

Mohgaon, Wardha Road, Nagpur - 441 108

An Autonomous Institute



DEPARTMENT OFELECTRONICS & COMMUNICATION ENGINEERING

B.Tech. Electronics & Communication Engineering

Syllabus

From

Academic Year 2022-23

Tulsiramji Gaikwad-Patil College of Engineering & Technology, Nagpur

(An Autonomous Institution Affiliated to RTM Nagpur University, Nagpur) Programme: Electronics & Communication Engineering

Scheme of Instructions: Third Year B.Tech. in Electronics & Communication Engineering

Sr.	Course	Course	Course Title		т	D	Contact	Course			EXAM SCHEME			
No.	Category	Code	Course rule	L	1	1	Hrs/Wk	Credits	CT-1	CT-2	TA/CA	ESE	TOTAL	
1	PCC	BEC3501	Analog & Digital Communication	3	-	-	3	3	15	15	10	60	100	
2	PCC	BEC3502	Digital Signal Processing And Application	3		-	3	3	15	15	10	60	100	
3	PCC	BEC3503	Control System Engineering	3		-	3	3	15	15	10	60	100	
4	PCC	BEC3504	Analog & Digital Communication Lab	-	-	2	2	1	-	-	25	25	50	
5	PCC	BEC3505	Digital Signal Processing lab	-	-	2	2	1	-	-	25	25	50	
6	PEC	BEC3506-	Program Elective-I	3	-	-	3	3	15	15	10	60	100	
		8	-											
7	PEC	BEC3513-	Program Elective-I Lab			2	2	1	-	-	25	25	50	
		15												
8	PEC	BEC3509 -11	Program Elective-II	4	-	-	4	4	15	15	10	60	100	
9	OEC	B\$\$XX01	Open Elective-I	4	-	-	4	4	15	15	10	60	100	
		-16				_								
10	PROJ	BEC3512	Micro Project Based on Simulation	-	-	2	2	1			25	25	50	
11	MCC	BAU3511	Heritage	2	-	-	2	Audit	-	-	-	-	-	
			Total	22	-	8	30	24	90	90	160	460	800	

Semester-V

L- Lecture CT1- Class Test 1 P-Practical

TA/CA- Teacher Assessment/Continuous Assessment

CT2- Class Test 2

ESE- End Semester Examination (For Laboratory End Semester performance)

Course Category	HSMC (Hum., Soc. Sc, Mgmt.)	BSC (Basic Sc.)	ESC (Engg. Sc.)	PCC (Programme Core Courses)	PEC (Programme Elective Courses)	OEC (Open Elective courses from other discipline)	Project / Seminar /Industrial Training	MCC (Mandatory Courses)
Credits				11	08	04	01	Yes
Cumulative Sum	5	21	24	27	08	04	01	

T-Tutorial

PROGRESSIVE TOTAL CREDITS : 78+24 =102

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Tulairamli Gathwad P.

Program Elective- I	Program Elective- II	Program Elective- III
Semester V	Semester V	Semester VI
BEC3506 Digital System Design	BEC3509 Introduction to MEMS	BEC3603 Antenna and Microwave Engineering
BEC3507 Embedded Systems	BEC3510 Information Theory and Coding	BEC3604 Optical Communication
BEC3508 Power Electronics	BEC3511 Biomedical Instrumentation	BEC3605 Mechatronics
Program Elective-IV	Program Elective-V	
Semester VI	Semester VII	
BEC3606 PLC SCADA	BEC4703 Robotics & Automation	
BEC3607 Wireless & Sensor Network	BEC4704 Machine learning	
BEC3608 Speech Processing	BEC4705 Satellite Communication	

	List of Oper	n Elective			
Sr. No.	Course Code	Course Title	Sr.	Course Code	Course Title
			N0.		
1	BCSXX01	Cyber Law and Ethics	9	BMEXX09	Nanotechnology and Surface Engineering
2	BCSXX02	Block chain Technology	10	BMEXX10	Automobile Engineering
3	BITXX03	Cyber Security	11	BEEXX11	Power Plant System
4	BITXX04	Artificial Intelligence	12	BEEXX12	Electrical Materials
5	BECXX05	Internet of Things	13	BAEXX13	Avionics
6	BECXX06	Embedded Systems	14	BAEXX14	Unmanned Aerial Vehicles
7	BCEXX07	Introduction to Art and Aesthetics	15	BBTXX15	Biomaterials
8	BCEXX08	Metro Systems and Engineering	16	BBTXX16	Food and Nutrition Technology

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Department of Electronics & Cone Tutstrami Geltward - Path Collega M Engineering & Technology, Hague

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Tulsiramji Gaikwad-Patil College of Engineering and Technology Wardha Road, Nagpur-441 108 **NAAC Accredited (A+ Grade)** An Autonomous Institute affiliated to RTMNU Nagpur **B.Tech Third Year (Semester-V) Electronics and Communication Engineering BEC3501**: Analog and Digital Communication **Teaching Scheme Examination Scheme** 3 Hrs/week 15 Marks Lectures **CT-1 CT-2** Tutorial 15 Marks 3 **Total Credit** CA 10 Marks ESE 60 Marks Total 100 Marks Duration of ESE: 03 Hrs 00 Min. **Course Outcomes:** Students will be able to Explain the concepts of modulation and demodulation techniques of amplitude modulation 1. Determine the concept of angle modulation in FM transmitter and receiver with radio receivers parameters. 2. **Examine** the digital modulation schemes PCM ,DM,ADM with their limitations 3. Apply the digital pass band data transmission schemes of ASK,FSK,PSK,QAM,QPSK and FDM,TDM 4. techniques. Analyze the line coding techniques and spread spectrum techniques of DSSS.FHSS and CDMA 5. **Course Contents**

Analog and Digital Messages, Channel Effect, Signal-to Noise ration and capacity, **Analog Modulation:**

Unit I Modulation, Need for Modulation, Amplitude Modulation, Types of Modulation, AM DSB-SC, SSB-SC and vestigial side band modulation and demodulation, AM transmitter (broadcast and low power), FDM, Noise in AM systems.

Angle modulation: FM and PM, reactance FET modulator Armstrong method, Foster-Seely discriminator, PLL detector, Stereophonic FM, Spectrum of FM, Narrow band and wide band
 Unit II
 FM, FM transmitter (broadcast and low power). Noise in FM systems.

 Radio Receivers :- Characteristics of Radio Receiver Sensitivity, Selectivity and Fidility, TRF and Super heterodyne Radio Receiver.

Unit IIISampling and Analog to digital Conversion :-Sampling theorem, Sampling and signal
reconstruction, Aliasing, Types of sampling, Quantization, PCM system, Bandwidth of PCM,
Limitations of PCM system, Companding, DPCM, ADPCM, Delta modulation, Adaptive
delta modulation, Limitation of DM and ADM , T1 carrier system.

- Unit IVPass band Data Transmission :- Overview of ASK, FSK, PSK, Generation, Signal Space
Diagram and detection of FSK, Probability of Error for FSK, Probability of Error for QPSK,
Generation, signal space diagram and detection of $\pi/4$ QPSK, Generation, signal space
diagram and detection of QAM, FDM & TDM signal multiplexing.
- Unit VLine coding & Spread Spectrum Techniques :- line coding techniques, pulse shaping,
Spread spectrum Communications, Frequency Hopping Spread Spectrum (FHSS), Direct
Sequence Spread Spectrum (DSSS), Code Division Multiple Access of DSSS.

Text Boo	ks
т 1	B.P. Lathi, "Modern Digital and Analog Communication System", Oxford University Press,
1.1	3 rd Edition, 2005
T.2	John G. Proakis, "Digital Communication", McGraw Hill Inc, 5th Edition, 2008.
т 2	Singh. R. P & Sapre. S. D, "Communication Systems: Analog & Digital," 3rd edition,
1.5	McGrawHill Education, Seventh Reprint, 2016.
Reference	ee Books
R.1	Simon Haykin, "Communication Systems", John Wiley & Sons, 4th Edition, 20008.
ЪĴ	Simon Haykin and Michael Moher, "Communication Systems," 5th edition, John Wiley &
K .2	Sons, 2013
D 2	Shu Lin, Daniel Costello, "Error control coding – Fundamentals and Applications", Prentice
К.3	Hall, Upper Saddle River, NJ, 2 nd Edition, 2004.
Useful L	inks
1	https://nptel.ac.in/courses/117/105/117105143
2	https://nptel.ac.in/courses/117/105/117105144
3	https://nptel.ac.in/courses/117/104/117104121

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Tulsiramji Gaikwad-Patil College of Engineering and Technology									
	An Autonomous Institute affiliated to RTMNII Nagnur								
B.Tech	B.Tech Third Year (Semester-V) Electronics and Communication Engineering								
]	BEC3502 : Digital Signal Processing and Application								
Teaching Sci	heme	0 0	Examinatio	on Scheme					
Lectures	3 Hrs/week		CT-1	15 Marks					
Tutorial	0 Hrs/week		СТ-2	15 Marks					
Total Credit	3		ТА	10 Marks					
			ESE	60 Marks					
			Total	100 Marks					
			Duration of 1	ESE: 03 Hrs 00 Min.					
Course Outo	comes (CO)								
Students will	be able to								
Identify discre	te-time signals analy	tically and visualize them in t	he time domain.						
Apply discrete	Fourier transform and	d verify its properties.							
Design Digital	Infinite Impulse Res	of structures.	nonse filter						
Analyze Fast H	Fourier Transform a	lgorithms							
1 0		Course Conten	ts						
Unit I	Unit IBasic elements of DSP and its requirement, Advantages of Digital over analog signal processing, sampling theorem, sampling process and reconstruction of sampling data. Discrete time signals & systems: Discrete time signals & systems, classification of discrete time signals and systems, LTI systems								
Unit II	Frequency doma DFT, Inverse II ,Graphical Cro IDFT.	in sampling: definition of DFT, DFT'S of typical t ss Correlation, Auto corre	Discrete Fourier Tra ime signals, linear elation. Circular con	ansform & Properties of convolution, Analytical nvolution using DFT &					
Unit III	Design of IIR transformation, Direct form-II, P	Filter from anolog filte Butterworth and Chebyshe Parallel & Cascade form.	r using Impulse v filter, IIR filter s	Invariance, Bilinear tructure : Direct form-I,					
Unit IV	IV Design of Finite Impulse Response filter design using various windowing techniques: Rectangular, Hanning, Hamming, Blackman, Finite Impulse Response filter structure : Direct & Cascade form								
Unit V	Unit V Introduction to Fast Fourier Transform algorithms: Decimation in Time –FFT Algorithm Decimation in Frequency- FFT Algorithm using radix 2 FFT – Butterfly structure for Decimation in Time –FFT and Decimation in Frequency- FFT								
Text Books									
1	1 Digital Signal Processing and applications- 4 th edition, 2013 John G. Proakis McGraw- Hill								
2	Discrete time Signet pearson	nal Processing- 3 rd editi	on 2010 Alan Opp	enheim,Ronald Schafer					
3	Digital Signal Pro Saniit K. Mitra Ma	cessing - A computer bas cGraw-Hil	ed approach-Publica	ation- 4 th edition, 2013					
Reference Books									
1	Digital Signal Proce Hill	ssing- 3 rd Edition 2017 S Sa	livahanan ,A Vallavra	j ,C Gnanapriya McGraw-					

2	Digital signal processing- A practical approach 2 nd Edition, 2002.E. C. Ifeachar, B. W. Jarvis Pearson
Useful Links	
1	https://nptel.ac.in/courses/108/104/108104139/
2	http://nptel.ac.in/courses/117107095

BOS-Chairman

Department of Electronics & Conver-Tutetraniji Guilwad - Patri College et Englaceding & Technology, Pagae

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Tulsiramii Gallwad-Pati College Of Engineering & Toutmotogy, Nagpur



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Third Year (Semester V) B. Tech. Electronics & Communication Engineering

BEC3503: Control System Engineering

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TeachingSche	eme		ExaminationSc	heme		
Lectures	3 Hrs/week	1	CT-1	15 Marks		
Tutorial	0Hrs/week		CT-2	15 Marks		
TotalCredit	3		ТА	10 Marks		
			ESE	60 Marks		
			Total	100 Marks		
			Duration of ESE	2: 03 Hrs 00Min.		
Course Outco	omes (CO)	1	<u> </u>			
Students will b	be able to					
Explain the prin	ciples of feedback of	control system.				
Represent trans	fer function using b	lock diagram reduction & signal flow	v graph			
Analyze the time	e response of contro	ol system				
Analyze the stab	oility of control system	em using ruths and hurwitzs criteria.				
Analyze the state	e space model					
		Course Contents				
UnitI	Introduction to Introduction, C Mechanical, El Function and Sta Classical represe	Control System: Classification of Control syst ectro mechanical with differen ate space representation. Advantagentation	em, Representati tial equation, Co ges of State Space	ion of Electrical, oncept of Transfer representation over		
UnitII	Transfer Funct Representation algebra, Signal f	tion, Block Diagram & Signal floor of Transfer Function of Electr flow graph and Mason's gain form	w graph: ical & Mechanic 1ula.	al, Block diagram		
Unit III	Unit III Time Response Analysis : Time response of system, first order and second order system, standard inputs, concept of gain and time constants. Steady state errors, type of control system, approximate methods for higher order system. Types of Controllers.					
UnitIV	UnitIVStability & Root Locus: Stability of control systems, condition of stability, characteristics equation, Routh Hurwitz criterion, special cases for determining stability, relative stability. Root location and effect on time response, elementary idea of root locus, Construction of root locus effect of addition of pole and zero in proximity of imaginary axis					
UnitV	UnitV State Space Analysis: UnitV State variable method of analysis, characteristics of system state. Choice of state variables, representation of vector matrix differential equation, standard form, relation between transfer function and state variables.					
TextBooks	1					
	1 I.J.Nagrath, M.C International Pu	Gopal, "Control System Engineerir blishers	g",6th Edition, New	v age		

2 B.C.Kuo, "Automatic Control System", PHI

3	B.S. manke, "Linear Control Systems", Khanna Publishers						
ReferenceBooks	ReferenceBooks						
1	A.K.Jairath, "Problems and Solutions of Control systems", CBS Publishers, New Delhi						
2	Nagrath & Gopal, "Control System Analysis".						
3	Ghosh S. "Control System Theory & Application" Person Publication						
UsefulLinks							
1	https://nptel.ac.in/courses/115/108/115108104/						
2	https://nptel.ac.in/courses/107/106/107106081/						
3	https://nptel.ac.in/courses/108/103/108103007/						

Kan There BOS Chairman

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Tulsirami Gathwad-Pati College Of Engineering & Testimology, Nagpur

Tulsiramji Gai				wad-Patil College of Engineering and Technology					
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	Imra	rear	(Semester	V) D. Tech. Electro			Engine	ering	
		BF	C3504: A	nalog and Digi	tal Com	munication	Lab		
Tea	ching So	cheme)			Examination Sc	heme		
Pra	ctical		2 Hrs/week			CA	25 Marl	ζS	
Tot	al Credi	t	1			ESE	25 Marl	KS	
						Total	50 Marl	KS	
G	0.1					Duration of ESE:	02 Hrs 0	0 M1n.	
Cou	irse Out		s (CO)						
Stu	dents wil	l be at	ble to						
1	Analyze	e the co	oncepts of analo	g modulation and demo	dulation tech	niques by using AM	[
2	Experin	nent t	he Angle modu	lation using FM Modul	ation and D	emodulation .			
3	Illustrat	te the c	ligital modulation	on techniques PCM ,DN	1,ADM and t	heir limitations			
4	Analyze techniqu	e the di	gital pass band	data transmission schem	ies using AS	K,FSK,PSK,QAM,	QPSK and	FDM, I DM	
5	Demons	trate t	the line coding	techniques and spread sp	pectrum tech	niques using DSSS.	FHSS and	l CDMA	
_	Sr. No.			List of I	Experiment	;	1100 411	CO	
	1	A	analyze the Ge	neration of AM modulation and Demodulation.				CO1	
	2	A	nalyze the Ge	neration of DSB-SC modulation and Demodulation.			CO1		
	3	E	xperiment the	angle modulation using FM Modulation and Demodulation.			<u> </u>		
	<u> </u>	E	Examine the Generation of PAM, PPM, PWM modulation and demodulation.				. CO3		
	5	A	Analyze the Generation of DM and ADM with analysis of step size.					CO3	
	6	A	Analyze the Generation and detection of Pulse Code Modulation				CO3		
	-	D	Demodulation.						
	7	A	analyze the Ge	Seneration and detection of DPCM and its Demodulation.				CO3	
	8	D	Demonstrate the	e Generation and detection of PSK Modulation and			CO4		
	0		Demodulation.	paration of OPSK Modulation and Demodulation			C04		
	<u> </u>	<u> </u>	Simulate modulation techniques by using MATLAB						
Тех	t Books	5		lation teeninques by us				0.05	
	1	ВD	Lathi "Mode	rn Digital and Analog	Communic	ation System" Ox	ford Unix	orcity	
	1	Pres	s, 3 rd Edition.	2005	Communit	ation System, Ox		ciony	
	2	Johr	G. Proakis, "	Digital Communicatio	on", McGrav	w Hill Inc, 5th Edi	tion, 2008	3.	
	3	Sing	gh. R. P &Sapr	e. S. D, "Communicat	tion System	s: Analog & Digita	al," 3rd ed	lition,	
		McC	GrawHill Educ	ation, Seventh Reprin	t, 2016.				
Ref	Reference Books								
	1 Simon Haykin, "Communication Systems", John Wiley & Sons, 4 th Edition, 20008.						008.		
	2 Simon Haykin and Michael Moher, "Communication Systems," 5th edition, John Wiley &								
Hac	Sons, 2013								
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BOS - CEBAIRMAN Department of Electronics & Comm Tuberanji Gallwad - Patri Collega of Engineering & Teenhology, Inagure

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Tulsiramji Ga	Ikwad-Patil
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and Technol	ogy, Nagpur

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Tulsirami Galkwad-Pati College Of Engineering & Technology, Nagpur

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-	Wardha Road, Nagpur-441 108									
3	An Auton	NAAC Accredited (A+ G	rade)							
Third	Voor (Semester V	V) B. Tach. Electronics	Communica	tion Engineer	ina					
11110	DEC2505. I	V) D. Tech. Electronics (R. Application	n Loh	ing					
Teaching S	cheme		Examinatio	n Scheme						
Practical Tractical	2 Hrs/week		CA	25 Marks						
Total Cred	It 1		ESE	25 Marks						
			I otal	50 Marks	1					
Course Out	taamaa (CO)		Duration of	ESE: 02 HIS 00 N	/1111.					
Course Ou Studente wi	lt ba abla to									
1 Identify	discrete time signals s	analytically and visualiza them in	the time domain							
2 Apply di	iscrete Fourier transfor	m and verify its properties								
2 Apply u	ligital filters in a variety	v of structures								
J Design	Digital Infinite Impulse	e Response and Finite Impulse R	esponse filter							
5 Analyze	Fast Fourier Transfo	rm algorithms	esponse mee							
Sr No		List of Experime	nt		CO					
1	Plot following has	sic discrete time signals usir	ng MATLAR fur	nctions Unit	co					
Ĩ	impulse unit sten	ramp real and complex expor	pential and its rep	resentations	CO1					
	impuise, and step,	rump, rear and complex export	iontial and its repr	coontactoris.						
2	Examine linear conv	volution of discrete signals usi	ing MATLAB fur	nctions.	CO1					
		8	8		001					
2	Evenin e eineulen ee	any obstion of discrete signals	NATI AD	functions	601					
3	Examine circular co	Divolution of discrete signals t	Ising MATLAD	functions.	COI					
4	Implement MAT	LAB program to compute	cross-correlation	of the given	CO2					
	sequences with corre	esponding plot.								
5	Implement MATLA	AB program to compute auto	o-correlation of g	iven sequences	CO2					
	with corresponding p	plot.								
6	Design Butterworth	IIR filters.			CO3					
7	Design Chebyshev I	IR filters.			CO3					
					005					
8	Design FIR filters us	sing windowing techniques.			CO4					
	C									
9	Implement HP IIR	filter for a given sequence.			CO4					
	ſ									
10	Compute DFT and 1	IDFT of discrete time signals.			CO5					
					-					
Text Books	5				<u>I</u>					
1	Digital Signal Process	sing and applications- 4th edition	n. 2013 John G. Pro	akis McGraw-Hill						
2	2 Discrete time Signal I	Processing- 3^{rd} edition 2010 Ala	n Oppenheim Ron	ald Schafer pearso	n					
	3 Digital Signal Proce	essing - A computer based apr	proach-Publication	$\frac{1}{n-4^{th}}$ edition 20	 13 Saniit					

K. Mitra, McGraw-Hil	
Reference Books	
1 Digital signal processing- A practical approach 2 nd Edition, 2002.E. C. Ifeachar, B. W. Jarvis Pearson	
2 Digital Signal Processing - A. Nagoor Kani 2nd Edition McGraw Hill.	
Useful Links	
1 <u>https://nptel.ac.in/courses/108/104/108104139/</u>	
2 http://nptel.ac.in/courses/117107095	

Wow. KNOK. BOS Chairman

Department of Electronics & Comm Tuterranji Galiwad - Pari College of Engineering & Technology, Nagua

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Tulsiramji Galkwad-Patil College Of Engineering and Technology, Nagpur

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	Tulsiramji Gai	kwad-Patil College of E	ngineering and Te	chnology		
1 1	Wardha Road, Nagpur-441 108					
		NAAC Accredited (A+ Grade)				
	An Autor	nomous Institute affiliate	ed to RTMNU Nagp	our		
Third	Year (Semester-	V) B.Tech. Electronics	s & Communicat	tion Engineering		
]	BEC3506: Digital Syst	em Design			
Teaching So	cheme		Examination	n Scheme		
Lectures	3 Hrs/week		CT-1	15 Marks		
Tutorial	0 Hrs/week		CT-2	15 Marks		
Total Credi	t 3		ТА	10 Marks		
			ESE	60 Marks		
			Total	100 Marks		
			Duration of I	ESE: 03 Hrs 00 Min.		
Course Out	comes (CO)					
Students wil	l be able to					
Examine prog	grammable devices and	d discuss the architecture of C	PLD and FPGA .			
Apply basic k	nowledge of Hardwar	e Description Language, desig	n flow and methodolo	egy.		
Analyze comb	vinational circuits which	ch give fundamental concepts	and techniques used in	n digital electronics.		
Analyze seque	ential circuits and com	ponents used in the typical da	ta path designs: Regist	ters, Adders, Shifters,		
Comparators;	Counters, Multiplier,	Arithmetic Logical Units (AL	U), RAM.	ital ainavita		
	omputer-Alded Design	Course Content	ts			
				· · · · · · ·		
	Digital Design I	rundamentals, Combination	al & Sequential des	sign issues, introduction		
Unit I	devices, PLA, P	AL, PROM. Structure of C	PLDs. Introduction	to FPGA. Architecture.		
	CLB, IOB, Pr	ogrammable Interconnect	Points, Different	type of programmable		
	switches used in	PLDs.				
	UDI Basad Da	asian flow Doquiromonts	of UDI Design M	athodologias Different		
Unit II	Modelling style	s Introduction to Verilo	σ Elements of Ve	erilog Verilog Module		
	definition, Elem	ents of Module.	5, Elements of ve	inog, vernog module		
	Basic Concepts	in Verilog, Reserved Ke	ywords, Syntax &	Semantics, Comments,		
Unit III	Identifiers, Nun	nber Representation, Syste	em Representation,	Verilog Ports, Verilog		
	Data Types, w	Design entry in Verilog	& Testbench Con	milation and synthesis		
	Timing analysis		a restochen, con	ipitation and synthesis,		
··· ···	Data Flow M	Iodelling, Delay, Contin	uous Assignment,	Delayed Continuous		
Unit IV	assignment, Stru	ictural Modelling Feature, I	Module Instantiation	i, Gate level Primitives,		
	Gale Delays, Sw	fich Level Philitives, User	Defined Finnitives.			
	Behavioral Mod	lelling, Initial, Always, Pr	ocedural Assignme	nt, Blocking and Non-		
	Blocking assign	ments, Sequential & Parall	lel Blocks, Race arc	ound Condition, Timing		
Unit V	Zero Delay Cor	ural Statements, Conditiona	Control Compiler	Directives Assign De-		
	assign. Force R	elease. Latch Models. FF N	Models. State Mach	ine Coding .Moore and		
	Mealy Machines	S.	, - - .	0,		
Text Books	5					
	1 Verilog Digital Hill 2009	System Design" Zainalabo	edin Navabi Second	Edition, Tata McGraw		
	2 Verilog HDL :	A Guide to Digital Design	and Synthesis Sami	r Palnitkar 2nd Edition,		
	Prentice Hall Ir	ndia, 2003				

Reference Book	SS SS
1	A Verilog HDL Primer" J. Bhaskar, 2nd Edition, Star Galaxy Press 1997
2	"Digital Circuits and Logic Design" by A P Godse and U A Bakshi
Useful Links	
1	https://nptel.ac.in/courses/108/106/108106177/
2	https://nptel.ac.in/courses/117/105/117105080/

bup Afron. BOS Chairman

Department of Electronics & Comm Tuterranji Geliwad - Paril College of Engineering & Technology, Nague

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DeamAcademics Tulsiramji Galkwad-Patil College Of Engineering and Technology, Nagpur

Tulsirami-Goikwad-Petti College Of Engineering & Touhiotoey, Nadour

Tulsiramii Gaitwad Pati College Of Engineering & Technology, Nagpur

	Tulsiramji Gail	kwad-Patil College	of Enginee	ering and Tecl	nology	
7 1		Wardha Road, Nagpur-441 108				
		NAAC Accredited (A+ Grade)				
	An Auton	omous Institute aff	iliated to F	RTMNU Nagpu	r	
Third	Year (Semester-	V) B.Tech. Electro	onics & C	ommunicatio	on Engine	ering
	BE	C3513: Digital Sy	stem Desi	ign Lab		
Teaching So	cheme			Examination	Scheme	
Practical	2 Hrs/week			CA	25 Mar	ks
Total Credi	t 1		-	ESE	25 Mar	ks
			-	Total	50 Mar	ks
				Duration of ES	SE: 02 Hrs (00 Min.
Course Out	comes (CO)					
Students wil	l be able to					
1 Analyze :	2- bit adder/subtractor	using XOR and NAND o	gates.			
2 Construc	ct 4:1 multiplexers usir	ig logic gates and Implei	ment full add	er using 4:1 Mult	iplexers.	
³ Design a	nd simulate of basic lo	gic gates using HDL.				
⁴ Simulate	the combinational circ	cuits such as adders, sub	otractors, mu	Itiplexers and de	coders using	HDL.
5 Simulate	the sequential circuits	such as counters and fl	ip-flops using	g HDL.		~~~
Sr. No.		List of H	Experiment			CO
1	Design and hard	lware implementation	of 2 bit add	ler/subs tractor	using XOR	as
2	4.1 Multiplever	gale. Using Universal gate.	& Realizatio	on of full adder	using	
	Multiplexer	using Oniversal gate (using	
3	BCD adder usir	g two binary adders				
4	3:8 decoder and	realization of full add	ler			
5	Realization of H	R-S, D, J-K Flip Flop				
6	Realization of M	Aod 8 Up Down Rippl	e Counter			
7	Realization of s	ynchronous Mod 2 Mo	od 3 Counte	er		
8	Modelling diffe	rent types of gates				
9	Modelling of ha	lf adder, full adder				
10	Modelling D-Fl	ip Flop				
Text Books						
1	Verilog Digital Sys 2009	tem Design" Zainalab	edin Navab	i Second Edition	on, Tata Mo	cGraw Hill ,
2	Verilog HDL : A Prontice Hell India	Guide to Digital Des	ign and Sy	nthesis Samir	Palnitkar 2	nd Edition,
Reference R	Frencice mail mula,	2005				
1	A Verilog HDL Pri	ner" J. Bhaskar. 2nd F	Edition. Star	Galaxy Press 1	.997	
2	"Digital Circuits and	d Logic Design" by A	P Godse an	d U A Bakshi		
Useful Link	S					
1	https://nptel.ac.in/co	ourses/108/106/108106	5177/			
2	https://nptel.ac.in/co	ourses/117/105/117105	5080/			
alinet	grav.	ant	10	de		

BOS Chairman Department of Electronics & Comm Trategrampi Galiward - Parit Contege of Engineering & Technology, Pagua

Dean Academitics Tulsiramji Galkwad-Patil College Of Engineering Ind Technology, Nagpur

() Tulsirami-Goikwad-Petti College Of Engineering & Tochnology, Nagour

L n Tulsiramii Gatkwad-Pati Collego Of Engineering & Technology, Nagpur

	Tu	Fulsiramji Gaikwad-Patil College of Engineering and Technology					
7 -7		Wardha Road, Nagpur-441 108					
		NAAC Accredited (A+ Grade)					
	Vaaa	An Auton	N D Took Electronic		NU Nagpur	F	
Inira	r ear	r (Semester-	v) B. I ech. Electronics		nunication	Engine	ering
			BEC3507: Embedded	d Systems			
Teaching S	cheme	9	_	Exa	mination Scl	heme	
Lectures		3 Hrs/week		CT-	1	15 Mar	ks
Tutorial		0 Hrs/week	-	CT-	2	15 Mar	ks
Total Credi	it	3	4	TA		10 Mar	ks
				ESE		60 Mar	ks
				Tota	al	100 Ma	arks
				Dura	ation of ESE:	03 Hrs ()0 Min.
Course Out	tcome	s (CO)					
Students will	ll be al	ble to					
Examine the	import	ance of Embed	lded Systems in Real life, Er	ngineering an	d Industrial aj	pplication	is and also to
observe impor	tance (of embedded pro	cepts of microcontroller				
Analyze peri	inheral	s interfacing an	d their programming to solve	prototype pro	oblems		
Test Real life	Engin	eering and Indu	stry problems using Embedde	ed Systems.			
Explore the c	oncept	s of ARM (Adva	ance RISK machine) and RTO	OS (Real Tim	e Operating S	ystem)	
			Course Conten	ts			
	H	istory, Definiti	ion, and Classification of	Embedded	System, De	sign Me	tric & Its
Unit I	op	timization, E	mbedded System Design	Challenges	, Processor	selection	ı Criteria,
Cint I	B	Building blocks of typical Embedded System –Memory Architecture, Memory & Its					
	<u> </u>	ypes, RISC and	1 CISC.			~	
T 1 1 1	ln D'	troduction to	ARM, features, architect	ure, instruct	tion set feat	ures, Co	ncepts of
Unit II	K	IUS ARM pro	timers on chip and off chi	Register set	, instruction	set, prog	gramming,
	111	terrupts, stack,	, timers on-emp and on emp	p periprierais	s, meriaenig	and prog	;rammig.
	A	nalyzing Inbui	built of ADC and DAC of ARM7TDMI Microcontroller, Applications				plications
Unit III	ba	based on PWM, Interfacing of Temperature Sensor, USART, Bluetooth, USB Drive,					
	L	CD display, GS	SM and GPS Module.				
	Pr	rotocol of Fm	bedded System:- Bluetoot	h USB Dr	ive I2C Bus	CAN F	Rus IFFF
Unit IV	80)2.11RS232.R	RS485 .GPRS. IEEE 802.15	5. Modbus, Z	Zigbee Archit	ecture.	Jus, ILLL
			(h = 1	<u> </u>	Ma 111	<u> </u>	
	Al Di	rchitecture of pes Events T	the kernel, Task schedule	r, Semapnoi	res, Mailbox, udv- Based (,Message	equeues,
Unit V	E	mbedded Syste	em. Based on Automation F	Embedded Sy	vstems.		nunication
Text Books	5		, 200000 0111000110010112		,		
	1 N	A Mazidi, J	G Mazidi, R D McKinla	y, The 805	l Microcontr	oller and	1 Embedded
	S	ystems Using	Assemble and C, Pearson/I	Prentice Hall	, 2nd Ed		
	2 F	Raj Kamal, "En	nbedded Systems ", TMH I	Publications.			
	2 k	X M Bhurchan	di. A K Rav. Advanced m	icroprocesso	ors and Perin	herals. N	AcGraw Hill
	Ē	Education India	a, 2012, 3rd edition	r 			
Reference	Books	6					
	1 L	yla B Das; Eı	mbedded Systems and Inte	egrated App	roach, Pearso	on, India	ı, 2013, first
	е	dition,					
	2	Dr. K.V.K.K. P	rasad, "Embedded / Real 7	Time System	s", Dreamtee	h Public	ations
	3 5	Steve Heath, "E	Embedded System Design",	, Neuwans P	ublications		

Useful Links	
1	https://nptel.ac.in/courses/117/106/117106112/
2	https://nptel.ac.in/courses/117/106/117106111/
3	https://nptel.ac.in/courses/117/104/117104072/

You TANK BOS Chairman

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Tulairamit-Goikwad-Petti College Of Engineering & Tochnotoey, Nagaur

Tulsiramii Gaikwad-Patii Collego Of Engineering & Technology, Nagpur

34	🆕 🛛 Tu	lsiramji Gai	kwad-Patil Colleg	e of Enginee	ring and T	echnology	
	Wardha Road, Nagpur-441 108						
1	NAAC Accredited (A+ Grade)						
	• • • • • •	An Autor	iomous institute a	iffiliated to R	I MNU Nag	gpur	•
Th	ird Year	· (Semester-	V) B. Tech. Elect	ronics & C	ommunica	ation Engineer	ing
]	BEC3514: Embed	dded System	n Lab		
Teachin	g Scheme	•			Examinati	on Scheme	
Practica	al2 Hrs/weekCA25 Marks						
Total C	redit	1			ESE	25 Marks	
					Total	50 Marks	
	Duration of ESE: 02 Hrs 00 M						Min.
Course	Outcome	s (CO)					
Students	s will be al	ble to					
1 De	nonstrate	e ARM 7 LPC	2148				
2 Int	erface the	display device	es				
3 Per	form the	Operation of a	ctuating devices				
4 Ge	nerate the	modulation w	vaveform				
5 Int	erface ext	ernal periphera	als devices				
r. No.			List of Ex	xperiment			CO
1	Demonstrate LPC2148 NXP ARM7 Development Kit CO				CO1		
2	Interface	e LED with Al	RM 7				CO2
3	Interface 7 segment display with ARM7 LPC2148.				CO2		
4	Interface	e LCD with Al	RM 7 LPC2148.				CO2
5	Interface	e Relay with A	ARM 7 LPC2148.				CO3
6	Interface	e stepper moto	or.				CO3
7	Generat	e Pulse Width	Modulation wavefor	rm			CO4
8	Execute	the program f	for DAC with ARM7	7 (LPC2148) p	processor.		CO5
9	Interface	e Buzzer with	ARM 7 LPC2148.				CO5
10	Interface	e Temperature	Sensor				CO5
Fext Bo	oks						
	1 Maz Asso	zidi Muhamma embly And C"	nd Ali, "8051 Micro ?, Pearson Education	controller And 2007.	l Embedded	Systems : Using	
	2 Vah	id Frank; Giva	argis Tony, "Embedo	ded System De	esign", Wile	y India.	
Keferen	ce Books						
	1 Jam ISBN	nes K. Peckol, " N: 978-0-471-7	'Embedded systems- 72180-2.	- A contempoi	rary design t	tool", John Wiley,	2008,
	2 Yife Lang	ng Zhu, "Embe guage and C",	edded Systems with 2"" Ed. Man Press LL	Arm Cortex-M _C 2015 ISBN:	Microcontr 0982692633	ollers in Assembly 3 9780982692639	/
Useful I	Links						
	1 https://w	www.youtube.co	om/watch?v=uFhDGa	gZzjs			
,	2 https://d	lituniversity.dig	gimat.in/nptel/courses/	video/10610519	93/L28.html		
Al	in Arcon	•	ent	(0 ×	Ja.		1-



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Tulsirami-Gaikwad-Peti¹ College Of Engineering & Touhinatoey, Nagour

Tulsiranii Gaikwad-Pasii College Of Engineering & Tedinology, Nagpur

	Tul	siramji Gail	kwad-Patil Colleg	e of Engine	ering and [Fechnology
7 • 7	Wardha Road,Nagpur-441108					
	NAAC Accredited (A+Grade)					
		An Auton	iomous Institute a	iffiliated to I	KTMNU Na	gpur
Third	I nird Year (Semester-V) B. I ech. Electronics & Communication Engineering					
		BI	EC3508:PE-1: P	ower Electi	onics	
Teaching So	cheme	-			Examinat	ion Scheme
Lectures		3Hrs/week			CT-1	15 Marks
Tutorial		0Hrs/week			CT-2	15 Marks
Total Credi	t	3			TA	10 Marks
					ESE	60 Marks
					Total	100 Marks
					Duration o	of ESE:03Hrs00Min.
Course Out	comes	s (CO)				
Students wil	l be ab	ole to				
1.Analyze the	e work	ing and charact	eristics of power devi	ces.		
2.Analyze the	e const	ruction, operati	on, and steady-state c	haracteristics o	f IGBT, Pow	er MOSFET, and GTO
devices.	the on	nlication of Por	ver devices as control	led rectifier A	^T DC conver	tore
4. Apply the H	Cnowle	edge of Power I	Devices for conversion	n by using Cho	oppers & Inve	erters
5.Illustrate t	he oper	ration and the n	ecessity of starters for	three-phase in	duction moto	ors and speed control
techniques app	licable	to three-phase	induction motors.			*
			Course C	Contents		
Unit I	 SCR : Construction, Operation, Transistor analogy, Static & dynamic Characteristics, Switching characteristics, SCR Ratings, Gate characteristics, Triggering requirements, Triggering techniques, Isolation Techniques, Pulse triggering, Burst triggering, Thyristor Commutation techniques TRIAC: Construction, Operation, steady stage characteristics, Triggering modes, 					
Unit II	Unit II IGBT : Construction, operation, Steady stage characteristics, Switching characteristics, Safe operating area, Need for gate/base drive circuits, Isolation techniques, Base drive circuits for Power BJT Power MOSFET: Construction, operation, Static characteristics, Switching characteristics, forward and reverse bias operation, Gate drive circuits for Power MOSFET and IGBT. CTO - Construction Operation Static					
Unit IIIPhase controlled Rectifiers (AC-DC Converters) : Single phase half Wave controlled, full wave controlled rectifiers with R and RL load, Bridge Configurations with R and RL load, Effect of Freewheeling diode, Three phase full wave and half wave controlled with resistive load.AC-AC Converters: Basic Principle, Operation, Single phase AC voltage controller for R and RL loads, Working of Three phase AC- AC controller with R Load.						
Unit IV	Unit IVDC-DC converters (Chopper) : Working principle of chopper, Types of chopper : Step-Up & Step- Down chopper for RL Load, Class-A, class-B, Class-C, Class-D and Class-E chopper, Control Strategies DC-AC Converters (Inverter): Classification of inverter, Working Principle of single phase Half Bridge and Single Phase Full Bridge inverter for R and RL load, Three phase Bridge inverter for Resistive (Star) load				er, Types of chopper : B, Class-C, Class-D and orking Principle of single and RL load, Three	
Unit V	 Three Phase Induction Motor: Principle of operation, Necessity of starters, DOL starter, Autotransformer starter, Star-Delta Starter, Speed control techniques of three-phase induction motor. 					

	DC Motors : Principle of Operation, Types of Motor, Speed Control of Shunt Motor : Flux Control, Armature Control and voltage control method, Speed Control of Series
	Flux Control, Rheostat Control method
	Universal Motor : Construction, Working , characteristics and applications
Text Books	
1	SEN,P.C: "MODERN POWER ELECTRONICS", S.CHAND AND CO
2	M.D. SINGH & KHANCHANDANI : "POWER ELECTRONICS", TATA MCGRAW HILL PUBLICATIONS, NEW DELHI. EDITION 2
3	SHINGARE, DEODATTA :" INDUSTRIAL AND POWER ELECTRONICS", ELECTROTECH PUB.
Reference Books	
1	ERICKSON R.W. AND OTHERS: "FUNDAMENTALS OF POWER ELECTRONICS", SPRINGER EDITION 2
2	JAIN, R. P ," MODERN POWER ELECTRONICS ", TATA MCGRAW HILL PUBLICATIONS
3	KOTHARI,D.P;NAGRATH,I.J: "ELECTRICAL MACHINES", TATA MCGRAW HILL
Useful Links	
1	https://nptel.ac.in/courses/108/102/108102145/
2	https://nptel.ac.in/courses/108/105/108105066/

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Tulsiramii Gatkwad Pati Collego Of Engineering & Technology, Nagpur

Tulsiramji Gaikwad-Patil College of Engineering and Technology					
Wardha Road,Nagpur-441108					
3	NAAC Accredited (A+Grade)				
Third	An Auton	V) P Tech Electronic		Nagpur	a a min a
Inira	rear (Semester-	(\mathbf{v}) B. I ech. Electronic		incation Engin	leering
	BEC	.3515: PE -1 Power 1	Liectronics La	1D	
Teaching Scl	heme		Exami	nation Scheme	
Practical	2Hrs/week CA 25 Marks				arks
Total Credit	1		ESE	25 Ma	arks
			Total	50 Ma	arks
Course Oute			Duratio	on of ESE:02Hrs0	01 v1 1n.
Students will	be able to				
¹ Examine (the characteristics of	I NYRISTOR.	I Chanacteristic		
$\frac{2}{3}$ Determine	e benavior of IGBT,	with the help of easterly 1			
4 Unstrate	enavior of rectifier w	ith the help of controlled de	vices		
5 Illustrate	behavior of DC Mot	nverter with the help of char	racteristics		
Sr.No.		List of Exp	eriment		CO
1	Determine VI Cha	racteristics of SCR			C01
2	2 Determine VI Characteristics of TRIAC.			C01	
3 Examine Characteristics of MOSFET			CO2		
4	4 Determine VI Characteristics of IGBT			CO2	
5	Analyze a single p	bhase half wave controlled re	ectifier.		CO3
6	Construct a single	phase fully controlled conv	erter and plot its re	esponse	CO3
7	Analyze and plot	the waveform of Parallel Inv	erter		CO4
8	Examine and plot	characteristics of DC Chopp	ber		CO4
9	Determine Series	Inverter			CO5
10	Examine Three Ph	ase Induction Motor and DO	C motor		CO5
Text Books					
1	SEN,P.C: "MODERN	N POWER ELECTRONICS	', S.CHAND ANI	0 CO	
2	M.D. SINGH & KHA	NCHANDANI : "POWER	ELECTRONICS"	, TATA MCGRAV	V HILL
3	SHINGARE. DEOD	atta :" INDUSTRIAL AN	D POWER ELEC	TRONICS". ELEC	CTROTECH
	PUB.				
Reference B	ooks				
1	ERICKSON R.W. AN <u>SPRIN</u> GER EDITIO	ND OTHERS: "FUNDAME DN 2	NTALS OF POW	ER ELECTRONIC	CS",
2	JAIN, R. P ," MODE	RN POWER ELECTRONIC	CS ", TATA MCC	GRAW HILL PUB	LICATIONS
3	KOTHARI,D.P;NAG	RATH,I.J: "ELECTRICAL	MACHINES", T	ATA MCGRAW H	IILL
Useful Links	1		-		
1	https://nptel.ac.in/cou	rses/108/102/108102145/			
2	https://nptel.ac.in/cou	rses/108/105/108105066/			
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BOS Chairman Department of Electronics & Comm Tutstramji Gallovari - Parir Collega at Engineering & Technology, Tragain

FM Desanatesteristes Tulsiramji Galkwad-Patil College Of Engineering and Technology, Nagpur

PX Tulairami-Gaikwad-Petti Gallegu of Engineering & E-unicities, Nagour

Dut Tutsiranii Gaikwad Pati Collego Of Engineering & Testinology, Nagpur



Tulsiramji Gaikwad-Patil College of Engineering and Technology Wardha Road, Nagpur-441 108





Third Ye	ar (Semester-	V) B.Tech. Electronics & (Communic	ation Engineering
		BEC3509: MEMS		0 0
Teaching Scher	me		Examinati	on Scheme
Lectures	3 Hrs/week		CT-1	15 Marks
Tutorial	-		CT-2	15 Marks
Total Credit	4		ТА	10 Marks
			ESE	60 Marks
			Total	100 Marks
			Duration of	f ESE: 03 Hrs 00 Min.
Course Outcon	nes (CO)			
Students will be	able to			
Examine the ope	eration of micro of	levices, micro systems and their	applications	
Identify the ME	MS fabrication p	rocess to micro devices, micro sy	vstems.	
Determine the d	esign process of	various sensor using the MEMS	fabrication te	chnique
Evaluate the De	signing of variou	is actuator using the MEMS fab	rication	
Validate the on a	micro and nano s	ystems for photonics.		
		Course Contents		
Unit I	INTRODUCTION TO MEMS AND MICROFABRICATION History of MEMS Development, Characteristics of MEMS-miniaturization - microelectronics integration - Mass fabrication with precision. Micro fabrication - microelectronics fabrication process- silicon based MEMS processes - new material and fabrication processing points of consideration for processing			
Instruction processing points of consideration for processing.MEMS FABRICATION TECHNOLOGIESMicrosystem fabrication processes: Photolithography, Ion Implantation, Diffusion, Oxidation. Thin film depositions: LPCVD, Sputtering, Evaporation, Electroplating; Etching techniques: Dry and wet etching, electrochemical etching; Micromachining: Bulk Micromachining, Surface Micromachining, High Aspect-Ratio (LIGA and LIGA- like) Technology; Packaging: Microsystems packaging, Essential packaging technologia. Selection of packaging metarials				
Unit III	Unit III MICRO SENSORS MEMS Sensors: Design of Acoustic wave sensors, resonant sensor, Vibratory gyroscope, Capacitive and Piezo Resistive Pressure sensors-engineering mechanics behind these Microsensors. Case study: Piezo-resistive pressure sensor			
Unit IV	MICRO ACTUATORSUnit IVUnit IVAlloys, Actuation using piezoelectric crystals, Actuation using Electrostatic forces (Parallel plate, Torsion bar, Comb drive actuators), Micromechanical Motors and pumps. Case study: Comb drive actuators.			tion using shape memory ising Electrostatic forces omechanical Motors and
Unit V	NANOSYSTEM Atomic Structure Shrodinger Equa Nanostructures a quantization. Mc	IS AND QUANTUM MECHA es and Quantum Mechanics, Mol tion and Wavefunction Theory, I and Molecular Dynamics, Electro plecular Wires and Molecular Cir	NICS ecular and Na Density Func magnetic Fie cuits.	anostructure Dynamics: tional Theory, elds and their

Text Books	
1	Chang Liu, "Foundations of MEMS", Pearson International Edition, 2006.
2	Marc Madou, "Fundamentals of Micro fabrication", CRC press 1997.
3	Stephen D. Senturia," Micro system Design", Kluwer Academic Publishers,2001
Reference B	ooks
1	GaberielM.Rebiz, "RF MEMS Theory,Design and Technology", John Wiley & Sons,2003
2	Charles P.Poole, Frank J.Owens, "Introduction to nanotechnology" John Wiley & sons, 2003.
3	Julian W.Gardner, Vijay K Varadhan, "Microsensors, MEMS and Smart devices", John Wiley & sons, 2001.
Useful Links	
1	https://nptel.ac.in/courses/108106165
2	https://www.me.iitb.ac.in/~gandhi/me645/05L1_coursecontents_mtvn.pd

Himp Alton. BOS Chairman

Department of Electronics & Convo Tutstramit Galiward - Path College of Englaceding & Technology, Pague

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Tulairamit-Goikwad-Petti College Of Engineering & Deductory, Nonsur

Tulsiramii Gaikwad-Pati Collego Of Engineering & Testinology, Nagpur



Tulsiramji Gaikwad-Patil College of Engineering and Technology Wardha Road, Nagpur-441 108 NAAC Accredited (A+ Grade) An Autonomous Institute affiliated to RTMNU Nagpur



Third Year (Semester-V) B.Tech. Electronics & Communication Engineering

tear (Semester-V) b. rech. Electronics & Communication Engin

BEC3510:Information Theory and Coding

Teaching Scheme	
Lectures	3 Hrs/week
Tutorial	0 Hrs/week
Total Credit	3

Course Outcomes (CO)

Students will be able to

1. **Apply** source coding algorithm in communication system.

2. Analyze channel coding algorithm for secure communication.

3. **Analyze** cyclic code in Information Theory for communication.

4. Illustrate BCH & Convolution code in Information Theory.

5. Analyze Turbo codes for Information Theory.

Course Contents

	Information Theory & Source Coding:-Introduction to information theory, Entropy
Unit I	and its properties, Source coding theorem, Huffman coding, Shannon-Fano coding, The Lempel Ziv algorithm, Run Length Encoding, Discrete memory less channel,
	Examples of Source coding-Audio and Video Compression.

- **Unit II** Channel Coding:-Channel capacity, Channel coding theorem, Differential entropy and mutual Information for continuous ensembles, Information Capacity theorem, Linear Block Codes: Syndrome and error detection, Error detection and correction capability, Standard array and syndrome decoding. Encoding and decoding circuit, Single parity check codes.
 - **Cyclic Codes:-** Galois field, Primitive element & Primitive polynomial, Minimal
polynomial and generator polynomial, Description of Cyclic Codes, Generator
matrix for systematic cyclic code, Encoding for cyclic code, Syndrome decoding of
cyclic codes, Circuit implementation of cyclic code.

BCH and Convolutional Codes:-Binary BCH code, Generator polynomial for BCH
code, Decoding of BCH code, RS codes, generator polynomial for RS code, Decoding
of RS codes, Cyclic Hamming code and Golay code. Introduction of convolution code,
State diagram, Tree diagram, Trellis diagram.

Unit V	Turbo Codes, Trellis Code: Introducton trellis description, structural and distance properties, Introduction to Turbo and LDPC codes, Iterative decoding of Turbo codes. Trellis coded modulation.
Text Books	
1	BernadSklar, -Digital Communication Fundamentals & applicationsl, Pearson Education. Second Edition.
2	Behrouz A. Foruzan, -Data communication and Networkingl, Tata McGraw-Hill.
3	Linear Network Theory - Kelkar and Pandit, Pratibha Publication 39th Edition.
Reference Boo	ks
1	Ranjan Bose, -Information Theory coding and Cryptographyl, McGraw-Hill, 2nd Ed.
2	MurlidharKulkarni, K.S.Shivaprakasha, —Information Theory & Codingl, Wiley Publications.
3	Simon Haykin, -Communication Systemsl, John Wiley & Sons, Fourth
Useful Links	
1	https://nptel.ac.in/courses/117/101/117101053/
2	https://nptel.ac.in/courses/112/104/117104129/

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Tulsiramit-Goikwad-Petti College Of Engineering & Touhistoey, Nagour

Tulsiramii Satkwad-Pati Collego Of Engineering & Technology, Nagpur

	Tu	lsiramji Gail	kwad-Patil College of E	Enginee	ring and Techn	ology	
7 - 7		Wardha Road, Nagpur-441 108					
		NAAC Accredited (A+ Grade)					
	An Autonomous Institute affiliated to RTMNU Nagpur						
Third	Year	(Semester-	V) B.Tech. Electronic	cs & Co	ommunication	Engine	eering
		BE	C3511: Biomedical In	nstrume	entation		
Teaching So	cheme				Examination Sc	heme	
Lectures		4 Hrs/week			CT-1	15 Mar	rks
Tutorial		0 Hrs/week			CT-2	15 Mar	rks
Total Credit	t	4			ТА	10 Ma	rks
					ESE	60 Ma	rks
					Total	100 M	arks
					Duration of ESE	: 03 Hrs	00 Min.
Course Out	comes	s (CO)					
Students wil	l be at	ole to					
Relate the p	rincip	les of biomedi	cal instrumentation to the	physiolo	gical systems of	the body	
Illustrate th	e use	of electrodes i	n capturing biopotential si	ignals.	<u> </u>	1 •	
Analyze the	impac	ct of cardiovas	cular conditions on the per	erformance	ce of biomedical	devices	
Analyze the	data d	obtained from	monitoring instruments to	ng anu n	atient health stat	ai intage	8
maryze the	uata	Jotaniea nom	Course Conter	nts	attent nearth statt	45	
	In	troduction to]	Biomedical instrumentation	on, develo	opment of biomed	dical inst	rumentation.
Unit I biometrics. Physiological system of body, problems encountered in measuring a line of biometrics.			ng a living				
	sv	vstem		, proorent			-88
	B	asic transduce	r principle, active transduc	cer, passi	ve transducer, ele	ectrode th	neory,
Unit II	t II biopotential electrodes, biochemical transducers						
Unit II		-					
		- 1				1.1	
Unit III		ne neart and ca	ardiovascular system, chara	racteristic	s of blood flow,	blood pro	essure
Cint III	m	easurement, n	eart sound measurement. F	Principles	s of ultrasonic dia	agnosis, i	
	III	easurement, e	neurocardiograph, plethysi	nograph	y, pullionary lun		asurement
	sp	filometry, pun	nonary function anaryzers,	s, respirat	ory gas anaryzers		
	C	onoration of in	nizing radiation instances	ntotion	or diagnostic V -	ou croci	
IIm:4 IN/	G	cheration of 10	umentation for modical use	entation I	or diagnostic A-r	ay, speci	
Unit IV	te	chnique, instru	imentation for medical use	e of radio	oisotopes, radiatio	on therap	y, EMG.
TT •4 \$7							
Unit v	Pa	tient care and	monitoring, the elements of	of intensi	ve care monitorin	ng, diag	nosis,
	ca	libration, repai	rability of patient monitori	ing equip	ment, instrument	tation for	monitoring
	pa	tient, pacemak	ters, defibrillators.				
Text Books							
T	.1 Bi	omedical Instru eiffer, 2nd Edit	imentation & Measurement, I ion ,PHI	By Leasli	e Cromwell, Fred	Weibell, l	Erich A
T	.2 Ha	andbook of Bior	medical Instrumentation, R.S	S.Khandp	ur, 2nd Edition, TM	ИН	

Reference Books				
1	Biomedical Digital Signal Processing, Tompkins, 1993 Edition, PHI			
2	Introduction to Biomedical Equipment Design ,Carr and Brown, 4th Edition, John Wiley			
Useful Links				
1	https://nptel.ac.in/courses/108/105/108105101/			
2	http://www.digimat.in/nptel/courses/video/108105101/L28.html			

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C DesinAcatemites

Tulsiramji Galkwad-Patil College Of Engineering and Technology, Nagpur

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Tulsiramii Galkwad-Patil Collego Of Engineering & Technology, Nagpur

	Tulsiramji Gaikwad-Patil Co	llege of Engineering and T	echnology		
1 1 1	Wardha Road, Nagpur-441 108				
	NAAC Accr	NAAC Accredited (A+ Grade)			
	An Autonomous Institute affiliated to RTMNU Nagpur				
Third Y	Year (Semester-VI) B.Tech. E	Electronics & Communic	ation Engineering		
	BECXX05 : Inte	rnet of Things (OE)			
Teaching Sc	heme	Examinati	on Scheme		
Lectures	3 Hrs/week	CT-1	15 Marks		
Tutorial	-	CT-2	15 Marks		
Total Credit	3	ТА	10 Marks		
		ESE	60 Marks		
		Total	100 Marks		
		Duration of	ESE: 03 Hrs 00 Min.		
Course Outo	comes (CO)				
Students will	be able to				
Understand	design levels of IoT				
Explain the	design levels of IoT and Architectur	re			
Analyze M2	M Value Chains and Machine-to M	achine			
Analyze Con	numication Protocols Sensor Nets	vorks			
Demonstrat	e Arduino and Raspberry Pi Platfor	m for IoT			
application					
	Cour	rse Contents			
	Introduction to IoT :- Io	T definition & Characteri	stics, Advantages and		
Unit I	disadvantages, IoT functional b	blocks, sensing, actuation,	Physical design of IoT,		
	Logical design of IoT, Constrain	ts affecting design in IoT			
	IOT Architecture :- Introducti	on, Functional View, Inform	ation View, Deployment		
Unit II	Unit II and Operational View, Other Relevant architectural views. Real-World Desig				
	Constraints- Introduction, Techn	ical Design constraints, IoT re	eference model		
I Init III	M2M Value Chaine LeT Value	Basic Concepts, Difference	between IoT and M2M,		
	IoT- Architecture Design princip	nles and canabilities	communication, M2NI to		
		pies and capabilities			
Tinit TV	Network and Communication	n Aspects :-Wireless mediu	m access issues, MAC		
Unit IV	model service management and	security	node discovery, service		
	model, service management and	security			
	Industrial IoT for Case Stud	ly: Introduction to different	IoT tools, Introduction to		
Unit V	Arduino and Raspberry Pi & Its	s Programming.			
	Case Study on Smart Parking,	Health care and Agriculture.			
xt Books		· · · · · · · · · · · · · · · · · · ·			
1	Arshdeep Bahga, Vijay Madisetti, -	—Internet of Things – A hands-	on approach ,		
	Universities Press, 2015 .	Internet of Things, Internetication	to a Now Age of		
2	Intelligence: By Jan Holler, Vlasios	Tsiatsis Catherine Mulligan St	r to a New Age of		
	Karnouskos David Rovle 1st Editiv	on Academic Press 2014	eran Avesanu, Stamatis		
	Larnousitos, Duviu Doyie, 13t Luiti	0.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			

3	Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), —Architecting the Internet of Things , Springer, 2011.
Reference Books	
1	Honbo Zhou, —The Internet of Things in the Cloud: A Middleware Perspective , CRC
	Press, 2012.
2	Olivier Hersent, David Boswarthick, Omar Elloumi , —The Internet of Things – Key
	applications and Protocols , Wiley, 2012
3	Rethinking the Internet of Things: A Scalable Approach to Connecting Everything, by
	Francis daCosta, 1st Edition, Apress Publications, 2013
Useful Links	
1	https://archive.nptel.ac.in/courses/106/105/106105166/
2	https://nptel.ac.in/courses/106105166
3	https://onlinecourses.nptel.ac.in/noc23_cs82/preview

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d DeanAcademics

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Third Year (Semester-V) B.Tech. Electronics & Communication Engineering

BECXX06: EMBEDDED SYSTEM (OE)

Teaching Scheme		Examination Scheme	
Lectures	3 Hrs/week	CT-1	15 Marks
Tutorial	0 Hrs/week	CT-2	15 Marks
Total Credit	3	ТА	10 Marks
		ESE	60 Marks
		Total	100 Marks
		Duration of ESE:	: 03 Hrs 00 Min.

Course Outcomes (CO)

Students will be able to

Examine importance of Embedded Systems in Real life, Engineering and Industrial applications and also to observe importance of embedded processors over general systems.

Implement basic programming instruction using concepts of microcontroller.

Analyze peripherals, interfacing and their programming to solve prototype problems.

Test Real life/ Engineering and Industry problems using Embedded Systems.

Explore the concepts of ARM (Advance RISK machine) and RTOS (Real Time Operating System)

	Course Contents
	History, Definition, and Classification of Embedded System, Design Metric & Its
	optimization, Embedded System Design Challenges, Processor selection Criteria,
Unit I	Building blocks of typical Embedded System – Core Types, Memory
	Architecture, Memory & Its Types, RISC and CISC.
	Introduction to ARM, features, architecture, instruction set features, Concepts of RTOS
Unit II	ARM processor and Architecture, Register set, instruction set, programming, interrupts,
	stack, timers on-chip and off chip peripherals, interfacing and programming.
	Analyzing Inbuilt of ADC and DAC of ARM7TDMI Microcontroller, Applications
Unit III	based on PWM, Interfacing of Temperature Sensor, USART, Bluetooth, USB Drive,
	LCD display, GSM and GPS Module.
	Protocol of Embedded System:- Bluetooth , USB Drive, I2C Bus, CAN Bus, , IEEE
Unit IV	802.11,,RS232,RS485,GPRS, IEEE 802.15, Modbus, Zigbee Architecture.
	Architecture of the kernel Tesk scheduler Semenhores Meilhey Message queues
Unit V	Arcintecture of the kernel, Task scheduler, Semaphores, Manbox, Message queues,
Unit v	Pipes, Events, Timers, Memory Management, Case study- Based on Communication
	Embedded System, Based on Automation Embedded Systems.
Text Books	
	1 M A Mazidi, J G Mazidi, R D McKinlay, The 8051 Microcontroller and
	Embedded Systems Using Assemble and C, Pearson/Prentice Hall, 2nd Ed

2	Raj Kamal, "Embedded Systems ", TMH Publications.
3	K M Bhurchandi, A K Ray, Advanced microprocessors and Peripherals, McGraw Hill Education India, 2012, 3rd ed
Reference Books	
1	Lyla B Das; Embedded Systems and Integrated Approach, Pearson, India, 2013, first edition,
2	Dr. K.V.K.K. Prasad , "Embedded / Real Time Systems", Dreamtech Publications
3	Steve Heath, "Embedded System Design", Neuwans Publications
Useful Links	
1	https://nptel.ac.in/courses/117/106/117106112/
2	https://nptel.ac.in/courses/117/106/117106111/
3	https://nptel.ac.in/courses/117/104/117104072/

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