor networks CO3: Restate importance of MAC & TCP in networks CO3: Restate importance of MAC & TCP in networks CO3: S as 3 3 3 3 3 3 3 3 CO3 NO4 PO5 PO6 PO7 PO8 PO9 PO10[PO11[PO11] CO3: S a 3 3 3 3 3 3 3 3 CO3: S a 3 3 3 3 3 3 3 3 CO3: S a 3 3 3 3															-		
2. Wireless Communication 3. Mobile Communication 4. Network Routing and Protocols COURSE OBJECTIVES: COURSE OBJECTIVES: 2. Describe various fundamental and emerging protocols of all layers 3. Report the issues pertaining to major obstacles in establishment and efficient management of Ad-hoc and sensor networks 4. Restate the nature and applications of Ad-hoc and sensor networks 5. Discuss various security practices and protocols of Ad-hoc and Sensor Networks COURSE OUTCOMES: On the successful completion of the course, students will be able to CO1: Identify different protocols developed for ad hoc and sensor networks CO2: Report different protocols developed for ad hoc and sensor networks CO2: Report different protocols developed for ad hoc and sensor networks CO4: Discuss a Sensor network environment for different type of applications CO4: Discuss a Sensor network environment for different type of applications CO4: DO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 CO3: Restate the security threats in ad hoc and sensor networks CO4: 3 3 3 3 3 3 3 3 CO5: PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 CO3: 3 3 3 3 3 3 3 3	PREREQU	ISITE:															
2. Wireless Communication 3. Mobile Communication 4. Network Routing and Protocols COURSE OBJECTIVES: COURSE OBJECTIVES: 2. Describe various fundamental and emerging protocols of all layers 3. Report the issues pertaining to major obstacles in establishment and efficient management of Ad-hoc and sensor networks 4. Restate the nature and applications of Ad-hoc and sensor networks 5. Discuss various security practices and protocols of Ad-hoc and Sensor Networks COURSE OUTCOMES: On the successful completion of the course, students will be able to CO1: Identify different protocols developed for ad hoc and sensor networks CO2: Report different protocols developed for ad hoc and sensor networks CO2: Report different protocols developed for ad hoc and sensor networks CO4: Discuss a Sensor network environment for different type of applications CO4: Discuss a Sensor network environment for different type of applications CO4: DO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 CO3: Restate the security threats in ad hoc and sensor networks CO4: 3 3 3 3 3 3 3 3 CO5: PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 CO3: 3 3 3 3 3 3 3 3		1	Com	amitan	Natura												
3. Mobile Communication 4. Network Routing and Protocols COURSE OBJECTIVES: 1. Understand the basics of Ad-hoc & Sensor Networks 2. Describe various fundamental and emerging protocols of all layers 3. Report the issues pertaining to major obstacles in establishment and efficient management of Ad-hoc and sensor networks 4. Restate the nature and applications of Ad-hoc and sensor networks 5. Discuss various security practices and protocols of Ad-hoc and Sensor Networks COURSE OUTCOMES: On the successful completion of the course, students will be able to COI: Identify different issues in wireless ad hoc and sensor networks COURSE COUTCOMES: On the successful completion of the course, students will be able to COI: Identify different protocols developed for ad hoc and sensor networks CO2: Report different protocols developed for ad hoc and sensor networks CO3: Restate the security threats in ad hoc and sensor networks CO3: Restate the security threats in ad hoc and sensor networks CO3: Restate the port invorke adveloped for ad hoc and sensor networks CO3: Restate the security threats in ad hoc and sensor networks CO3: Restate the security threats in ad hoc and sensor networks							าท										
4. Network Routing and Protocols COURSE OBJECTIVES: 1. Understand the basics of Ad-hoc & Sensor Networks 2. Describe various fundamental and emerging protocols of all layers 3. Report the issues pertaining to major obstacles in establishment and efficient management of Ad-hoc and sensor networks 4. Restate the nature and applications of Ad-hoc and sensor networks 5. Discuss various security practices and protocols of Ad-hoc and Sensor Networks COURSE OUTCOMES: On the successful completion of the course, students will be able to COI: Identify different issues in wireless ad hoc and sensor networks CO2: Report protocols developed for ad hoc and sensor networks CO2: Report inferent protocols developed for ad hoc and sensor networks CO3: Restate the security threats in ad hoc and sensor networks CO4: Discuss a Sensor network environment for different type of applications CO5: Restate importance of MAC & TCP in networks CO4: DO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10[PO11 PO12] CO3 3 3 3 3 3 3 3 3 CO3 PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10[PO11 PO12] CO4 3 3 3 3 3 3 3 3 CO3 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10[PO11 PO12] CO3 3																	
COURSE OBJECTIVES: 1 Understand the basics of Ad-hoc & Sensor Networks 2 Describe various fundamental and emerging protocols of all layers 3 Report the issues pertaining to major obstacles in establishment and efficient management of Ad-hoc and sensor networks 4 Restate the nature and applications of Ad-hoc and sensor networks 5 Discuss various security practices and protocols of Ad-hoc and Sensor Networks COURSE OUTCOMES: On the successful completion of the course, students will be able to COI: Identify different issues in wireless ad hoc and sensor networks CO2: Report different protocols developed for ad hoc and sensor networks CO3: Restate the security threats in ad hoc and sensor networks CO3: Restate the security threats in ad hoc and sensor networks CO4: Discuss a Sensor network environment for different type of applications CO5: Restate importance of MAC & TCP in networks CO3 3 3 3 3 3 3 3 3 3 CO4 DO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 CO3 3 3 3 3 3 3 3 3 3 CO4 3 3 3 3 3 3 3 3 3 CO4 So PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 CO3 3 3 3 3 3 -								ls									
1. Understand the basics of Ad-hoc & Sensor Networks 2. Describe various fundamental and emerging protocols of all layers 3. Report the issues pertaining to major obstacles in establishment and efficient management of Ad-hoc and sensor networks 4. Restate the nature and applications of Ad-hoc and sensor networks 5. Discuss various security practices and protocols of Ad-hoc and Sensor Networks COURSE OUTCOMES: On the successful completion of the course, students will be able to COURSE OUTCOMES: On the successful completion of the course, students will be able to COURSE OUTCOMES: On the successful completion of the course, students will be able to COURSE OUTCOMES: COURSE COUTEONES: CO2: Report different issues in wireless al hoc and sensor networks CO3: Restate the security threats in ad hoc and sensor networks CO4: Discuss a Sonor network environment for different type of applications CO5: CO5 PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 CO8 PO PO10 PO1 PO2 PO3 3 <td colsp<="" td=""><td></td><td>- т.</td><td>1101</td><td>WOIK IN</td><td>outing</td><td>und i</td><td>101000</td><td>15</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td>	<td></td> <td>- т.</td> <td>1101</td> <td>WOIK IN</td> <td>outing</td> <td>und i</td> <td>101000</td> <td>15</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>		- т.	1101	WOIK IN	outing	und i	101000	15								
2. Describe various fundamental and emerging protocols of all layers 3. Report the issues pertaining to major obstacles in establishment and efficient management of Ad-hoc and sensor networks 4. Restate the nature and applications of Ad-hoc and sensor networks 5. Discuss various security practices and protocols of Ad-hoc and Sensor Networks COURSE OUTCOMES: On the successful completion of the course, students will be able to CO1: Identify different issues in wireless ad hoc and sensor networks CO2: Report different protocols developed for ad hoc and sensor networks CO3: Restate the security threats in ad hoc and sensor networks CO4: Discuss a Sensor network environment for different type of applications CO5: Restate importance of MAC & TCP in networks CO4 3 3 3 3 3 3 3 3 3 3 3 3 CO3 3 3 3 3 3 3 3 3 3 3 3 3 CO4 3 3 3 3 3 3 3 3 3 3 3 3 CO5 Vs PSOs MAPPING: Imagemental Solution of the CO2 3 3 CO3 3 3 3 3 3 3 3 3 3 3 3 3 CO5 vs PSOs MAPPING: Imagemental Solution for the CO2 3 3 CO3 3 C 3 3 CO4 3 3 C 3 3 CO5 3 C -	COURSE O	BJEC	TIVE	S:													
2. Describe various fundamental and emerging protocols of all layers 3. Report the issues pertaining to major obstacles in establishment and efficient management of Ad-hoc and sensor networks 4. Restate the nature and applications of Ad-hoc and sensor networks 5. Discuss various security practices and protocols of Ad-hoc and Sensor Networks COURSE OUTCOMES: On the successful completion of the course, students will be able to CO1: Identify different issues in wireless ad hoc and sensor networks CO2: Report different protocols developed for ad hoc and sensor networks CO3: Restate the security threats in ad hoc and sensor networks CO4: Discuss a Sensor network environment for different type of applications CO5: Restate importance of MAC & TCP in networks CO4 3 3 3 3 3 3 3 3 3 3 3 3 CO3 3 3 3 3 3 3 3 3 3 3 3 3 CO4 3 3 3 3 3 3 3 3 3 3 3 3 CO5 Vs PSOs MAPPING: Imagemental Solution of the CO2 3 3 CO3 3 3 3 3 3 3 3 3 3 3 3 3 CO5 vs PSOs MAPPING: Imagemental Solution for the CO2 3 3 CO3 3 C 3 3 CO4 3 3 C 3 3 CO5 3 C -																	
3. Report the issues pertaining to major obstacles in establishment and efficient management of Ad-hoc and sensor networks 4. Restate the nature and applications of Ad-hoc and sensor networks 5. Discuss various security practices and protocols of Ad-hoc and Sensor Networks COURSE OUTCOMES: On the successful completion of the course, students will be able to COURSE OUTCOMES: On the successful completion of the course, students will be able to CO2: Report different protocols developed for ad hoc and sensor networks CO2: Restate the security threats in ad hoc and sensor networks CO3: Restate timportance of MAC & TCP in networks COs Vs POs MAPPING: Cos Vs POs MAPPING: Cos Vs PSOs MAPPING: COs PS																	
management of Ad-hoc and sensor networks 4. Restate the nature and applications of Ad-hoc and sensor networks 5. Discuss various security practices and protocols of Ad-hoc and Sensor Networks COURSE OUTCOMES: On the successful completion of the course, students will be able to CO1: Identify different issues in wireless ad hoc and sensor networks CO2: Report different protocols developed for ad hoc and sensor networks CO3: Restate the security threats in ad hoc and sensor networks CO4: Discuss a Sensor network environment for different type of applications CO5: Restate importance of MAC & TCP in networks COs Vs POs MAPPING: Cos Vo POs MAPPING: Cos Vs PSos MAPPING: OS Vs PSos MAPPING: OS Vs PSOs MAPPING: Cos Vs PSos MAPPING: OS Vs PSos MAPPING:																	
4. Restate the nature and applications of Ad-hoc and sensor networks 5. Discuss various security practices and protocols of Ad-hoc and Sensor Networks COURSE OUTCOMES: On the successful completion of the course, students will be able to COIT: Identify different issues in wireless ad hoc and sensor networks CO2: Report different protocols developed for ad hoc and sensor networks CO3: Restate the security threats in ad hoc and sensor networks CO4: Discuss a Sensor network environment for different type of applications CO5: Restate importance of MAC & TCP in networks CO5 VS POS MAPPING: COS VS POS MAPPING: COS VS POS MAPPING: COS VS PSOS MAPPING: COS VS PSOS MAPPING: COS PSO1 PSO2 PSO3 CO1 3 CO3 3 CO3 3 CO3 3 CO3 3 CO4 3 CO3 3 CO4 3 CO5 3 COURSE CONTENTS: POINDULE 1 MAC & TCP IN AD HOC NETWORKS POINDULE 1 MAC & TCP protocols for Ad-Hoc Wireless Networks - Contention Base Protocols for Ad-Hoc Wireless Networks - Contention Base Protocols or CP over Ad-Hoc networks-TCP protocol overvice - TCP and MANETs - Solutions for											s in es	tablish	ment a	nd effic	ient		
5. Discuss various security practices and protocols of Ad-hoc and Sensor Networks COURSE OUTCOMES: On the successful completion of the course, students will be able to CO1: Identify different issues in wireless ad hoc and sensor networks CO2: Report different protocols developed for ad hoc and sensor networks CO3: Restate the security threats in ad hoc and sensor networks CO4: Discuss a Sensor network environment for different type of applications CO5: Restate importance of MAC & TCP in networks CO61: 3 3 CO5 Restate importance of MAC & TCP in networks CO3: 3 3 CO3: 3 3 CO4: 3 3 CO3: 3 3 CO4: 3 3 CO3: 3 3 CO4: 3 3 CO4: 3 3 CO3: 3 3 CO4: 3 3 CO5: 3 3 CO4: - 3				Ŭ													
COURSE OUTCOMES: On the successful completion of the course, students will be able to COURSE OUTCOMES: COURSE out different issues in wireless ad hoc and sensor networks CO2: Report different protocols developed for ad hoc and sensor networks CO2: Report different protocols developed for ad hoc and sensor networks CO2: Report different protocols developed for ad hoc and sensor networks CO4: Discuss a Sensor network environment for different type of applications CO5: Restate importance of MAC & TCP in networks CO5 Vs POS MAPPING: CO3 3 3 3 3 3 3 3 3 CO3 3 3 3 3 3 3 3 3 CO4 3 3 3 3 3 3 3 3 3 CO4 3 3 3 3 3 3 3 3 3 CO4 3 3 3 3 3 3 3 3 3 CO5 3 3 3 3 3 3 3 3 3 CO5 Vs PSOs MAPPING: CO5 Vs PSOs MAPPING: CO4 3 3 3 3 3 3 3 CO5 S 3 3 3 3 3 3 3 CO5 3 CO1 3 CO2 3 CO2 3 CO2 3 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>1</td></t<>																1	
On the successful completion of the course, students will be able to CO1: Identify different issues in wireless ad hoc and sensor networks CO2: Report different protocols developed for ad hoc and sensor networks CO3: Restate the security threats in ad hoc and sensor networks CO4: Discuss a Sensor network environment for different type of applications CO5: Restate importance of MAC & TCP in networks CO5: Vs POS MAPPING: COS V9 PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 CO3 3 3 3 3 3 3 3 3 CO2 3 3 3 3 3 3 3 3 3 CO2 3 3 3 3 3 3 3 3 3 CO4 3 3 3 3 3 3 3 3 CO4 3 3 3 3 3 3 3 3 CO4 3 3 3 3 3 3 3 3 CO5 Vs PSOs MAPPING: COs Vs PSOs MAPPING:			5.	Discus	s varic	us sec	urity p	ractice	es and p	orotoco	ols of A	Ad-hoc	and Se	ensor N	etwor	KS	
On the successful completion of the course, students will be able to CO1: Identify different issues in wireless ad hoc and sensor networks CO2: Report different protocols developed for ad hoc and sensor networks CO3: Restate the security threats in ad hoc and sensor networks CO4: Discuss a Sensor network environment for different type of applications CO5: Restate importance of MAC & TCP in networks CO5: Vs POS MAPPING: COS V9 PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 CO3 3 3 3 3 3 3 3 3 CO2 3 3 3 3 3 3 3 3 3 CO2 3 3 3 3 3 3 3 3 3 CO4 3 3 3 3 3 3 3 3 CO4 3 3 3 3 3 3 3 3 CO4 3 3 3 3 3 3 3 3 CO5 Vs PSOs MAPPING: COs Vs PSOs MAPPING:	CUIBEEN	UTCO	MFS														
CO1: Identify different issues in wireless ad hoc and sensor networks CO2: Report different protocols developed for ad hoc and sensor networks CO3: Restate the security threats in ad hoc and sensor networks CO4: Discuss a Sensor network environment for different type of applications CO5: Restate importance of MAC & TCP in networks CO5 VS POS MAPPING: COs Vo POS PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 CO3 3 3 3 3 3 3 3 3 CO3 CO3 3 3 3 3 3 3 3 3 CO3 CO3 3 3 3 3 3 3 3 3 CO4 3 3 3 3 3 3 3 3 CO4 3 3 3 3 3 3 3 3 CO4 3 3 3 3 3 3 3 3 CO5 VS PSOs MAPPING: COs (CO1 3) CO3 (CO1 3) CO5 (CO1 3) </td <td></td>																	
CO1: Identify different issues in wireless ad hoc and sensor networks CO2: Report different protocols developed for ad hoc and sensor networks CO3: Restate the security threats in ad hoc and sensor networks CO4: Discuss a Sensor network environment for different type of applications CO5: Restate importance of MAC & TCP in networks CO5 VS POS MAPPING: COs Vo POS PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 CO3 3 3 3 3 3 3 3 3 CO3 CO3 3 3 3 3 3 3 3 3 CO3 CO3 3 3 3 3 3 3 3 3 CO4 3 3 3 3 3 3 3 3 CO4 3 3 3 3 3 3 3 3 CO4 3 3 3 3 3 3 3 3 CO5 VS PSOs MAPPING: COs (CO1 3) CO3 (CO1 3) CO5 (CO1 3) </td <td>On</td> <td>the suc</td> <td>cessfi</td> <td>ul com</td> <td>oletion</td> <td>of the</td> <td>course</td> <td>e, stud</td> <td>ents wi</td> <td>ll be al</td> <td>ole to</td> <td></td> <td></td> <td></td> <td></td> <td></td>	On	the suc	cessfi	ul com	oletion	of the	course	e, stud	ents wi	ll be al	ole to						
CO3: Restate the security threats in ad hoc and sensor networks CO4: Discuss a Sensor network environment for different type of applications CO5: Restate importance of MAC & TCP in networks CO5: Restate importance of MAC & TCP in networks CO5 VS POS MAPPING: CO3 3 3 3 3 3 3 3 3 3 CO3 3 3 3 3 3 3 3 3 CO3 3 3 3 3 3 3 3 3 CO4 3 3 3 3 3 3 3 3 CO4 3 3 3 3 3 3 3 3 CO4 3 3 3 3 3 3 3 3 CO4 3 3 3 3 3 3 3 3 CO4 3 3 3 3 3 3 3 3 CO5 VS PSOs MAPPING: COs Vs PSOs MAPPING: COs Vs PSOs MAPPING: COs Vs PSOs MAPPING: CO3 3 CO4 3 CO5 3 COURSE CONTENTS: <th c<="" td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></th>	<td></td>																
CO4: Discuss a Sensor network environment for different type of applications CO5: Restate importance of MAC & TCP in networks COs Vs POs MAPPING: COs Vs POs MAPPING: CO1 3 3 3 3 3 3 3 3 3 3 CO2 3 3 3 3 3 3 3 3 3 CO3 3 3 3 3 3 3 3 3 3 CO4 3 3 3 3 3 3 3 3 3 CO5 3 3 3 3 3 3 3 3 3 COs Vs PSOs MAPPING: COURSE CONTENTS: MODULE I MAC & TCP IN AD HOC NETWORKS 9 Hours Fundamentals of WLANS – IEEE 802.11 Architecture - Self configuration and Auto configuration-Issue n Ad-Hoc Wireless Networks – MAC Protocols for Ad-Hoc Wireless Networks – Contention Base Protocols - TCP over Ad-Hoc networks-TCP protocol overview - TCP and MANETs – Solutions fo	CO2:	Report	diffe	rent pi	otocol	s deve	loped	for ad	hoc and	d senso	or netw	/orks					
COS: Restate importance of MAC & TCP in networks COS VS POS MAPPING: COS VS POS MAPPING: CO2 3 3 3 3 3 3 3 3 3 3 3 CO2 3 3 3 3 3 3 3 3 3 3 CO3 3 3 3 3 3 3 3 3 3 CO3 3 3 3 3 3 3 3 3 3 CO4 3 3 3 3 3 3 3 3 3 CO5 3 3 3 3 3 3 3 3 3 CO5 3 3 3 3 3 3 3 3 3 CO5 3 3 3 3 3 3 3 3 3 CO5 3 3 CO2 3 CO2 3 CO2 3 CO2 3 CO3 3 CO3 3 CO3 3 CO4 3 CO5 3 COURSE CONTENTS: MODULE 1 MAC & TCP IN AD HOC NETWORKS 9 Hours Planers Planers Planers Planers Planers Planers Planers																	
Cos vs POs MAPPING: COs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 CO1 3 3 3 3 - - - - 3 3 CO2 3 3 3 3 - - - - 3 3 CO3 3 3 3 3 - - - - 3 3 CO4 3 3 3 3 - - - - 3 3 CO5 3 3 3 3 - - - - 3 3 CO5 3 3 3 3 - - - - 3 3 3 - - - - 3 3 3 - - - 3 3 - - - 3 3 CO2 - 3 3 CO2 - 3 3 CO										t type	of app	lication	ns				
Cos POI PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 CO1 3 3 3 3 - - - - 3 3 CO2 3 3 3 3 - - - - 3 3 CO3 3 3 3 3 - - - - 3 3 CO4 3 3 3 3 - - - - 3 3 CO5 3 3 3 - - - - 3 3 CO5 3 3 3 - - - - 3 3 COs PSOI PSO2 PSO3 - - 3 3 CO1 - - 3 - - 3 3 CO2 - 3	CO5:	Restate	e imp	ortance	of MA	AC & '	TCP in	netwo	orks								
Cos POI PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 CO1 3 3 3 3 - - - - 3 3 CO2 3 3 3 3 - - - - 3 3 CO3 3 3 3 3 - - - - 3 3 CO4 3 3 3 3 - - - - 3 3 CO5 3 3 3 - - - - 3 3 CO5 3 3 3 - - - - 3 3 COs PSOI PSO2 PSO3 - - 3 3 CO1 - - 3 - - 3 3 CO2 - 3	CO LI DI		DDIN	G													
COI 3 3 3 3 - - - - - 3 3 CO2 3 3 3 3 3 3 - - - - - 3 3 3 - - - - - 3 3 3 - - - - - 3 3 3 - - - - - 3 3 - - - - - 3 3 - - - - - - 3 3 - - - - - - 3 3 - - - - - 3 3 - - - - - 3 3 - - - 3 3 - - - - 3 3 - - - 3 - - - 3 - - - 3 - - - 3 - - - -<	COS VS PC	JS MA	PPIN	G:													
COI 3 3 3 3 - - - - - 3 3 CO2 3 3 3 3 3 3 - - - - - 3 3 3 - - - - - 3 3 3 - - - - - 3 3 3 - - - - - 3 3 - - - - - 3 3 - - - - - - 3 3 - - - - - - 3 3 - - - - - 3 3 - - - - - 3 3 - - - 3 3 - - - - 3 3 - - - 3 - - - 3 - - - 3 - - - 3 - - - -<		COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1(PO11	PO12			
$ \begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$							_	-	-	-	-	-	_				
$ \begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$		CO2	3	3	3	3	3	-	-	-	-	-	3	3			
COS 3 3 3 3 - - - - 3 3 COs Vs PSOs MAPPING: COs Vs PSOs MAPPING: COs Vs PSOs MAPPING: COs Vs PSOs MAPPING: COURSE CONTENTS: COURSE CONTENTS: MODULE I MAC & TCP IN AD HOC NETWORKS 9 Hours Fundamentals of WLANs – IEEE 802.11 Architecture - Self configuration and Auto configuration-Issue n Ad-Hoc Wireless Networks – MAC Protocols for Ad-Hoc Wireless Networks – Contention Based Protocols - TCP over Ad-Hoc networks-TCP protocol overview - TCP and MANETs – Solutions fo		CO3	3	3	3	3	3	-	-	-	-	-	3	3			
COS VS PSOS MAPPING: COs VS PSOS MAPPING: COS VS PSOS MAPPING: CO2 3 CO2 3 CO2 3 CO3 3 CO4 3 COURSE CONTENTS: MODULE I MAC & TCP IN AD HOC NETWORKS Fundamentals of WLANs – IEEE 802.11 Architecture - Self configuration and Auto configuration-Issue n Ad-Hoc Wireless Networks – MAC Protocols for Ad-Hoc Wireless Networks – Contention Based Protocols - TCP over Ad-Hoc networks-TCP protocol overview - TCP and MANETs – Solutions for						3		-	-	-	-	-					
COs PSO1 PSO2 PSO3 CO1 - - 3 CO2 - - 3 CO3 - - 3 CO4 - - 3 CO5 - - 3 COURSE CONTENTS: 9 Hours Fundamentals of WLANs – IEEE 802.11 Architecture - Self configuration and Auto configuration-Issue n Ad-Hoc Wireless Networks – MAC Protocols for Ad-Hoc Wireless Networks – Contention Based Protocols - TCP over Ad-Hoc networks-TCP protocol overview - TCP and MANETs – Solutions for		CO5	3	3	3	3	3	-	-	-	-	-	3	3			
COs PSO1 PSO2 PSO3 CO1 - - 3 CO2 - - 3 CO3 - - 3 CO4 - - 3 CO5 - - 3 COURSE CONTENTS: 9 Hours Fundamentals of WLANs – IEEE 802.11 Architecture - Self configuration and Auto configuration-Issue n Ad-Hoc Wireless Networks – MAC Protocols for Ad-Hoc Wireless Networks – Contention Based Protocols - TCP over Ad-Hoc networks-TCP protocol overview - TCP and MANETs – Solutions for																	
COs PSO1 PSO2 PSO3 CO1 - - 3 CO2 - - 3 CO3 - - 3 CO4 - - 3 CO5 - - 3 COURSE CONTENTS: 9 Hours Fundamentals of WLANs – IEEE 802.11 Architecture - Self configuration and Auto configuration-Issue n Ad-Hoc Wireless Networks – MAC Protocols for Ad-Hoc Wireless Networks – Contention Based Protocols - TCP over Ad-Hoc networks-TCP protocol overview - TCP and MANETs – Solutions for			APPI	NC													
CO1 - - 3 CO2 - - 3 CO3 - - 3 CO4 - - 3 CO5 - - 3 COURSE CONTENTS: OUDULE I MAC & TCP IN AD HOC NETWORKS 9 Hours Fundamentals of WLANs – IEEE 802.11 Architecture - Self configuration and Auto configuration-Issue 9 Hours rotocols - Self configuration and Auto configuration-Issue Protocols - TCP over Ad-Hoc networks-TCP protocol overview - TCP and MANETs Solutions for	03 1310	05 111	1111														
CO1 - - 3 CO2 - - 3 CO3 - - 3 CO4 - - 3 CO5 - - 3 COURSE CONTENTS: OUDULE I MAC & TCP IN AD HOC NETWORKS 9 Hours Fundamentals of WLANs – IEEE 802.11 Architecture - Self configuration and Auto configuration-Issue 9 Hours rotocols - Self configuration and Auto configuration-Issue Protocols - TCP over Ad-Hoc networks-TCP protocol overview - TCP and MANETs Solutions for						C	COs PS	501 PS	SO2 PS	03							
CO3 - 3 CO4 - 3 CO5 - 3 COURSE CONTENTS: 9 Hours MODULE I MAC & TCP IN AD HOC NETWORKS 9 Hours Fundamentals of WLANs – IEEE 802.11 Architecture - Self configuration and Auto configuration-Issue 9 Hours n Ad-Hoc Wireless Networks – MAC Protocols for Ad-Hoc Wireless Networks – Contention Based Protocols - TCP over Ad-Hoc networks-TCP protocol overview - TCP and MANETs – Solutions for								-									
CO4 - 3 CO5 - 3 COURSE CONTENTS: 9 Hours MODULE I MAC & TCP IN AD HOC NETWORKS 9 Hours Fundamentals of WLANs – IEEE 802.11 Architecture - Self configuration and Auto configuration-Issue 9 Hours r Ad-Hoc Wireless Networks – MAC Protocols for Ad-Hoc Wireless Networks – Contention Based Protocols - TCP over Ad-Hoc networks-TCP protocol overview - TCP and MANETs – Solutions for						C	202	-	- 3								
CO5 - 3 COURSE CONTENTS: 9 Hours MODULE I MAC & TCP IN AD HOC NETWORKS 9 Hours Fundamentals of WLANs – IEEE 802.11 Architecture - Self configuration and Auto configuration-Issue 9 Hours n Ad-Hoc Wireless Networks – MAC Protocols for Ad-Hoc Wireless Networks – Contention Based Protocols - TCP over Ad-Hoc networks-TCP protocol overview - TCP and MANETs – Solutions for						C	203	-	- 3								
COURSE CONTENTS: MODULE I MAC & TCP IN AD HOC NETWORKS 9 Hours Fundamentals of WLANs – IEEE 802.11 Architecture - Self configuration and Auto configuration-Issue 9 Hours n Ad-Hoc Wireless Networks – MAC Protocols for Ad-Hoc Wireless Networks – Contention Based 9 Hours Protocols - TCP over Ad-Hoc networks-TCP protocol overview - TCP and MANETs – Solutions for								-	- 3								
MODULE I MAC & TCP IN AD HOC NETWORKS 9 Hours Fundamentals of WLANs – IEEE 802.11 Architecture - Self configuration and Auto configuration-Issue 9 Hours n Ad-Hoc Wireless Networks – MAC Protocols for Ad-Hoc Wireless Networks – Contention Based 9 Hours Protocols - TCP over Ad-Hoc networks-TCP protocol overview - TCP and MANETs – Solutions for						C	205	-	- 3								
MODULE I MAC & TCP IN AD HOC NETWORKS 9 Hours Fundamentals of WLANs – IEEE 802.11 Architecture - Self configuration and Auto configuration-Issue 9 Hours n Ad-Hoc Wireless Networks – MAC Protocols for Ad-Hoc Wireless Networks – Contention Based 9 Hours Protocols - TCP over Ad-Hoc networks-TCP protocol overview - TCP and MANETs – Solutions for						•		•									
MODULE I MAC & TCP IN AD HOC NETWORKS 9 Hours Fundamentals of WLANs – IEEE 802.11 Architecture - Self configuration and Auto configuration-Issue 9 Hours n Ad-Hoc Wireless Networks – MAC Protocols for Ad-Hoc Wireless Networks – Contention Based 9 Hours Protocols - TCP over Ad-Hoc networks-TCP protocol overview - TCP and MANETs – Solutions for	COURCE -	01	N TOP O														
Fundamentals of WLANs – IEEE 802.11 Architecture - Self configuration and Auto configuration-Issue n Ad-Hoc Wireless Networks – MAC Protocols for Ad-Hoc Wireless Networks – Contention Based Protocols - TCP over Ad-Hoc networks-TCP protocol overview - TCP and MANETs – Solutions for	COURSE C	UNTE	NTS	:													
Fundamentals of WLANs – IEEE 802.11 Architecture - Self configuration and Auto configuration-Issue n Ad-Hoc Wireless Networks – MAC Protocols for Ad-Hoc Wireless Networks – Contention Based Protocols - TCP over Ad-Hoc networks-TCP protocol overview - TCP and MANETs – Solutions for		ъ. г. 4		TOP		IIOC	NIE	VODI	76						0 11-		
n Ad-Hoc Wireless Networks – MAC Protocols for Ad-Hoc Wireless Networks – Contention Based Protocols - TCP over Ad-Hoc networks-TCP protocol overview - TCP and MANETs – Solutions fo										onfirm	rotion	and A		figurat			
Protocols - TCP over Ad-Hoc networks-TCP protocol overview - TCP and MANETs - Solutions fo																	
ΓCP over Ad-Hoc Networks					netwe	11.2-1	ci più	10001		··· -		110 IVI/	1111719	- 501	anons	101	

MODULE II ROUTING IN AD HOC NETWORKS

Routing in Ad-Hoc Networks- Introduction-Topology based versus Position based Approaches-Proactive, Reactive, Hybrid Routing Approach-Principles and issues – Location services - DREAM – Quorums based location service – Grid – Forwarding strategies – Greedy packet forwarding – Restricted directional flooding-Hierarchical Routing- Issues and Challenges in providing QoS.

MODULE III MAC, ROUTING & QOS IN WIRELESS SENSOR NETWORKS

Introduction – Architecture - Single node architecture – Sensor network design considerations – Energy Efficient Design principles for WSNs – Protocols for WSN – Physical Layer : Transceiver Design considerations – MAC Layer Protocols – IEEE 802.15.4 Zigbee – Link Layer and Error Control issues - Routing Protocols – Mobile Nodes and Mobile Robots - Data Centric & Contention Based Networking – Transport Protocols & QOS – Congestion Control issues – Application Layer support.

MODULE IV SENSOR MANAGEMENT

Sensor Management - Topology Control Protocols and Sensing Mode Selection Protocols - Time synchronization - Localization and positioning – Operating systems and Sensor Network programming – Sensor Network Simulators

MODULE V SECURITY IN AD HOC AND SENSOR NETWORKS

Security in Ad-Hoc and Sensor networks – Key Distribution and Management – Software based Anti-tamper techniques – water marking techniques – Defense against routing attacks - Secure Adhoc routing protocols – Broadcast authentication WSN protocols – TESLA – Biba – Sensor Network Security Protocols – SPINS

REFERENCES:

- 1. Adrian Perrig, J. D. Tygar, "Secure Broadcast Communication: In Wired and Wireless Networks", Springer, 2006
- 2. Carlos De MoraisCordeiro, Dharma Prakash Agrawal "Ad Hoc and Sensor Networks: Theory and Applications (2nd Edition), World Scientific Publishing, 2011
- 3. C.Siva Ram Murthy and B.S.Manoj, "Ad Hoc Wireless Networks Architectures and Protocols", Pearson Education, 2004
- 4. C.K.Toh, "Ad Hoc Mobile Wireless Networks", Pearson Education, 2002
- 5. ErdalÇayırcı, ChunmingRong, "Security in Wireless Ad Hoc and Sensor Networks", John Wiley and Sons, 2009.

9 Hours

9 Hours

9 Hours

9 Hours

TOTAL: 45 HOURS

2402CO204		W	IREL	ESS C		UNIC. ABOR			D NET	WOR	KS	-	L		Р	C
													0 0)	4	2
PREREQUIS	SITE:															
							1									
		2. V	Vireles	s Com	munic	ation L	ab									
COURSE OF	RIE <i>C</i>	TIVE	<u>S</u> .													
			~•													
		1. 7	To stud	v the r	etwork	c simul	ators f	or imp	lemen	tation	of diffe	erent la	avered	l pro	otocc	ols
			o Imp										5	1		
			To perf							netwo	rk prot	ocols,	Mobi	lity	mod	el
			•								•					
COURSE OU	JTCO	MES	:													
041			.1	1.4	. f 41		1.		11 1 1	1.4.						
CO1			l comp								m	ontion	avator	20		
C01			he wire								IIIIuIII	Jation	systen	115.		
CO2	_	0	perfori						5.							
CO4		si une	he IP a	nd TC	$\frac{01100}{P}$	ic in st	atic an	s. d mob	ile adh	oc net	work					
C05			the co					u moo	iie aan		WOIK.					
CO6			the di													
	- 1511	1141414	, the at		10000	5 41501										
COs Vs POs	s MA	PPIN	G:													
_								_				1		_		
	COs		PO2	PO3	PO4	PO5	PO6				PO10		_	2		
	<u>CO1</u>	3	3	3	3	3	-	-	3	3	-	3	3	_		
	<u>CO2</u>	3	3	3	3	3	-	-	3	3	-	3	3	_		
	<u>CO3</u>	3	-	3	3	3	-	-		3	-		3	_		
	CO4	3	3	3	3	3	-	-	3	3	-	3	3	_		
	CO5	3	3	3	3	3	-	-	3	3	-	3	3	_		
	CO6	3	3	3	3	3	-	-	3	3	-	3	3			
COs Vs PSC	Ds M/	APPI	NG:													
000 10100	0.0 1.11															
						COs	PSO1	PSO2]							
						CO2	-	3	1							
						CO3	-	3	1							
						CO4	-	3	1							
						CO5	-	3	1							
						CO6	-	3								
IST OF EX	PERI	MEN	TS:													
												~				
					·	netwo	rk in o	pen so		mulato	or and j	perform	mance	ana	lysi	5
			ementa													
2. Simul	lation	of Dis	stance '	Vector	and L	ink stat	te rout	ing in 1	NS2							
2. Simul 3. Simul	lation lation	of Dis of a n	stance ` nulticas	Vector st routi	and L	ink stat chanisr	te rout n in N	ing in 1 S2								
2.Simul3.Simul4.Simul	lation lation lation	of Dis of a n and P	stance ` nulticas erform	Vector st routi ance a	and L	ink stat chanisr	te rout n in N	ing in 1 S2		based	on Th	rough	put, P	DR,	Ave	erag
2. Simul 3. Simul 4. Simul End to	lation lation lation o End	of Dis of a n and P delay	stance ` nulticas erform and Jit	Vector st routi ance a tter	and L ng meo nalysis	ink stat chanisr s of IEF	te rout n in N EE 802	ing in 3 S2 2.11 ne	tworks						Ave	erag
 Simul Simul Simul Simul End to Simul 	lation lation lation o End lation	of Dis of a n and P delay of IEI	stance ` nulticas erform	Vector st routi ance a tter .11 ne	and L ng mee nalysis	ink stat chanisr s of IEF with N	te rout n in N EE 802 Aobilit	S2 S2 S2 S2 S2 S2 S2 S2 S2 S2 S2 S2 S2 S	tworks						Ave	erag

6. Simulation and Performance analysis of IEEE 802.16 WiMAX networks

- 7. Design and Simulation of Handover mechanism in WiMAX systems and performance analysis based on Packets sent and received
- 8. Simulation and Performance analysis of Table Driven routing protocol in Mobile Ad Hoc Networks
- 9. Simulation of On-Demand Routing Protocols in Mobile Adhoc networks and Performance comparison with Table Driven Protocols
- 10. Simulation of a security attack in Wireless Networks and analysis of performance degradation
- 11. Performance analysis of secure routing mechanism in Wireless Networks and study on network performance in the presence of an attack
- 12. Design and simulation of Wireless Sensor Networks using Zigbee and performance analysis based on battery model

Mini Project

- Design of Vehicular Ad Hoc Network and performance analysis based on different Mobility conditions
- Design of Wireless sensor networks for a specific application of Patient Health Monitoring
- Performance analysis and comparison of Battery aware models in Wireless Networks
- Performance evaluation of Medium Access Control in Heterogeneous wireless networks
- Design and simulation of GSM network and their performance analysis

TOTAL: 30 HOURS

REFERENCES:

- 1. K.Nandakumar, R.Anandaraj, "Power Electronics and Drives Laboratory Manual", 2018
- 2. G.K Dubey, "Fundamentals of Electrical Drives", 2nd Edition, Narosa Book Distributors, 2013.
- 3. R. Krishnan, "Electric Motor Drives: Modeling, Analysis and Control", 1st Edition, Pearson Education, 2015.
- 4. Bimal K. Bose, "Modern Power Electronics and AC Drives", 1st Edition, Pearson Education, 2015.

5. https://nptel.ac.in/courses/108/104/108104140/

6. https://in.mathworks.com/matlabcentral/fileexchange?q=electrical+drives

7. https://ied-nitk.vlabs.ac.in/

8. https://em-coep.vlabs.ac.in/List%20of%20experiments.html