

Mohgaon, Wardha Road, Nagpur - 441 108

(An Autonomous Institute)



DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

M.Tech Electronics Engineering (Communication)

NEP Structure & Curriculum

From

Academic Year 2024-25

Vision of Institute

To emerge as a learning Center of Excellence in the National Ethos in domains of Science, Technology and Management

Mission of Institute

[M1]: To strive for rearing standard and stature of the students by practicing high standards of professional ethics, transparency and accountability.

[M2]: To provide facilities and services to meet the challenges of Industry and Society.

[M3]: To facilitate socially responsive research, innovation and entrepreneurship.

[M4]: To ascertain holistic development of the students and staff members by inculcating knowledge and profession as work practices.

Vision of the Department

To emerge as a learning Hub and center of excellence in the domain of Electronics and Communication Engineering.

Mission of the Department

[M1]: To impart quality technical education through effective teaching learning process.

[M2]: To provide a platform for addressing societal issues and challenges encountered by industries.

[M3]: To foster a culture of research and instill innovative and entrepreneurial skills. **[M4]:** To promote lifelong learning in order to foster the holistic development of students and staff through the knowledge and professional ethics.

Program Education Objectives (PEO)

[PEO1]: Demonstrate essential technical skills to identify, analyze and solve problems and design issues in Electronics and Communication Engineering.

[PEO2]: Apply field knowledge, research and professional practices to meet the requirements of industries.

[PEO3]: Imbibe lifelong learning practices and entrepreneurship skills in tune with emerging technologies.

[PEO4]: Inculcate professional ethics and managerial skills to satisfy real life problems for serving the needs of society and environment.

Program Outcomes (PO)

- **1. Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- **2. Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- **3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- **4. Conduct investigations of complex problems:** Use research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- **5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and software tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- **6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- **7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- **8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- **9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- **10.Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **11.Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- **12.Lifelong learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change

(An Autonomous Institute Affiliated to RTM Nagpur University, Nagpur)

NEP Autonomy Scheme of Instructions and Syllabus

Scheme of Instructions for First Year M. Tech. Programme in Electronics Engineering (Communication)

Sr.	Course	CourseCode	Course Title	т	Т	р	Contact	Cradita	Exam Scheme				
No.	Category	CourseCode	Course The	L	I	ľ	Hrs/week	Creans	CT - 1	CT - 2	TA/AC	ESE	TOTAL
1	PCC	MEC21101	Embedded System Design & Application	4	I	I	4	4	20	20	-	60	100
2	PCC	MEC21102	Digital Communication Technology	4	-	-	4	4	20	20	-	60	100
3	PCC	MEC21103	Adaptive Signal Processing	4	-	-	4	4	20	20	-	60	100
4	PCC	MEC21104	Wireless Sensor Networks	4	-	-	4	4	20	20	-	60	100
5	PEC	MEC21105-7*	Program Elective - I	4	-	-	4	4	20	20	-	60	100
6	PCC	MEC21108	Digital Communication Technology Lab	-	-	2	2	1	-	-	25	25	50
			Total	20	-	2	22	21	100	100	25	325	550

Semester – I (w.e.f.: AY 2024-25)

L-Lecture T-Tutorial P-Practical CT1- Class Test 1 CT2- Class Test 2 TA/CA- Teacher Assessment / Continuous Assessment ESE- End Semester Examination (For Laboratory: End Semester Performance)

*-Indicates out of the 03 course code each student has to select any one Program Elective. PROGRESSIVE TOTAL CREDITS= 21

Chairman Bob (ECE) Cettartment of Electronics & Comm-Tuterramit Galkwad - Part Cottege * Engineering & Technology, Nagura

Jean Academics

Dean Academics Tulsiramji Gaikwad-Patil College Of Engineering and Technology. Nagpur

Vice Runoipai Tulsiramji Galkwad-Patil College Of Engineering & Technology, Nagpur.

Principal

Principal Tulsiramji Gaikwad Patil College Of Engineering and Technology, Nagpur

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Scheme of Instructions for First Year M. Tech. Programme in Electronics Engineering (Communication)

Sr.	Course	Course Code	Course Title	т	т	р	Contact	Cradita		Exam Scheme					
No.	Category	Course Code	Course Thie	L	1	P	Hrs/ week	Creans	CT - 1	CT - 2	TA /CA	ESE	TOTAL		
1	PCC	MEC21201	Optical Communication System	4	-	-	4	4	20	20	-	60	100		
2	PCC	MEC21202	Smart Antenna	4	-	I	4	4	20	20	-	60	100		
3	PCC	MEC21203	Advanced Communication Network	4	-	-	4	4	20	20	-	60	100		
4	PEC	MEC21204-6*	Program Elective-II	4	-	-	4	4	20	20	-	60	100		
5	RM	MEC21207	Research Methodology	4	-	-	4	4	20	20	-	60	100		
6	PCC	MEC21208	Optical Communication System Lab	-	-	2	2	1	-	-	25	25	50		
			Total	20	-	2	22	21	100	100	25	325	550		

Semester – II (w.e.f.: AY 2024-25)

L- Lecture T-Tutorial P-Practical CT1- Class Test 1 CT2- Class Test 2 TA/CA- Teacher Assessment / Continuous Assessment ESE- End Semester Examination (For Laboratory: End Semester Performance)

*-Indicates out of the 03 course code each student has to select any one Professional Elective. PROGRESSIVE TOTAL CREDITS= 21+21 = 42

Chairman BoS (ECE)

Cestartment of Electronics & Committee Tuterram)/ Gallowad - Part Correge * Engineering & Tucontology, Nagres

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Principal Tulsiramji Gaikwad Patil College Of Engineering and Technology, Nagour

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NEP Autonomy Scheme of Instructions and Syllabus

Scheme of Instructions for Second Year M. Tech. Programme in Electronics Engineering (Communication)

Sr.	Cours	C	Course Title	т	т	n	Contact	Cara dita	Exam Scheme				
No.	Category	Course Code Course Title L I P Hrs/week Credits CT -		CT - 1	CT - 2	TA / CA	ESE	TOTAL					
1	PCC	MEC22301	IOT and Application	4	-	-	4	4	20	20	-	60	100
2	PEC	MEC22302\$	MOOCS /NPTEL Courses	-	-	-	-	3	-	-	-	-	-
3	OJT / FP	MEC22303	Project Dissertation Phase- I	-	-	11	11	11	-	-	100	100	200
			Total	4	-	11	15	18	20	20	100	160	300

Semester – III (w.e.f.: AY 2024-25)

Note:

1. In Case, the course offered online are not completely relevant with the topic of dissertation then any course suggested by NASSCOM on recenttechnologies can be opted by candidate.

2. \$ Programme coordinator will provide list of 03 MOOC courses of minimum 12 weeks duration (as per availability). Students are expected to complete any one out of three courses in order to get the required credits.

L- Lecture CT1- Class Test 1 CT2- Class Test 2 T-Tutorial P-Practical TA/CA- Teacher Assessment/Continuous Assessment ESE- End Semester Examination (For Laboratory End Semester performance OJT/FP-On Job Training: Internship/ Apprenticeship

PROGRESSIVE TOTAL CREDITS= 42+18= 60

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NEP Autonomy Scheme of Instructions and Syllabus

Scheme of Instructions for Second Year M. Tech. Programme in Electronics Engineering (Communication)

Semester – IV (w.e.f.: AY 2024-25)

Sr.	Course	Course	Course Title	L T B Cont	Contact	Constitution	Exam Scheme						
No.	Category	Code	Course 1 the	L	I	P	Hrs /week	Creatts	CT - 1	CT - 2	TA /CA	ESE	TOTAL
1	OJT / FP	MEC22401	Project Dissertation Phase- II	-	-	20	20	20	-	-	200	200	400
			Total	-	-	20	20	20	-	-	200	200	400

Note:

TA/CA- Teacher Assessment / Continuous Assessment

ESE- End Semester Examination (For Laboratory: End Semester Performance) OJT/FP-On Job Training: Internship/ Apprenticeship

PROGRESSIVE TOTAL CREDITS= 60+20 = 80

Chairman BoS (ECE)

Cretiantment of Electronics & Committee Tutsman)/ Gallowad - Part College * Engineering & Technology, Nagaria

Dean Academics

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and Technology, Nagpur

Vice Rrincipal Tulsiramji Galkwad-Patil College Of Engineering & Technology, Nagpur.

Principal Tulstramji Gaikwad Patil College Of Engineering and Technology, Nagour

(An Autonomous Institute Affiliated to RTM Nagpur University, Nagpur) NEP Autonomy Scheme of Instructions and Syllabus M. Tech. Programme in Electronics (Communication) Engineering (w.e.f.: AY 2024-25) List of Program Elective Courses

	Semester I	Semester II			
Course Code	Program Elective I	Course Code	Program Elective II		
MEC21105	Active RF Devices and Circuits	MEC21204	Artificial Neural Networks and Application		
MEC21106	Industrial Communication Systems	MEC21205	Satellite Communication		
MEC21107	Telecommunication Networks	MEC21206	Modelling and Simulation Techniques		

Chairman BoD (ECE) O-transment of Electronics & Commu-Tuterram)/ Galkwad - Part College < Engineering & Technology, Nageria

Dean Academics

Dean Academics Tulsiramji Gaikwad-Patil College Of Engineering and Technology, Nagpur

Vice Runcipar

Vice Remotpai Tulsiramji Galkwad-Patil College Of Engineering & Technology, Nagpur.

Principal Tulstramji Gaikwad Patil College Of Engineering and Technology, Nagour

	Tulsiramji Gaikwad-Patil College of Engineering and Technology									
3			Wardha Road, Nagpur-441 108							
		(An Autonomo	NAAC Accredited with A+ Grade us Institute Affiliated to RTM Nagnur U	niversity, Nagn						
Pr	ogran	n: M.Tech Elect	tronics Engineering (Communicati	on)	,					
S	emester	:: I MEC21101: I	Embedded System Design & Application	,						
	Teac	ching Scheme		Examinati	on Scheme					
	Theor	y 4 Hrs/week		CT-I	20 Marks					
	Tutori	al]	CT-II	20 Marks					
Τα	otal Cre	edits 4]	CA						
]	Duratio	n of ESE: 3 Hrs.		ESE	60 Marks					
Pr	Pre-Requisites:Embedded System.Total Marks100 Marks									
Co	ourse O	bjectives:			•					
1.	Stude	nts will analyze the i	need and application of ARM Microprocess	sors in embedded	l systems.					
2.	To org	ganize the architectu	re of ARM series microprocessor.							
3.	To exp proces	xplain the fundamental of IOT and embedded systems including basic design strategy and ess modeling								
4.	Stude	nts will understand th	he fundamentals of security in IOT.							
5.	To dea	sign case study of th	e embedded systems.							
			Course Contents							
		Introduction to E	Embedded Systems: Introduction to Emb	edded Systems,	Architecture of					
		Embedded System	, Design Methodology, Design Metrics, G	General Purpose	Processor, and					
U	J nit I	System On chip.								
		Embedded system design and development: Embedded system design, Life-Cycle Models, Problem solving. The design process Requirement identification Formulation of								
		requirements specification. Development tools.								
		ARM7, ARM9, A	ARM11 Processors: Introduction to AR	M processors an	nd its versions,					
	• • • •	ARM7, ARM9 &	ARM11 features, advantages & suitab	oility in embedd	led application,					
U	nit II	programming in	assembly language, registers, CPSR, SI	PSR, ARM and	l RISC design					
		types of RTOS.	data now model, programmers model, mo	des of operation	s, R105,					
		Embedded IoT H	Platform Design Methodology: Introduc	tion to Embedd	ed System and					
		Internet of Things	o Embedded Systems, IoT: Definition and	d characteristics	of IoT, Internet					
U	nit III	of Things: Vision	n, Emerging Trends, Purpose and requ	irement specifi	cation, Process					
		specification, Dom	an model specification, information mode	el specification,	Service					
specification Device and component integration Application development										
		IoT Protocols and	d Security Networks: Protocol Standardiz	zation for IoT, N	A2M and WSN					
		Protocols, SCADA	A and RFID Protocols, Issues with IoT	Standardization	, Unified Data					
U	nit IV	Standards, Protoco	ols – IEEE 802.15.4, Modbus, Zigbee Ar	chitecture, Netw	ork layer, APS					
		layer. Bluetooth, II	SEE 802.11 , CAN, 12C and USB, RS232, RS	5485						
		Embedded System	m Design Case Studies: Automated M	eter Reading S	vstems (AMR).					
U	nit V	Digital Camera, N	Iultimedia System, Electronic Control U	nit (ECU) of C	ar and Medical					
		Instrumentation.								

Text Bo	oks								
T.1	Davi	d E.Simon, —An Embedded Software	e Primer∥, Perason Educati	on, 2003.					
T.2	Haki 8482	ma Chaouchi, — The Internet of Thi 21-140-7, Wiley Publication	ngs Connecting Objects to	o the Web	ISBN : 978- 1-				
Referen	ce Boo	oks							
R.1	Noe	rgaard Tammy, —Embedded Systems	Architecturel, Elsevier Pu	blication.					
R.2	Vijay Madisetti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach"								
Useful L	inks			11					
1	https://nptel.ac.in/courses/106/105/106105159/								
2	2 https://nptel.ac.in/courses/108/102/108102169/								
Course	Course CodeCourse OutcomesPO/PSOCLClass Sessions								
MEC21	101.1	Explain the embedded system Design Metrics, Processor Technology, IC Technology, Design Technology.	PO1,PO3,PO12	4	9				
MEC21	101.2	Analyze the Embedded system architecture and feature of ARM7, ARM9, ARM11 processor.	PO1,PO2,PO3,PO12	4	9				
MEC21	101.3	Implement an architectural design for IoT for specified requirement.	PO1,PO2,PO3,PO12	3	9				
MEC21101.4		Interface the advanced peripherals to ARM based Processor	PO1,PO2,PO3,PO12	5	9				
MEC21101.5		Design embedded system with available resources.	PO1,PO2,PO3,PO12	6	9				

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7	-		Wardha Road, Nagpur-441 108						
3			NAAC Accredited with A+ Grade	•4					
Dro	aron	(An Autonomous	s Institute Affiliated to R1M Nagpur Uni	versity, Nagpur)				
Son	gi all		mital Communication Technology)					
Sen	Too	ching Scheme		Evominoti	on Sahama				
					20 Marka				
Т	i neor	y 4 Hrs/week		СТ-І	20 Marks				
Tot		al							
100		4	-	ESE CA	60 Mortza				
Dura	ation	of ESE: 3 Hrs.		LGL	00 Warks				
Pre-	Requ	isites: Communicatio	n Engineering.	Total Marks	100 Marks				
Cou	rse O	bjectives:							
	To a	nalyze the representation	on of a signal with the help of different pres	sentation models	and how				
1.	effec	ctive and useful tool in	the analysis of digitally modulated signals.						
	Ctud	anta will loam how di	sital transmission is more second as one	taly dama dulata	the data on				
2	infor	mation with the help	of modulation techniques. Design optimum	receivers for dia	the data of				
2.	mod	ulation techniques.	or modulation teeninques. Design optimum		,itai				
3.	Stud	ents will learn how to	design the optimum filter with less probabi	lity of error.					
4.	To u	nderstand the differen	t multicarrier modulation techniques and the	eir algorithm.					
5	To a	nalyze different types	of spread spectrum technique and transmiss	sion of digital dat	a through				
5.	vario	ous techniques and the	ir secure reception at the demodulation.						
			Course Contents		1 11 6				
		Characterization of Communication Signals and Systems: Mathematical model for							
Un	it I	system Representati	on of digitally modulated signals. Spectr	al characteristics	s of Digitally				
		modulated signals. N	on-linear modulation methods with Memory	v.	s of Digitally				
		Optimum Receiver	for Signals Corrupted by AWGN Channe	el: Performance	of the				
Uni	t II	Optimum receiver for	r Memory less modulation, Optimum receiv	ver for CPM sign	al in AWGN				
		channel. Probability	of Error for Binary and M-ary signaling in A	AWGN channel.					
		Detection Strategie	s and Filter Characteristics: Baseband	Reception and	Probability of				
Unit	t III	error, The ML & M	MAP detection strategies, ML detection	with Zero mean	AWGN, the				
C III	• • • • •	Optimum Filter, Tra	nsfer function of Optimum filter, Matched	l filter, Propertie	es of Matched				
filter.									
		Multicarrier system	ns: Orthogonal Frequency Division Mul	tiplexing Techn	ique, MIMO-				
Unit IV OFDM modulation system, SISO-OFDM modulation system, Algorit				n, Algorithm ir	nplementation				
		IFFT/FFT of OFDM	Continuous phase Modulation (CPM) sche	mes channel cha	racterization.				
		Compand Company	Simple Direct comments		MA4				
Uni	it V	Spread Spectrum	signals: Direct sequence spread speces of DS-SS system in AWCN abannel D	erformance analy	via systems,				
		system in AWGN ch	annel.	analy analy	515 UI I'I '-33				
		system in AWGN channel.							

Text Boo	oks									
T.1	Digit	tal Communications1995 4 th Edition J. G.	Proakis McGraw Hill							
T.2	Digit	al Communications 1998 Simon Haykin Jo	hn Wiley & Sons							
Т.3	Princ Hill	ciples of Digital Communications and Cod	ling 1979 J. Viterbi and J	. K. Om	ura McGraw					
Reference	Reference Books									
R.1	Sprea Barry	ad Spectrum Communications 1995. Marvi y K. Levit John Wiley & Sons.	in K. Simon ,Jim K Omu	a, Rober	t A. Scholtz,					
R.2	CDMA Principles of Spread Spectrum Communications 1995. Andrew J Viterbi Addison Wesley.									
Useful L	Links									
1	https://nptel.ac.in/courses/117/105/117105144/									
2 https://nptel.ac.in/courses/117/105/117105077/										
Course (Code	Course Outcomes	PO/PSO	CL	Class Sessions					
MEC21	102.1	Analyze the principles that underline the analysis and design of digital communication systems.	PO1, PO2, PO3, PO12	4	9					
MEC211	102.2	Determine reliable transmission and reception of symbols over noisy channels.	PO1, PO2, PO3, PO12	3	9					
MEC21102.3		Explore representation of digitally modulated signals.	PO1, PO2, PO3, PO12	3	9					
MEC21102.4		Evaluate baseband reception and probability of error, the ML and MAP detection strategies	PO1, PO2, PO3	4	9					
MEC21102.5		Evaluate code Acquisition and Tracking, Spread Spectrum as a Multiple AccessTechnique.	PO1, PO2, PO3, PO12	5	9					

Ĩ			ılsiramji Ga n Autonomou	Nikwad-Patil College of Engine Wardha Road, Nagpur-441 NAAC Accredited with A+ G INSTITUTE Affiliated to RTM Nag	e <mark>ering and Technolo</mark> 108 rade gpur University, Nagp	ur)	
Pr	ogran	n: M	Tech Elect	ronics Engineering (Commu	nication)		
S	Semest	er: I	MEC21103:	Adaptive Signal Processing			
	Tea	ching S	Scheme		Examination	Scheme	
	Theo	ry	4 Hrs/week		CT-I	20 Marks	
	Tutor	ial		-	CT-II	20 Marks	
Т	otal Cr	edits	4	-	CA		
D	ouratio	on of E	SE: 3 Hrs.		ESE	60 Marks	
Pr	Pre-Requisites: Digital Signal Processing.Total Marks100 Marks						
Co	urse C	bjectiv	ves:				
1.	Stude	nts wil	l study the filte	er structure and its types under adva	nce digital signal proce	ssing.	
2.	To ex comn	plain a nunicat	daptive signal ion systems ar	processing which involves Linear of ad signal processing.	optimum filtering, appli	cations in	
3.	Students will understand types of different filters in digital processing and examine their behavior as						
	per signal given to them, analyze the algorithm used for filtering the signal.						
4.	4. Students will Apply the knowledge of filters and determines the transmission of signal and study the						
	detec	tion of	signal at receiv	ving end by the use of orthogonal pr	roperty.	• 1	
Э.	Stude	nts W1	I apply the dif	frerent types of algorithms in digital	i signaling and their con	vergence with	
	the ne		LS algorithm.	Course Contents			
		Strue	ture for FIR	system: Direct Cascade Frequenc	v Sampling Lattice Str	ucture	
U	nit I	Struc	ture for IIR sy	ystem: Direct, Cascade, Parallel, Lat	tice & lattice-ladder St	ructure	
U	nit II	Linea struct filters	ar optimum tures, adaptive s.	filtering and Wiener filtering: C e equalization, noise cancellation	Optimum linear predict and beam forming. F	ion linear filter Prediction error	
Ur	nit III	Adar adapt	otive filters La ive algorithms	evinson: Durbin algorithm, FIR ada s, fast algorithms. Applications; ech	aptive LMS algorithm. o canceller and equalize	Convergence of er.	
Uı	nit IV	Tran transf	sform domai forms, The tran	n adaptive filters: the orthogonalizen nsform domain LMS algorithm.	zation property of ortho	gonal	
U	Unit VRecursive least: - squares algorithms. Convergence analysis of the RLS algorithm. Least square forward prediction, Least square backward prediction, Kalman filtering. Fast RLS algorithm.						
Te	xt Boo	ks					
	Г.1	Haykir	n, S., "Adaptive	Filter Theory", Pearson Education			
	T.2 Widrow, B. and Stearns, S.D., "Adaptive Signal Processing", Pearson Education.						
Re	ferenc	e Book	S			• • • • •	
I	R.1	Manol House	akis, D.G., Ingl	le, V.K. and Kogon, M.S., "Statistical	and Adaptive Signal Pro	cessing", Artech	
R.2 Diniz, P.S.R., "Adaptive Filtering: Algorithms and Practical Implementation", Kluwer.							

R.3	Scharf, Addiso	L.L., "Statistical Signal Processing: Detection, n-Wesley.	Estimation, and Tir	ne Series	Analysis",
Useful L	inks				
1	https://i	nptel.ac.in/courses/106/102/106102064/			
2	https://n	nptel.ac.in/courses/106/102/106102064/			
Course	Code	Course Outcomes	PO/PSO	CL	Class Sessions
MEC21103.1		Examine filter structure and its types solutions	PO1, PO2, PO3	3	9
MEC21103.2		Analyze linear filtering solutions for optimizing the cost function using wiener filters.	PO1, PO2, PO, PO12	4	9
MEC2	1103.3	Analyze convergence and stability issues using LMS algorithm and its transform domain.	PO1, PO2, PO, PO12	5	9
MEC2	1103.4	Evaluate the performance Recursive Least Squares (RLS) techniques to improve convergence behavior.	PO1, PO2, PO3	4	9
MEC2	1103.5	Explore properties of orthogonalization transform by using mathematical perspective and Convergence analysis of the RLS algorithm	PO1, PO2, PO3	3	9

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Program	n: M.7	Fech Elect	ronics Engineering	g (Communi	cation)				
Semeste	er: I	MEC21104:	Wireless Sensor Net	works					
Teac	ching So	cheme			Examination	Scheme			
Theor	·y	4 Hrs/week	-	_	CT-I	20 Marks			
Tutori	al				CT-II	20 Marks			
Total Cro	edits	4			CA				
Duratio	n of ES	SE: 3 Hrs.			ESE	60 Marks			
Pre-Requ	isites:	Wireless Cor	mmunication.		Total Marks	100 Marks			
Course O	bjectiv	es:							
1. Studer	nts will	study the diff	ferent wireless sensor i	networks.					
2. To exp	plain ne	twork archite	ecture sensor networks	and scenarios	design principle.				
3. Studen cycle	nts will protoco	understand ty ls and wakeu	ypes of different MAC p concepts	protocols for v	vireless sensor networ	ks, low duty			
4. Studer Locali	nts will zation a	apply the know	owledge of Topology (Control, Cluster	ing, TimeSynchroniz	ation,			
5. Studer	nts will	understand	the different types of S	Sensor Node Ha	ndware – Berkelev M	otes.			
Progra	amming	Challenges,	Node level software p	latforms.					
			Course (Contents					
Unit I	OVEF	RVIEW OF	WIRELESS SENSO	OR NETWOR	KS: Single Node A	Architecture			
	Hardware Components Network Characteristics unique constraints and challenges,								
	Enabling Technologies for Wireless Sensor Networks Types of wireless sensor networks.								
	ARCH	HITECTUR	ES:- Network Archite	cture Sensor N	etworks Scenarios D	esign Principle,			
Unit II	Physical Layer and Transceiver Design Considerations, Optimization Goals and Figures of								
	Merit,	Gateway Co	oncepts, Operating Sy	stems and Exe	cution Environments	introduction to			
	Tiny C	DS and nesC.	Internet to WSN Com	munication.					
Unit III	NETV	VORKING	SENSORS:- MAC P	rotocols for W	ireless Sensor Netwo	orks, Low Duty			
	Cycle	Protocols Ar	nd Wakeup Concepts	– SMAC, BMA	AC Protocol, IEEE 80	02.15.4 standard			
	and Z	igBee, the M	Iediation Device Prote	ocol, Wakeup	Radio Concepts, Add	lress and Name			
	Management, Assignment of MAC Addresses, Routing Protocols Energy Efficient Routing								
Geographic Kouting.									
Unit IVINFRASTRUCTURE ESTABLISHMENT:- Topology Control, Clustering, Ti Synchronization, Localization and Positioning, Sensor Tasking and Control.					ring, Time				
Unit V	SENSOR NETWORK PLATFORMS AND TOOLS: Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node level software platforms, Node level Simulators, State centric programming.								

Text Books							
T.1	Holger John W	Holger Karl & Andreas Willig, "Protocols And Architectures for Wireless Sensor Networks", John Wiley, 2005.					
T.2	Feng Z Approa	hao & Leonidas J.Guibas, "Wireless Sensor Net ach", Elsevier, 2007	works An Informati	on Proce	ssing		
T.3	Walten and Pra	egus Dargie, Christian Poellabauer, "Fundamen actice", John Wiley & Sons Publications, 2011.	tals of Wireless Ser	nsor Netw	vorksTheory		
Referen	ce Books	S					
R.1	Kazem Applica	Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Seations", John Wiley, 2007	ensor NetworksTechr	ology, Pr	otocols, and		
R.2	Anna H	lac, "Wireless Sensor Network Designs", John Wiley	v, 2003				
Useful L	inks						
1	https://	nptel.ac.in/courses/106/105/106105160/					
2	https://	onlinecourses.swayam2.ac.in/arp19_ap52/preview					
Course Code		Course Outcomes	PO/PSO	CL	Class Sessions		
MEC21104.1		Explain wireless sensor networks and types of wireless sensor networks.	PO1,PO2,PO3	4	9		
MEC21104.2		Analyze network architecture sensor networks.	PO1,PO2,PO, PO12	4	9		
MEC21104.3		Explain different networking sensors protocols.	PO1,PO2,PO, PO12	4	9		
MEC21104.4		Evaluate topology control, clustering, time, sensor tasking and control.	ne, PO1,PO2,PO3 5		9		
MEC21104.5		Build sensor network platforms and tools.	PO1,PO2,PO3 ,po12	6	9		

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		NAAC Accredited with A+ Grade					
-	(An Autonomous Institute Affiliated to RTM Nagpur University, Nagpur)						
Prog	gram	M.Tech Electro	nics Engineering (Communication	n)			
Seme	ester:	I MEC21105: Act	ive RF Devices and Circuits (PE-1)				
Teaching Scheme Exam					on Scheme		
T	heory	4 Hrs/week		CT-I	20 Marks		
Τι	utoria	l		CT-II	20 Marks		
Tota	l Crea	lits 4		CA			
Du	iratio	n of ESE: 3 Hrs.		ESE	60 Marks		
Pre-R	Requis	ites: RF Engineering		Total Marks	100 Marks		
Cours	se Ob	jectives:					
1. St	tudent	will able to use of Sn	hith chart to determine the various parame	ter of transmissi	on line.		
2. St	tudent	s will able to analyze	the parameters of active devices to design	microwave sem	iconductor		
de	evices						
3. St	tudent	s able to design and ev	valuate RF Amplifier and low noise ampli	fier.			
4. St	tudent	s will be able to desig	gn a RF mixer Circuit.				
5. St	tudent	s will able to design of	oscillators.				
		~	Course Contents				
T T •4		Characteristics of pa	ssive components for RF circuits:-Passi	ve RLC network	KS,		
Unit	t I	I ransmission lines, I wo-port network modeling, S-parameter model, Smith Chart and its					
		applications					
		Active devices for RI	F circuits: - RF Diodes, Microwave BJT'	s, GaAs FET's,	Low noise		
Unit	II	and power GaAs FET's, MESFET, SiGe MOSFET, GaAs, pHEMT, HBT					
	-	Device parameters and	l their impact on circuit performance.				
		RF Amplifier design:	Single and Multi-stage Amplifiers, Low-	pass. Highpass.	Band-Pass		
		and Band-Reject Filte	rs, Bandwidth Estimation methods.	p, 18p,	20110 1000		
Unit		Low Noise Amplifier	design: Noise types and their characteriz	ation, LNA topo	opologies, power		
	1	match vs noise match,	Low Noise amplifier and Power amplifier : C	lass A, B, AB, C, D,	. E, F		
				1			
Wicrowave Mixer Design: Types of mix			esign: Types of mixers, Mixer theory and conduct mixer and cincle holomood mixer.	characteristics, S	SB versus		
Umt	1.	DSB mixers.Single-ended mixer and single-balanced mixer, Double balanced and image					
		ejection mixers, in pr	ase quadrature mixture				
		Oscillators:-Oscillato	r versus amplifier design, Oscillation con	ditions, Gunn di	ode Modes of		
Unit	\mathbf{v}	operation, Equivalent	circuit. Design of Gunn diode oscillator, 1	FET oscillators.	Frequency		
	1	tuning techniques, Pha	ase Locked Loop (PLL), Introduction to C	AD packages, N	Aicrowave		
		integrated circuits(MI	C)				

Text Boo	oks								
т 1	Radio Frequency and Microwave Communication Circuits Analysis and Design 2004 D. K.								
1.1	Misra Jo	ı John Wiley							
T.2	Microw	ave Engineering 1998 D. M. Pozar John	n Wiley						
Reference	ce Books								
R.1	Microw	ave Transistor Amplifiers Analysis and	Design 1997. G. G	onzalez Prentie	ce Hall				
R.2	The Des Phase S	ign of CMOS Radio-Frequency Integra hifters, Second Edition 1991 Thomas H	tted Circuits Microv I. Lee S.K. Koul and	vave and Milli B. Bhat CAM	meter Wave IBRIDGE .				
R.3	Design	of Analog CMOS integrated circuits, R	azavi Behzad, McG	raw Hill					
Useful L	inks								
1	https://n	ptel.ac.in/noc/courses/noc20/SEM1/no	c20-ee35/						
Z	https://n	ptel.ac.in/courses/108/107/108107142/							
Course Code		Course Outcomes	PO/PSO	CL	Class Session				
MEC21105.1		Determine the various parameter of transmission line by using of Smith chart.	PO1, PO2, PO3, PO12	3	9				
MEC21105.2		Analyze the parameters of active devices to design microwave semiconductor devices.	PO1, PO2, PO12	4	9				
MEC21105.3		Evaluate of RF Amplifier and low noise amplifier.	PO1, PO2, PO3	5	9				
MEC21105.4		Design a RF mixer Circuit.	PO1, PO2, PO3, PO12	6	9				
MEC21105.5		Design oscillators, Phase Locked Loop	PO1, PO2, PO3, PO12	6	9				

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7			n Autonomous I	NAAC Accredited with A+ Grade	iversity Nagnu	r)		
Pr	Program: M.Tech. Electronics Engineering (Communication)							
Se	mester	I I	MEC21106: Ind	ustrial Communication Systems (PE-1)				
	Teaching Scheme Examination Scheme			on Scheme				
	Theor	ry	4 Hrs/week		CT-I	20 Marks		
	Tutor	ial			CT-II	20 Marks		
Т	otal Cr	edits	4		СА			
	Durati	ion of I	ESE: 3 Hrs.		ESE	60 Marks		
Pro	e-Requ	isites:	Digital Commun	ications	Total Marks	100 Marks		
Со	urse O	bjectiv	ves:					
1.	To int	troduce	the basic princip	les of networking				
2.	To lea	arn ind	ustrial protocols a	ind the way of data processed and transfe	rred in industria	l network		
3.	To eq	uip the	students with the	e relevant knowledge to understand and so	olve technical pi	oblems in		
	maus		tomation systems	Course Contents				
		Fund	amental of Indu	strial Data Communication Systems:-	Review of Dat	a Acquisition,		
U	nit I	Autor	nation System A	rchitecture - Hierarchical Levels, Func	tional Layered	Models - OSI		
reference model, System engineering approach, Input / Output S		tput Structures,	Control Unit					
		Structure, Protocols, Communication principles and modes: network topology, tr			, transmission			
media, noise, cable characteristic and selection;		characteristic and selection; bridg	es, routers a	nd gateways,				
		Instru	mentation and co	ntrol devices.				
		Seria	l communicatio	n standards:- Standards organizations	, Serial data c	ommunication		
U	nit II	interfa	ace standards,	Balanced and unbalanced transmission	on lines, Syno	chronous and		
		async	hronous commun	ication, RS 232,422,485 standards.				
		Indus	strial protocols	: XON/OFF Signaling, Binary Sy	nchronous Pro	tocol (BSC),		
Ur	nit III	HDL	C/SDLC protoco	ol, CSMA/CD, CA protocol, OSI in	nplementation	for Industrial		
		2 5	iumeanons, mau	surar control applications. ASCCII-base	u protocol – Al	NSI -A 3.20 -		
		2.3.						
.	•	HAR	T Communicat	ion Protocol Architecture: Physical,	data link, app	lication layer,		
U	nit IV	comm	communication technique, normal and burst mode of communication, benefits of HART.					
Industrial Ethe			strial Ethernet:	0Mbps, 100Mbps Ethernet, Gigabit Ethe	rnet, Industrial l	Ethernet.		
U	nit V							
Tex	t Book	KS						
r	Г.1	John P	ark, Steve Macka	y, Edwin Wright, Practical Data Commu	inications for In	strumentations		
		and Control, 1st Edition ELSEVIER, 2003.						

	Deon Reynders, Steve Mackay, Edwin Wright, Practical Industrial Data Communications, 1st						
T.2	Edition ELSEVIER, 2005.						
Reference	ce Books						
R .1	William C. Dunn, Fundamental of industrial instrumentation and process control, Mc Graw						
	Hill, 200	05.					
R.2	Behrouz 2001.	z A. Forouzan, Data Communications a	nd Networking, 2nd	Edition, Mc (Grow – Hill,		
Useful L	inks						
1	https://n	ptel.ac.in/courses/117101051					
2	https://a	rchive.nptel.ac.in/courses/108/101/108	101113/		1		
Course Code		Course Outcomes	PO/PSO	CL	Class Session		
		Analyze the need for network					
MEC21106.1		protocols during data exchange	PO1, PO2, PO3, PO12	4	9		
		Demonstrate the use of serial					
MEC2	1106.2	standards as required in an	PO1, PO2, PO12	3	Q		
		industrial plant environment.		5	,		
		Analyze the methods of					
MEC21106.3		communications.	PO1, PO2, PO3	4	9		
MEC2	1106.4	Explain different protocols used as industrial standards.	PO, PO2, PO3,	4	9		
		Illustrate different Industrial	r012				
MEC21106.5		Ethernet.	PO1, PO2, PO3.	4	9		
			PO12	PO12			

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Program	Program: M Tash Electronics Engineering (Communication)						
Semeste		MEC21107. Tel	ecommunication Networks (PF-1)	II)			
Te		Schome	communication retworks (i E-i)	Evaminati	on Scheme		
Theo	rv	4 Hrs/week			20 Marks		
	ial			СТ-П	20 Marks		
Total Ci	redits	4					
Durat	tion of 1	ESE: 3 Hrs.		ESE	60 Marks		
Pre-Req	uisites:	Digital Commun	nications	Total Marks	100 Marks		
Course (Dbjectiv	ves:					
1. To u	nderstar	nd the principles	of telecommunication network manageme	ent.			
2. To ga	ain knov	wledge on telecon	nmunication network management protoc	cols.			
3. To equivalent	uip the	students with the	e relevant knowledge to understand and so	olve technical pr	oblems in		
4. Stude	nt will	learn network ma	nagement applications.				
5. Stude	nt will	learn web based 1	nanagement and IP network management	t.			
			Course Contents				
	Overview of Data Communication and Network Management:- Goals, Organization and						
	Functi	ons; Network M	Ianagement – Architecture and Organiz	zation; Network	Management		
Unit I	Perspectives; Current Status and Future of Network Management. Network Topology,						
	SNMP and Network Management:- Network Management Standards Network						
Management Models, Organizational Model Information Model Communication					cation Model.		
	SNMPv1 –History of SNMP, Internet Organization and Standards, SNMP Model,						
Unit II	Organizational Model, System Overview, Information Model. SNMP Communication Model,						
	Functional Model.SNMPv2 and SNMv3.						
	Teleco	ommunications	Management Network:- TMN Concep	tual Model, TN	AN Standards,		
Unit III	TMN Architecture, TMN Management Service Architecture, TMN Integrated View, TMN						
	Implei	mentation.					
	Netwo	ork Manageme	nt Applications:- Configuration Mana	agement, Fault	Management,		
Unit IV	Perfor	mance Managen	hent, Security Management, Service Le	vel Managemer	it, Accounting		
	Manag	gement, Report M	Tanagement, Policy- Based Management.				
	web 1	Based Managem	and IP Network Management:- Se	h Server Comr	Access, SNMP		
	Netwo	ork Management	a – Configuration, Management Inform	ation Base. Si	nple Network		
Unit V	Manag	gement Protocol,	IP-Based Service Implementation- Netw	ork Manageme	nt Issues, OSS		
	Archit	ecture.	-	C C			

Text Boo	oks							
T.1	Mani Subramanian "Network Management – Principles and Practice", Addison- Wesley, 2010.							
T.2	2 Salah Aiidarons, Thomas Plevayk, "Telecommunications Network Technologies and Implementations", Eastern Economy Edition IEEE press, New Delhi, 1998.							
Reference	ce Books							
R.1	Lakshm Econom	i. G, Raman, "Fundamentals of Teleco y Edition IEEE Press, New Delhi,199	ommunication Networ 8.	k Manageme	nt", Eastern			
R.2	J. Richa Pearson	rd Burke, "Network Management: Con Education, 2008.	ncepts and Practice, A	A Hands-on A	Approach ",			
Useful L	inks							
1	https://a	rchive.nptel.ac.in/courses/106/105/106	5105183/					
2	https://a	rchive.nptel.ac.in/courses/108/106/106	5106167/					
Course Code		Course Outcomes	PO/PSO	CL	Class Session			
MEC21107.1		Explain the Data Communication and Network Management system	PO1, PO2, PO3, PO12	4	9			
MEC21107.2		Analyze the SNMP and Network Management.	PO1, PO2, PO12	4	9			
MEC21107.3		Analyze the Telecommunications Management Network.	PO1, PO2, PO3	4	9			
MEC21107.4		Explain Network Management Applications.	PO1, PO2, PO3, PO12	4	9			
MEC2	1107.5	Illustrate different Web Based Management and IP Network Management.	PO1, PO2, PO3, PO12	4	9			

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		N State Stat					
Prog	ram: M.'	Tech Electro	nics Engineering (Communication)				
	Semes	ter: I	MEC21108: Digital Communication Technology Lab				
Teaching Scheme			Examination Sch	ieme			
Pra	actical	2 Hrs/week	CA 25 Ma	arks			
Total	Credits	1	ESE 25 Ma	arks			
Pre-R	Pre-Requisites: Digital Communication. Total 50 Mark						
Cours	e Objectiv	ves:					
1.	Student	s will Explore t	he signal representation and estimation in communication channel				
2.	Student output o	s will know the concept and hov	concept of modulation shift keying and maximum input and maximur v securely they transmit the date with the help of secure modulationtech	n 1nique.			
3.	Student reflecte	s will Learn mu d from multiple	alticarrier modulation and examine transmitted signal scattered and paths due to mobility of transmitter				
4.	Student hopping carrier	Students will Understand the concept of direct sequence spread spectrum and frequency hopping spread spectrum and their technique for modulation and learn how rapidly theychanging their carrier signal for radio transmission.					
5.	Student	Students will design the structure of content with the help of MATLAB.					
Sr. No	D.	List of Experiment (
1	Design	Design and Analysis of Spectrum Estimators using MATLAB					
2	Design	Design and Analyze the Channel equalizer design using MATLAB					
3	Design	Design of Optimum Receiver for signals corrupted by AWGN channel.					
4	Evaluat	Evaluate Probability of Error for Binary in AWGN channel.					
5	Evaluat	Evaluate Probability of Error for M-ary signaling in AWGN channel.					
6	Explore	e the Multicarrie	r modulation schemes i.e OFDM, MIMO, SISO in FPGA kit	CO3			
7	Explore	the Performan	ce analysis of FH-SS system in AWGN channel.	CO4			
8	Explore	e the Performan	ce analysis of DS-SS system in AWGN channel.	CO4			
9	Analyz	e the simulation	of ML & MAP detection strategies in AWGN channel using MATLA	B CO5			
10	Design	Continuous pha	ase Modulation (CPM) schemes channel characterization in FPGA kit	CO5			

Brijo TAKM. Chairman BOS (ECE)

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12/03/2024 al Dean Academics

Dean Academics Tulsiramji Gaikwad-Patil College Of Engineering and Technology. Nagpur

Vice Remoipar

Tulsiramji Galkwad-Patil College Of Engineering & Technology, Naqpur.

Mos Principal

Principal Tulsiramji Gaikwad Patil College Ot Engineering and Technology, Nagpur