

DTE Code: 4151 www.tgpcet.com TULSIRAMJI GAIKWAD-PATIL College of Engineering & Technology AN AUTONOMOUS INSTITUTE

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING



B.Tech Electronics & Communication Engineering

As Per NEP-2020

III Year (VI Sem) Scheme & Syllabus Session :- 2025-26



DTE Code: 4151 www.tgpcet.com **TULSIRAMJI GAIKWAD-PATIL** College of Engineering & Technology — AN AUTONOMOUS INSTITUTE —

DEPARTMENT OF ELECTRONICS& COMMUNICATION ENGINEERING Vision of the Institute

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

Mission of the Institute

- To strive for rearing standard and stature of the students by practicing high standards of professional ethics , transparency and accountability.
- To provide facilities and services to meet the challenges of Industry and Society.
- To facilitate socially responsive research, innovation and entrepreneurship.
- To ascertain holistic development of the students and staff members by inculcating knowledge and profession as work practices.



DTE Code: 4151 www.tgpcet.com **TULSIRAMJI GAIKWAD-PATIL** College of Engineering & Technology —— AN AUTONOMOUS INSTITUTE ——



"To emerge as a learning hub and center of excellence in the domain of Electronics and Communication Engineering"

Mission of the Department

- To impart quality technical education through effective teaching learning process.
- To provide a platform for addressing societal issues and challenges encountered by industries.
- To foster a culture of research and instill innovative and entrepreneurial skills.
- To promote lifelong learning in order to foster the holistic development of students and staff through the knowledge and professional ethics.





DEPARTMENT OF ELECTRONICS& COMMUNICATION ENGINEERING

PEO's of the Department

PEO 1: Demonstrate essential technical skills to identify, analyze and solve problems and design issues in Electronics and Communication Engineering.

PEO 2: 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.

PEO 4: Inculcate professional ethics and managerial skills to satisfy real life problems for serving the needs of society and environment.

PSO's of the Department

PSO1: Formulate solutions to intricate engineering problems by applying fundamental principles from the Electronics and Communication Engineering technology.

PSO2: Develop methodologies to analyze and design circuits in electronics for communication applications to meet the societal needs. PSO3: Implement project-based learning techniques to conduct experiments in Embedded Systems, communication system, signal and Image processing, Circuit analysis and design to work professionally in the industry or as an entrepreneur



TULSIRAMJI GAIKWAD-PATIL College of Engineering and Technology

Wardha Road, Nagpur - 441108 Accredited with NAAC A+ Grade Approved by AICTE, New Delhi, Govt. of Maharashtra

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

Scheme of Instruction for Third Year of B. Tech. (UG) Programme Department of Electronics and Communication Engineering

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

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Semester VI

											%				ESE
SN	Sem	Туре	BoS/ Dept	Sub. Code	Subject	T/P	U	Contact H	ours	Credits	Weigh	tage			Duration Hours
									TT		СТА			Total	
							L	Р	Hrs		C1/IA	CA	ESE	Marks	
								SIXT	H SEMEST	ER					
1	VI	PCC	EC	BEC33601	Power Electronics	Т	3	0	3	3	30	10	60	100	3
2	VI	PCC	EC	BEC33603	Internet of Things	Т	3	0	3	3	30	10	60	100	3
3	VI	MDM	IT	BIT33613	Machine Learning	Т	2	0	2	2	14	6	30	50	2
4	VI	PEC	EC	BEC33605- 07	Program Elective-II	Т	4	0	4	4	30	10	60	100	3
5	VI	PEC	EC	BEC33608- 10	Program Elective-III	Т	4	0	4	4	30	10	60	100	3
6	VI	РСС	EC	BEC33602	Power Electronics Lab	Р	0	2	2	1	0	25	25	50	2
7	VI	PCC	EC	BEC33604	Internet of Things Lab	Р	0	2	2	1	0	25	25	50	2
8	VI	VSEC	IT	BIT33612	Python Programming	Р	0	4	4	2	0	50	50	100	2
			TOTA	L SIXTH SEM			16	8	24	20	134	146	370	650	

Course Category	BSC/ESC (Basic Science Course/ Engineering Science Course.)	PCC (Program me Core Courses)	PEC (Programme Elective Courses)	(MDM/OEC) Multidisciplinary Minor/ (OEC) Open Elective Course)	SEC (Skill Course)	Humanities Social Science & Management	Experiential Learning Courses	CC (Co- Curricular Courses)
Credits		08	08	02	02			
Cumulative Sum	16 / 13	38	12	18	08	10	10	04

PROGRESSIVE TOTAL CREDITS: 105+20 = 125

TIMENT OF Electronics & Comm	Habram	Dr. Pragati Patil	hts	June,2025	1.00	Applicable for AY 2025-26 Onwards
ranji Galkw <u>ka . Admirgigon</u> mearing & Technology Nagits Col	ean AttArtemie Aramji Gaikwada loge Of Engineer Technology, Nag	s Vice-भिक्तिकिका निर्मामुं। Gaikwad Pati! Colleg मुद्दिring & Technology. Nac मुद्दि	Principal Nakt e of Principal GPCET, Nagpur	DO Date of Release	Version	-





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

Program Elective List for U.G.

Semester V	Semester VI			
Program Elective- I	Program Elective- II	Program Elective- III		
BEC3506: Electromagnetic Field and Antenna	BEC33605: Microwave & Radar Engineering	BEC33608: Wave guide & Antenna		
BEC3507: CMOS VLSI Design	BEC33606: HDL Using Verilog	BEC33609: VLSI Signal Processing		
BEC3508: Instrumentation and Control System	BEC33607: PLC Fundamental	BEC33610: SCADA		
Semester VII	Semester VIII			
Program Elective- IV	Program Elective- V	Program Elective- VI		
BEC34702: Optical Fiber Communication	BEC34805: Mobile Communication	BEC34808: Satellite Communication		
BEC34703: Robotics & Automation	BEC34806: VLSI Testing	BEC34809: Nanotechnology		
BEC34704: Mixed Signal Design	BEC34807 : Distributed Control Systems	BEC34810: System Security		

HOD HOD Tuisiramiji Gaikwad - Patil College of Engineering & Technology, Nagpus

Dr. Friemanand Naktode Principal TGPCET, Nagpur

Dr. Pragati Patil (9 Vice-Principal Tulsifamji Gaikwad Patil College of wrinn & Technology A

Dean Academics Fulsiramji Gaikwad-Patil College Of Engineering and Technology, Nagour





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Open Elective List for U.G.

	Open Elective-I (SEM-III)					
Sr.	Course					
No.	Code	Course				
1	B\$\$325XX	Basic Electronics & Communication				

Open Elective-II (SEM-IV)						
Sr. No.	Course					
1	B\$\$324XX	Evoluation in Communication Technologies				

Open Elective-III(SEM-V)						
Sr.						
No.	Course Code	Course				
1	B\$\$325XX					
		ICT in Rular Sector				

++partment of Electronics & Comm. Tuistramfi Gaikwad - Patil College of Engineering & Technology, Nagpure,

Dr. Fremanand Naktode Principal TGPCET, Nagpur

Pragati Patil Vice-Principal Tulsifamji Gaikwad Patil College of frinn & Technology 1

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HONORS SPECIALIZATION IN VLSI Design and Technology

Sr. No	Sem	Course Code	Subject	Nature of Evaluation	Credits		
1	III	BEC32306	Integrated Circuits and Applications	NPTEL/ESE	03		
2	IV	BEC32410	Hardware Modelling using Verilog	NPTEL/ESE	03		
3	V	BEC33510	System Design Through Verilog	NPTEL/ESE	03		
4	VI	BEC33611	Digital IC Design	NPTEL/ESE	03		
4		BEC33612	VLSI Design Flow: RTL to GDS	NPTEL/ESE	05		
5	VII	BEC34708	VLSI Physical Design	NPTEL/ESE	03		
6	VIII	BEC34813	Internship(VLSI 1 month)	ESE	03		
7	v 111	BEC34814	Capstone Project	ESE	05		
	Total						

June,2025 1.00 240 . . . Applicable for AY 2025-26 trange Gallwar , Chairperson O an Dear Arethenies Vice-Printer part Dr. Pragati Patil Onwards Dr. Fremeprincipal NaktodeDate of Release Version College Of Engineering & Technology, Nagpur Stud Technology, Nagpur





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MINORS SPECIALIZATION IN EMBEDDED SYSTEM & IOT

Sr. No	Sem	Course Code	Subject	Nature of Evaluation	Credits		
1	III	BEC32306	Microcontrollers & Applications	NPTEL/ESE	03		
2	IV	BEC32410	Embedded Systems	NPTEL/ESE	03		
3	V	BEC33510	RISC-processor	NPTEL/ESE	03		
4	VI	BEC33611	ARM-based Development	NPTEL/ESE	03		
5	VII	BEC34708	Real-Time Operating Systems (RTOS)	NPTEL/ESE	03		
6	VIII	BEC34813	Industrial IoT (IIoT)	ESE	03		
	Total						

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Internet of Electronics & Courses Dr. Pragat Patil Dr. Presupplicipal NakiodoDate of Belease	Version	Onwards
nearing & Technology Natifistramji Gaikwad Batil College of Principal College of Engineering & Technology, Nather Sud Technology, Nather		



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Scheme of Instruction for Third Year of B. Tech. (UG) Programme Department of Electronics and Communication Engineering

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

Exit Course

Award of UG Certificate (After First Year)

Sr. No	Course Name	Mode of conduction	Credits				
01	Digital Electronics	Certification Online/Offline/NPTEL	04				
02	Microprocessor 8085	Certification Online/Offline/NPTEL	04				
	OR						
03	Internship(16 week)	-	08				
	Total	08					

Award of Diploma (After 2 Year)

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	Sr. No	Course Name	Mode of conduction	Credits
	01	PCB Design & Development	Certification Online/Offline/NPTEL	04
	02	PLC & SCADA	Certification Online/Offline/NPTEL	04
		C	DR	
	03	Internship(16 week)	-	08
		Total		08
re-partm Tuistrai 1 Engine	en of Electronics & mil Gaikwad - Paul (aring & Technology	Comm. Dr. Friemanand Naktode Sollege Principal Nagpure TGPCET, Nagpur	Dr. Pragati Patil Vice-Principal Tulsiramji Gaikwad Patil Co	Dean Academics rutsiramji Gaikwad-Patil College Of Engineering and Technology, Nagpur

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1	Wardha Road, Nagpur-441 108							
	NAAC Accredited (A+ Grade)							
An Autonomous Institute affiliated to RTMNU Nagpur								
Secor	nd Yea	ar (Semester	r-VI) B.Tech. Electronics &	& Commu	nication Eng	ineering		
			BEC33601 : Power Elect	tronics				
Teaching S	Scheme	:		Examinat	tion Scheme			
Lectures		3 Hrs/week		CT-1	15 Mar	ks		
Tutorial		0 Hrs/week		CT-2	15 Mar	ks		
Total Cred	lit	3		CA	10 Mar	ks		
				ESE	60 Mar	ks		
				Total	100 Ma	arks		
				Duration of	of ESE: 03 Hrs (00 Min.		
Course Ou	tcomes	5 (CO)						
Students wi	ill be at	ole to						
1 Explai	n the w	vorking and ch	aracteristics of power devices.					
2 Discrip	minate	the construct	ion, operation, and steady-state c	characteristic	s of IGBT, Pow	er MOSFET,		
and G	to the o	Ices.	Dower devices as controlled rest	fior AC DC	aconstantant			
4 Annly	the Kn	owledge of Pc	-ower devices as controlled fect	ising Choppe	ers & Inverters			
5 Illustr	ate the	operation and	the necessity of starters for three	e-phase indu	ction motors, ar	d speed control		
technic	jues ap	plicable to three	ee-phase induction motors.	- P	••••••••••••••••••••••••••••••••••••••			
	<u> </u>	-	Course Contents					
Unit I	SCR: charac technic TRIA DIAC	Construction, teristics, SCI ques, Isolation C: Constructio , P base contro	Operation, Transistor analogy, S R Ratings, Gate characterist r Techniques, Pulse triggering, B on, Operation, steady stage char ol using TRIAC	Static & dyna ics, triggeri urst triggerir racteristics, '	amic Characteri ing requiremer ng Triggering mod	stics, switching ats, Triggering es, Principle of		
Unit II	Unit II GBT: 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. GTO : Construction, Operation, Turn-off mechanism, Applications							
Unit III	Phase 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	Ioads, Working of Three phase AC-AC controller with R Load. DC-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 Unit IV 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							

	Three Phase Induction Motor: Principle of operation, Necessity of starters, DOL starter,							
Unit V	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								
T1	SEN,P.C: "MODERN POWER ELECTRONICS", S.CHAND AND CO							
T2	M.D. SINGH & KHANCHANDANI : "POWER ELECTRONICS", TATA MCGRAW HILL							
	PUBLICATIONS, NEW DELHI. EDITION 2							
Т3	SHINGARE, DEODATTA :" INDUSTRIAL AND POWER ELECTRONICS",							
	ELECTROTECH PUB.							
Reference	Books							
R1	ERICKSON R.W. AND OTHERS: "FUNDAMENTALS OF POWER ELECTRONICS",							
	SPRINGER EDITION 2							
R2	JAIN, R. P ," MODERN POWER ELECTRONICS ", TATA MCGRAW HILL							
	PUBLICATIONS							
R3	KOTHARI,D.P;NAGRATH,I.J: "ELECTRICAL MACHINES", TATA MCGRAW HILL							
Useful Lin	KS Contraction of the second se							
L1	https://nptel.ac.in/courses/108/102/108102145/							
L2	https://nptel.ac.in/courses/108/105/108105066/							

Puertment of Electronics & Comm Tuistramfi Guikwad - Patil College of Engineering & Technology, Nagnus,

Dean Academics

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Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road, Nagpur-441 108
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An Autonomous Institute affiliated to RTMNU Nagpur



An Autonomous Institute affiliated to RTMNU Nagpur							
Third Yea	ar ((Semester-V	VI) B.Tech. Electronics & C	Communication	Engine	eering	
BEC33603: Internet of Things							
Teaching Sche	me			Examination Scheme			
Lectures 3 Hrs/week				CT-1	15 Ma	rks	
Tutorial		0 Hrs/week		CT-2 15 Marks			
Total Credit		3		ТА	10 Ma	rks	
				ESE	60 Ma	rks	
				Total	100 M	arks	
				Duration of ESE	: 03 Hrs	00 Min.	
Course Outcor	nes	(CO)					
Students will be	e at	ole to					
Explain the func		iental concept	s and architecture of the Internet	of Things.	manina	their velve	
chains, architect	ure	s, design princ	ciples, and core capabilities.	et of Things by Co	mparing	, then value	
Explain the desi	gn	levels of IoT a	and Architecture with respect to no	etwork and commu	nication	aspects.	
Evaluate progra platforms.	amr	ning capabilit	ies and suitability for IoT appli	cations by IoT de	evelopme	nt tools and	
Implement the	fun	damentals of	IoT and its role in enabling sm	art application do	mains to	assess their	
impact and effec	tive	eness.					
			Course Contents				
	In	troduction to	IoT and Architecture: - IoT de	finition & Charact	eristics, A	Advantages	
	and disadvantages, IoT functional blocks, sensing, actuation, Physical Design of IoT,						
Unit I	Lo Vi	ew Information	of 101, Constraints affecting de	sign in 101. Intro tional view	duction,	Functional	
	N		Introduction Desis Consents Di	ffortan og hattmaar I	L on a T	INT NON	
Unit II	Value Chains IoT Value Chains Machine to Machine Communication M2M to IoT-						
	Ar	chitecture, De	sign principles and capabilities.				
	Ne	twork and	Communication Aspects:- Wi	reless medium ad	ccess iss	sues. MAC	
Unit III	pro	otocol, Comm	unication Protocols: ZigBee, 6 I	oWPAN, Bluetoo	th NFC a	and RFID,	
	Se	nsor deployme	ent & Node discovery.				
Unit IV	Io'	T Tools: -	Introduction to different IoT t	ools, Introduction	to Ard	luino and	
	ĸa	spoerry PI & I	its Programming.				
	IoT Applications: - Intelligent Traffic systems, Smart Parking, Health Care and						
Unit V	Ag	griculture.					
Text Books	1	A 1 1 D 1				1.	
	1	Arsnaeep Bar Universities F	nga, v ijay Madisetti, —Internet o Press. 2015.	1 I nings – A hands	-on appro	oacn∥,	
	2	Dieter Uckelr	mann, Mark Harrison, Michahelle	s, Florian (Eds), —	Archited	ting the	
		Internet of Th	ningsl, Springer, 2011.	, , , , , , , , , , , , , , , , , , , ,		0	
	3	Introduction t	to IoT by Sudip Mishra, Anandrup	Mukherjee, Arijit	Roy. Pul	blisher :	
		Cambridge U	niversity Press				

4	Internet of Things Architecture and Design Principles by Rajkamal. Publisher : McGraw Hill Education (India) Pvt. Ltd.
Reference Books	

	Raj Kamal, "Internet of Things: Architecture and Design", McGraw Hill.2nd edition June 2022
	2Pethuru Raj, Anupama C. Raman ," The Internet of Things Enabling Technologies,
	Platforms, and Use Cases", Taylor and Francis group. February 2017
	3 Peter Waher, "Mastering Internet of Things: Design and create your own IoT
	applications using Raspberry Pi 3", First Edition, Packt Publishing, 2018.
Useful Links	
	1 NPTEL course on "Components and Applications of IoT" by Dr.
	Sanjoy Parida,
	https://onlinecourses.swayam2.ac.in/arp19_ap52/preview_
	2 https://onlinecourses.nptel.ac.in/noc23_cs82/preview_

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Tulsiramji Gaikwad-Patil College of Engineering and Technology Wardha Road, Nagpur-441 108Image: College of Engineering and Technology Wardha Road, Nagpur-441 108NAAC Accredited (A+ Grade) & NBA Accredited An Autonomous Institute affiliated to RTMNU NagpurImage: College of Engineering and Technology Wardha Road, Nagpur-441 108									
Third Ye	Third Year (Semester-VI) B.Tech. Electronics & Communication Engineering								
Teaching Sch	Bitsol/: Machine Learning Teaching Scheme								
L ooturos	Iterating Scheme Difference Iterating scheme OT 1 7 Marks								
Tutorial	- Hrs/week		CT-2	7 Marks					
Total Credit	- 1115/ WCCK			6 Marks					
Total Cleun	2		FSF	30 Marks					
			Total	50 Marks					
			Duration	of ESE: 02 Hrs 00 Min					
Course Outer	mes (CO)		Duration						
Students will l	be able to								
Explain machi foundational da Examine super	ne learning paradig ata analysis. rvised learning in t	gms and dimensionali erms of regression ,cl	ty reduction technique assification and neura	es PCA and LDA for l networks.					
Analyze cluste decision-makin	ring and reinforcer g tasks.	nent learning techniqu	ues for unsupervised p	problems and optimize					
Unit I	Introduction: Unsupervised Introduction (PCA), Linear	Introduction to I learning, Reinforcem to Dimensionality I Discriminant Analys	Machine learning, S ent learning. Deep lea Reduction: Principal is (LDA)	Supervised learning, rning. Component Analysis					
Unit II	Supervised Learning I- Regression: Decision Trees-ID3, CART, Naive Bayes, K-Nearest-Neighbours (KNN), Logistic Regression, Multinomial Logistic Regression, Support Vector Machines (SVM) - Nonlinearity and Kernel Methods Supervised Learning II- Neural Network: Problems – Perceptrons, Activation Functions, Artificial Neural Networks								
Unit III Unsupervised Learning: Clustering-K-means, K-Modes, K-Prototypes, Gaussian Mixture Models, Expectation-Maximization. Reinforcement Learning: Exploration and exploitation trade-offs, non-associative learning, Markov decision processes, Q-learning									
Text Books									
1	Machine Lear Pearson	ning –Saikat Dutt, Su	bramanian Chandram	ouli, Amit Kumar Das,					
2	Foundations of Ameet Talwal	of Machine Learning kar, MIT Press.	g, Mehryar Mohri, A	Afshin Rostamizadeh,					
3	Kevin Murphy Press,2012	, Machine Learning:	A Probabilistic Perspe	ective, MIT					
Reference Bo	oks								

1	1 Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical					
Learning, Springer2009						
2	Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.					
Useful Links						
1	https://onlinecourses.nptel.ac.in/noc23_cs18					
2	https://scikit-learn.org/stable/user_guide.html					

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

yer ye	Tu	lsiramji Gai	kwad-Patil Colleg	e of Engine	ering and	Technology			
Wardha Road, Nagpur-441 108									
3.7			NAAC Accredit	NAAC Accredited (A+ Grade)					
Second Veen (Semester VI) P. Tech. Electronics & Communication Engineering									
Secon	u i ea	DEC226	$(-v_1)$ D. Lett. Ele				gmeering		
DEC3005:FE-II MICTOWAVE & Kadar Engineering									
Teaching S	cheme				Examina	tion Scheme	1		
Lectures		4 Hrs/week			CT-1	15 Ma	arks		
Tutorial	4	0 Hrs/week	•		CT-2	15 Ma	arks		
Total Credi	t	4			CA	10 Ma	arks		
					ESE	60 Ma	irks Levier		
					Total		larks		
Course Out					Duration	of ESE: 03 Hrs	00 Min.		
Studente wi	ll bo ok	$\frac{1}{10}$							
1 A nnly th	e prin	ciples of micro	wave transmission 1	ines to solve	microwave	nroblems			
2 Explain	the pri	nciples of way	ve propagation in wa	veguides and	the function	on of passive co	omponents.		
3 Analyze	the mo	odes of operati	ion using RWH theor	ry and the per	formance	of microwave d	iodes in practical		
circuits.		-					-		
4 Examine	e the ra	dar block diag	gram, signal flow and	d functional i	ntegration	of subsystems.			
5 Evaluate	e the ef	fectiveness of	pulse Doppler radar	in differentia	iting movin	ig targets from s	stationary clutter.		
			Course	Contents					
	Micro	wave transm	ission lines: Introd	luction, tran	smission 1	ines equations	and solutions,		
I Init I	reflection and transmission coefficients, standing waves and SWR, line impedance and line								
	admit	tance. Smith c	hart, impedance mate	ching using s	ingle stubs	, Microwave co	axial connectors.		
						_			
Unit II	Micro	wave waveg	uides and compone	ents: Introdu	iction, rec	tangular wave	eguides, circular		
	isolate	ors.	vave cavilles, iniciov	vave flyblid c	incuits, une	cuonal coupler	s, circulators and		
	. <i>C</i>	1, 1							
	Micro	wave diodes:	Transfer electron de	vices: Introd	uction, GU	NN effect diod	les – gaas diode,		
Unit III	BARI	TT diode. Par	ametric amplifiers O	ther diodes: 1	PIN diodes	. Schottky barri	er diodes.		
						,			
	An in	troduction to	radar: Basic Radar,	The simple	form of th	e Radar equati	on, Radar block		
TI	diagra	am, Radar freq	uencies, application	of Radar, the	e origins of	Radar.			
Unit III BARITT diode, Parametric amplifiers Other diodes: PIN diodes, Schottky barrier diodes. An introduction to radar: Basic Radar, The simple form of the Radar equation, Radar block diagram, Radar frequencies, application of Radar, the origins of Radar. Unit IV									

Unit V	MTI and pulse doppler radar: Introduction to Doppler and MTI Radar, delay line Cancellers, digital MTI processing, Moving target detector, pulse Doppler Radar.
Text Books	
1	Microwave Devices and circuits- Liao / Pearson Education
2	Introduction to Radar systems-Merrill I Skolnik, 3rd Ed, TMH, 2001.
3	Microwave Engineering – Annapurna Das, Sisir K Das TMH Publication, 2001.
Reference	Books
1	Microwave Engineering – David M Pozar, John Wiley, 2e, 2004 Dept of ECE/ GCEM
Useful Link	XS
L1	https://youtu.be/R6pGtFSdn70?feature=shared
L2	https://youtu.be/ge_117dWU9Q?feature=shared

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

	Tulsiramji Gaikwad-Patil College of Engineering and Technology								
	Wardha Road, Nagpur-441 108								
7-1	NAAC	NAAC Accredited (A+ Grade) & NBA Accredited							
An Autonomous Institute affiliated to RTMNU Nagpur									
Fourth	Year (Semester-	VI) B.Tech. Electronics &	Communic	ation Engineering					
	BEC	C33606 :(PE-II) HDL Using	g Verilog						
Teaching So	Teaching Scheme Examination Scheme								
Lectures	4Hrs/week		CT-1	15 Marks					
Tutorial	0 Hrs/week		CT-2	15 Marks					
Total Credi	t 4		ТА	10 Marks					
			ESE	60 Marks					
			Total	100 Marks					
			Duration of	ESE: 03 Hrs 00 Min.					
Course Out	comes (CO)								
Students wil	l be able to								
Describe the	role of Verilog as a	Hardware Description Language	(HDL) in digi	tal system design.					
Analyse sequ	ential elements usin	g Verilog gate-level modelling.							
Construct co	mbinational and seq	uential circuits using the dataflow	v modelling.						
Design and si	imulate combination	al and sequential circuits using b	ehavioural mo	delling in Verilog.					
Develop the t	test benches for testi	ng combinational and sequential	circuits using	various test bench					
techniques.		Course Contents							
	Introduction to	Varilag HDL : Varilag as HDL	Lavala of Dag	ian Decorintion					
	Concurrency Pr	ogram structure. Top-down and F	Levels of Des	ign methodology					
TT • 4 T	differences betw	een modules and module instance	es, parts of a s	imulation design					
Unit I	block, stimulus b	block. Verilog Data types and Op	erators, syster	n tasks, compiler					
	directives.	, , , , , , , , , , , , , , , , , , ,	, . , . ,	r, r					
	Gate-Level Mo	delling: Modelling using basic V	verilog gate P	rimitives, Description of					
Unit II	and/or and buf/	not type gates, rise, fall and tu	rn-off delays,	, min, max, and typical					
	delays, Design of	of Decoders, Multiplexers, Flip-	flops, Registe	ers & Counters in Gate-					
	level Modelling.								
	Dataflow Mod	elling: Continuous assignment	s, Delay spe	ecification, expressions,					
Unit III	II operators, Design of Decoders, Multiplexers, Flip-flops, Registers & Counters in								
	dataflow model.								
T T •4 T T7	Behavioural M	odelling: Procedural Assignment	ts, Initial and	always blocks, blocking					
Unit IV	branching loop	ng statements, delay control,	Design of	Decoders Multiplexers					
	Flin-flons Regis	ters	s, Design of	Decoucis, Multiplexeis,					
	& Counters in B	ehavioural model.							
	Components Te	st and Verification: Test Bench	- Combinatio	onal Circuits Testing,					
	Sequential Circu	its Testing, Test Bench Techniqu	es, Design Ve	erification, Assertion					
Unit V	Verification	- 1	C						

Text Books	
1	Samir Palnitkar-Verilog HDL: A Guide to Digital Design and Synthesis, Pearson
	Education, 2nd Ed., 2009.
2	
	Michel D. Ciletti- Advanced Digital Design with Verilog HDL,2nd Ed., PHI, 2009
Reference Books	S
1	Padmanabhan, Tripura Sundari -Design through Verilog HDL, Wiley, 2016
2	S.Brown, Zvonko – Vranesic, Fundamentals of Digital Logic with Verilog Design,
	ТМН,
	3rd Ed., 2014.
Useful Links	
1	https://rashmistudents.yolasite.com/resources/Verilog%20HDL%20-
	%20Samir%20Palnitkar.pdf
2	https://onlinecourses.nptel.ac.in/noc24_cs61/preview
3	https://learning.intel.com/developer/learn/courses/235/verilog-hdl-basics

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	Tulsiramji Gaikwad-Patil College of Engineering and Technology								
1 1		Wardha Road,Nagpur-441108							
		NAAC Accredited (A+ Grade)& NBA Accredited							
	An Autonomous Institute affiliated to RTMNU Nagpur								
Third Y	ear (S	Semester V	/I) B.Tech. El	ectronics & (Communication	n Engin	eering		
		BE	C33607: PE II	-PLC Funda	amentals				
Teach	Teaching Scheme ExaminationScheme								
Lectures		4 Hrs/week			CT-1	15	5 Marks		
Tutorial		0 Hrs/week			CT-2	15	5 Marks		
TotalCredit		4			ТА	10) Marks		
					ESE	60) Marks		
					Total	10	0 Marks		
					Duration of ESE:	:03Hrs 0	0Min.		
Course Outo	comes ((CO)							
Students will	be able	e to							
Describe the 1	role, ar	chitecture, ty	pes, and compone	ents of PLC syst	ems and their selec	ction crit	eria in		
Industrial auto	omation	l. ain a with I/O	daviaga gangang	actuators and	antral alamanta				
Explain PLC Explain PLC	progra	mming I/O	nodules, commun	ication selection	n and application	s in autor	mation		
Develop ladde	er logic	using timers	s. counters. and co	ontrol instruction	ns for industrial ap	plication	S.		
Apply advance	ed PLC	C functions for	or analog control,	PID, and motor	control application	ns.	~ •		
			Cours	e Contents	••				
	Trada	advetion to	DI C. Dala of out	omotion in Indu	string hanafits of a		Necesity		
	of F	PIC History	PLC: Kole of aut	of $PIC_{types_{-}}$	-fixed/modular/ded	licated (Overall PI C		
Unit I	syst	em, PLC Ing	out and output me	odules (along w	ith Interfaces), CP	U, progi	ammers and		
	mor	nitors, power	supplies, selection	n criterion	,,,				
	Into	- mfacing of I	$\overline{\mathbf{D}}$ C with \mathbf{I} C de	viage Input O	V/OEE awitahing	laviaga	Innut analaa		
	devi	ces Output	ON/OFE devices	Output analog	devices Sensors-to	emperatu	input analog		
UnitII	flow	<i>iees, Output</i>	ators-Electrical. p	neumatic. hvdra	aulic Limit switche	es. proxi	mity sensors		
	Con	trol Element	s- Mechanical, El	ectrical, Fluid v	alves	, I			
	Pro	grammable	logic controlle	rs: Programma	able controllers,	Program	mable logic		
	cont	trollers, Anal	og digital input ar	nd output modul	es, PLC programm	ing, Lad	der diagram,		
Unit III	Seq	uential flow	chart, PLC Co	mmunication a	and networking, I	PLC sel	ection, PLC		
	Inst	anation, Auv	antage of using P.	LC for industria					
	Арр	olication of I	PLC: Rules for pr	oper constructio	n of ladder diagram	n Timer	and counter-		
	type	es along with	timing diagrams	, Reset instruct	ion, latch instruction	on and c	ontrol zones		
Unit IV	Dev	eloping lada	er logic for Seque	alant car parkin	s, ON OFF Tank le	troller	rol, ON OFF		
Unit V	Adv	ance functional processing	on and Applicat	ions of PLC: A	Analog PLC operations and let AC motor and	tion and DC mot	PLC analog		
	PI C	Application	$_{5}$, $_{112}$ principles, ns in developing	systems- Tank	level controller 1	ising an	alog signals		
	tem	perature cont	troller using RTD.	speed control of	of electric motor.	and and	105 51511a15,		
Text Books				*					

1	John W. Webb, Ronald A. Reis, "Programmable Logic Controllers: Principles and
	Application", PHI Learning, New Delhi, 5th Edition
2	John R. Hackworth, Frederick D., Hackworth Jr., "Programmable Logic Controllers
	Programming Methods and Applications", PHI Publishers
3	Stuart A Boyer, "SCADA supervisory control and data acquisition", ISA, 4th Revised
_	edition
Reference Books	
1	Batten G. L., "Programmable Controllers", McGraw Hill Inc., Second Edition
2	Krishna Kant, "Computer Based Industrial Control", PHI
3	P. K. Srivstava, "Programmable Logic Controllers with Applications", BPB
	Publications

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	Tulsiramji Gail	wad-Patil College of Engineering and Technology)gy		
	Wardha Road, Nagpur-441 108				
1 -1	NAAC Accredited (A+ Grade)& NBA Accredited				
	An Auton	omous Institute affiliated to RTMNU Nagpur			
Third Y	Year (Semester-V	VI) B.Tech. Electronics & Communication E	ngineering		
	BEC33	508 : (PE-III) Waveguide and Antenna			
Teaching Se	cheme	Examination Scher	me		
Lectures	4Hrs/week	CT-1 1	5 Marks		
Tutorial	0 Hrs/week	CT-2 1	5 Marks		
Total Credi	it 4	TA 1	0 Marks		
		ESE 6	0 Marks		
		Total 1	00 Marks		
		Duration of ESE: 03	3 Hrs 00 Min.		
Course Out	comes (CO)				
Students wil	ll be able to				
Examine mic	crowave circuits and	systems using passive and active microwave devices.			
Analyze the	UHF components wi	th the help of scattering parameter.			
Evaluate the	antenna parameters	using Friis transmission equation.			
Construct an	itennas using the cor	ncept monopole.			
Examine con	nmunication reliabil	ity using the gain of arrays antenna.			
	Dessions and set	Course Contents	Dissetional		
	Passive and active microwave devices: Microwave Passive components: Directional				
TT:4 T	Semiconductor	Devices: Gunn Diodes IMPATT diodes. Schottky Ba	rrier diodes. PIN		
Unit I	diodes, Microwa	we tubes: Klystron, TWT, Magnetron.			
	Microwave Com	ponents : Introduction to rectangular waveguide & wav	reguide excitation		
Unit II	,Principles of S-	parameters, S-parameters for multi-ports (2-port, 3-port	t, 4-port etc.)		
	properties of S-n	natrix, waveguide Tees (E, H, E-H planes), Directional	Couplers,		
	Isolators gyrato	tions, Microwave attenuators, Slotted line, Ferrite devi	ces,Circulators,		
	Introduction to r	nicrowave systems and antennas. Microwave frequency	v hands Physical		
Unit III	Unit III concept of radiation Near- and far-field radions. Fields and Power Radiated by an				
C	Antenna Antenna Pattern Characteristics Antenna Gain and Efficiency Aperture				
	Efficiency and Effective Area, Antenna Noise Temperature and G/T. Impedance				
	matching, Friis t	ransmission equation	L		
Unit IV	Radiation mecha	nisms and design aspects: Radiation Mechanisms of Li	inear Wire and		
	Loop antennas, A	Aperture antennas, Reflector antennas, Microstrip anter	nas and		
	Frequency indep	endent antennas, Design considerations and application	ns.		
	Antenna arrays a	and applications			
	Two-element arr	ay, Array factor, Pattern multiplication, Uniformly spa	ced arrays with		
Linit V	uniform and non	-uniform excitation amplitudes, Direction of Arrays, Si	mart antennas.		

Text Books	
1	John D Krauss, Ronald J Marhefka and Ahmad S. Khan, "Antennas and Wave Propagation: Fourth Edition, Tata McGraw-Hill, 2006.
2	David M. Pozar, "Microwave Engineering", Fourth Edition, Wiley India, 2012.
3	Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd ed., 2000
Reference Books	S
1	Constantine A.Balanis, —Antenna Theory Analysis and Design, Third edition, John Wiley India Pvt Ltd., 2005.
2	R.E.Collin, "Foundations for Microwave Engineering", Second edition, IEEE Press, 2001
3	Antennas and Wave Propagation – K.D. Prasad, Satya Prakashan, Tech India Publications, New Delhi, 2001.
Useful Links	
1	http://www.digimat.in/nptel/courses/video/108101112/L40.html
2	https://archive.nptel.ac.in/courses/108/101/108101112/
3	https://www.youtube.com/watch?v=h51mFbIgZRI

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	Tulsiramji Gail	wad-Patil College of Engine	ering and Tech	nology		
	Wardha Road, Nagpur-441 108					
1 -1	NAAC Accredited (A+ Grade)& NBA Accredited					
	An Auton	omous Institute affiliated to	RTMNU Nagpur			
Third Y	Year (Semester-V	VI) B.Tech. Electronics & (Communicatio	n Engineering		
	BEC33	609 : (PE-III) VLSI Signa	l Processing			
Teaching So	cheme		Examination S	cheme		
Lectures	4Hrs/week		CT-1	15 Marks		
Tutorial	0 Hrs/week		CT-2	15 Marks		
Total Credi	i t 4		ТА	10 Marks		
			ESE	60 Marks		
			Total	100 Marks		
			Duration of ESI	E: 03 Hrs 00 Min.		
Course Out	tcomes (CO)		-			
Students wil	ll be able to					
Apply pipelin	ning and parallel pro	cessing techniques to enhance the	e performance and	d reduce the power		
consumption	of FIR digital filters	and other digital systems.				
Analyze the o	concept and properti	es of unfolding in digital system	design.			
Develop the o	concept of folding tr	ansformation in digital system de	esign.			
Examine the	principles of systoli	c array design methodology.	1 70 1 133	7* 1 /1 1		
Analyse fund	damentals of fast col	Avolution algorithms including C	ook-100m and w	inograd methods.		
	Dinalining and	Course Contents	tion Dinalining	of FID Digital		
	Filters Parallel	raranei rrocessing. Introduc	ction, Fipenning	OI FIR Digital		
	Finers, Farance Processing Pipelining and Parallel Processing for Low Power Retiming					
Unit I	Introduction,		-8			
	Definition and P	roperties, Solving System of Inec	qualities, Retiming	g Techniques.		
	Unfolding: Introduction an Algorithms for Unfolding, Properties of Unfolding, Critical					
Unit II	Path,					
	Unfolding and Retiming Application of Unfolding.					
	Folding: Introd	uction to FoldingTransformation	n, Register Minin	nization Techniques,		
Unit III	II Register Minimization in FoldedArchitectures, Folding in Multirate Systems.					
	Systolic Archit	Systolic Architecture Design: Introduction, Systolic Array Design Methodology, FIR				
I	Systolic	Systolic				
Unitiv	Arrays, Selection of Scheduling Vector, Matrix Multiplication and 2D Systolic Array					
Systolic Design for Space Representations Containing Delays						
	Fast Convolut	ion: Introduction, Cook, Toor	n Algorithm, W	/inogard Algorithm,		
Unit V	Iterated		e ,	6 6 7		
Convolution, Cyclic Convolution, Design of Fast Convolution Algorithm by Inspec						
Text Books						

1	Keshab K. Parhi. VLSI Digital Signal Processing Systems, Wiley-Inter Sciences,			
	1999			
2	Mohammed Ismail, Terri, Fiez, Analog VLSI Signal and Information Processing,			
	McGraw Hill, 1994.			
3	Kung. S.Y., H.J. While house T.Kailath, VLSI and Modern singal processing,			
	Prentice Hall, 1985.			
Reference Book	S			
1	Jose E. France, YannisTsividls, Design of Analog Digital VLSI Circuits for			
	Telecommunications and Signal Processing' Prentice Hall, 1994.			
Useful Links				
1	https://onlinecourses.nptel.ac.in/noc20_ee44/preview			

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	Tul	lsiramji Gail	kwad-Patil Colleg	ge of Engine	ering and Tech	nology	
7 • 7	Wardha Road, Nagpur-441 108						
	NAAC Accredited (A+ Grade)						
		An Auton	omous Institute a	affiliated to I	RTMNU Nagpu	r 	
Third	Year ((Semester-V	(I) B. Tech. Elec	ctronics & (Communicatio	on Engin	eering
			BEC33610: SC	ADA (PE-	·III)		
Teaching S	cheme				Examination S	Scheme	
Lectures		4 Hrs/week			CT-1	15 Mai	rks
Tutorial		0 Hrs/week			CT-2	15 Ma	rks
Total Credi	it	4			ТА	10 Ma	rks
					ESE	60 Ma	rks
					Total	100 M	arks
					Duration of ES	E: 03 Hrs	00 Min.
Course Out	tcomes	(CO)					
Students wi	ll be ab	ole to					
1 Exp	olain in	dustrial autom	nation concepts, evo	plution, and co	mpare PLC, DC	S, and SC	ADA.
2 Illu Dov	strate	the working of	t core components f	or SCADA sy	vstem.	roprocont	inductrial
3 proc	cesses a	and equipment		is within SCA	DA soltware to	represent i	industriar
4 Ana	alyze da	ata trends to tr	oubleshoot anomali	ies and sugges	st process improv	vements.	
5 Rec	ognize	the function of	of other prevalent in	dustrial comn	nunication proto	cols.	
			Course	Contents			
	Intro	duction to Inc	dustrial Automatio	on and Contro	ol Systems: Def	inition and	importance
	of indu	ustrial automat	tion, Evolution of co	ontrol systems	(Relay Logic, I	DCS, PLC,	SCADA).
Unit I	Benefi	its of automati	on (efficiency, safe	ty, cost reduct	ion), Compariso	n of PLC,	DCS, and
SCADA.							
	Funda	amentals of S_{A}	CADA Systems: 1	Levels of a SC	CADA system, C	omponents	s of a typical
Unit II	SCADA system, Master Terminal Unit (MTU) / Master Station, Remote Terminal Units (RTUs) Programmable Logic Controllers (PLCs) as RTUs Human-Machine Interface (HMI)						
	Communication Infrastructure, SCADA Servers (Historian, Alarm, I/O, etc.)						
				χ.		. ,	
	SCAD.	A Software	and HMI Develo	pment: Ov	erview of popu	lar SCAD	A software,
	Installa	ation and setup	p of SCADA softw	are, Principle	s of effective H	MI design	for operator
Unit III	technio	iues (sizing, m	ovement. blinking.	visibility, filli	ng). Data entry of	biects (but	ttons. sliders.
	input fi	ields).		· j ,		-j(,,
	Data A	cquisition an	d Real-time Opera	tions: Metho	ds of data acquisi	tion from	field devices,
	Real-ti	me data flow	and processing, C	onfiguring an	d displaying rea	al-time tre	nds, logging
Unit IV	historic	cal data, analy:	zing historical data	for process op	timization and th	roubleshoc	oting.
Unit V	SCAD	A Communic	ation Protocols an	d Networkins	g: Serial commu	inication (1	RS-232, RS-
/	485), E	Ethernet netwo	rks in industrial env	vironments, Fi	ber optics and w	ireless	,
	commu	inication, Mod	lbus: RTU, ASCII,	TCP/IP, Open	Platform Comn	nunications	s, Other
	protocols (e.g., Profibus, Profinet, EtherNet/IP).						

Text Books	8
1	David Bailey and Edwin Wright, "Practical SCADA for Industry", Elsevier
2	Bogdan M. Wilamowski and J. David Irwin "Industrial Communication Systems" CRC Press Taylor & Francis Group.
3	Stuart A Boyer, "SCADA supervisory control and data acquisition", ISA, 4th Revised edition
Reference	Books
1	David J. Tepper "Industrial Control Systems Security" Elsevier
2	Krishna Kant, "Computer Based Industrial Control", PHI
3	P. K. Srivastava, "Programmable Logic Controllers with Applications", BPB Publications
Useful Linl	KS
1	http://www.digimat.in/nptel/courses/video/108108099/L30.html
2	https://archive.nptel.ac.in/courses/108/105/108105062/
3	http://digimat.in/nptel/courses/video/124105158/L24.html

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		Tulsiramji Gaikwad-Patil College of Engineering and Technology Wardha Road,Nagpur-441108 NAAC Accredited (A+ Grade) & NBA Accredited (An Autonomous Institute Affiliated to RTM Nagpur University,Nagpur)				
T	hird Y	ear (Semester-	VI) B.Tech. Electronic	cs & Communi	cation Eng	ineering
			BEC33602: Power Elct	tronics Lab		
Γ	Ceaching	g Scheme			Examina	tion Scheme
Lectu	ıres	2Hr/Week			СТ	-
Tuto	rials	-			CA	25 Marks
Total C	redits	1			ESE	25 Marks
					Total	50 Marks
					Duration of	ESE:02Hrs
Course	Outcon	nes:				
Students	will be a	ble to				
1	Demon	strate the characte	ristics of Thyristor.			
2	2 Determine behavior of IGBT, MOSFET with the help of VI Characteristics.					
3	3 Analyze behavior of rectifier with the help of controlled devices.					
4	4 Examine concept of chopper, inverter with the help of characteristics.					
5	Examin	e behavior of DC	Motor and Inverter.			
Sr.No.	List of Experiment				СО	
1	Verify Y	VI Characteristics	of SCR			CO1
2	Verify VI Characteristics of TRIAC.			CO1		
3	Verify Characteristics of MOSFET			CO2		
4	Determine VI Characteristics of IGBT C			CO2		
5	Perform	Perform a single phase half wave controlled rectifier			CO3	
6	Construct a single phase fully controlled converter and plot its response			CO3		
7	Perform and plot the waveform of Parallel Inverter			CO4		
8	Examine and plot characteristics of DC Chopper			CO4		
9	Determ	ine Series Inverte				CO5
10	Examin	e Three Phase Inc	uction Motor and DC moto	r		CO5

Text Bo	oks
T.1	Sen,P.C: "Modern Power Electronics", S.Chand and co.
T.2	M.d. Singh & Khanchandani : "Power Electronics", Tata mcgraw hill publications, new delhi. Edition 2.
T.3	Shingare, Deodatta :" Industrial and Power Electronics", Electrotech pub.
Reference	e Books
R.1	Erickson R.W.: "Fundamentals of Power Electronics", springer edition 2
R 2	Jain, r. P ," Modern Power Electronics ", Tata Mcgraw hill publications
R.3	Kothari,d.p;nagrath,i.j: "Electrical Machines", Tata Mcgraw hill publications

Us	seful Links
1	https://nptel.ac.in/courses/108/102/108102145/
2	https://nptel.ac.in/courses/108/105/108105066/

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

BEC3604:	Internet of	Things Lab
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Teaching Scheme		E	Examination Scheme	
Practical 2 Hrs/week		СА	CA	25 Marks
Total Credit 1		E	ESE	25 Marks
		Т	Fotal	50 Marks
		Γ	Duration of ESE	2: 02 Hrs 00 Min.

Course C	Dutcomes (CO)	
Students	will be able to	
1	Demonstrate the fundamentals and architecture details of Internet of Things	
2	Develop GPIO-based programs for LED control and buzzer activation using real- interfacing.	-time I/O
3	Test programs for LCD interfacing and Bluetooth communication using embedded syst	tems.
4	Verify programs for interfacing Seven Segment and OLED displays using embedded p	latforms.
5	Design programs for PIR and Ultrasonic sensor interfacing to detect motion and measure using embedded systems.	distance
Sr. No.	List of Experiment	СО
1	Demonstrate the functionality and performance of core Arduino components through hands-on experiments.	CO1
2	Execute programming for LED Blink.	CO1
3	Execute programming for LED Blink with Switch.	CO2
4	Execute programming for Buzzer.	CO2
5	Execute programming for LCD Display.	CO3
6	Perform programming for Bluetooth.	CO3
7	Prepare Program for Seven Segment Display.	CO4
8	Prepare Program for OLED.	CO4
9	Create Program for PIR Sensor.	CO5
10	Create Program for Ultrasonic Sensor.	CO5
	Text Book	
1	Arshdeep Bahga, Vijay Madisetti, —Internet of Things – A hands-on approach ^I , Ur Press, 2015.	niversities
2	Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), —Architecting the Internet of Things, Springer, 2011.	
3	Introduction to IoT by Sudip Mishra, Anandrup Mukherjee, Arijit Roy. Publisher : Cambridge University Press	
4	Internet of Things Architecture and Design Principles by Rajkamal. Publisher : McC Education (India) Pvt. Ltd.	Graw Hill

	Reference Books
1	Honbo Zhou, —The Internet of Things in the Cloud: A Middleware Perspectivel, CRC Press, 2012.
2	Olivier Hersent, David Boswarthick, Omar Elloumi, —The Internet of Things – Key applications and Protocols, Wiley, 2012

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Т	hird Y	ear (Semester-	VI) B.Tech. Electronics & Communic	cation Engi	neering
			BIT33612:Python Programming		
Teaching Scheme		g Scheme	Examination Sc		tion Scheme
Lectures		4Hr/Week		СТ	-
Tutorials		-		CA	50 Marks
Total Credits		2		ESE	50 Marks
				Total	100 Marks
				Duration of	ESE:02Hrs
Course	Outcon	nes:			
1	Execu	ite the setup of a I	Python IDE and simple Python programs.		
2	Perfo	rm Python progra	ms using operators and conditional statements	•	
3	Imple	Implement programming logic in Python using while and for loops.			
4	Creat	t e Python data stru	ctures Lists, Tuples, Sets to access, update, an	d delete elem	ents.
5	Analyze OOP concepts by writing Python programs using simple inheritance and user-defined exceptions.				
Sr.No.			List of Experiment		СО
1	Apply s (IDE) f	steps to install and for software develo	configure a Python Integrated Development E	Environment	CO1
2	Execute IDE.	Execute a basic Python program to display a message on the screen using the configured CO1 IDE.			
3	Perform and log	n a program for ar fical evaluations.	ithmetic and logical operators to perform basic	computation	s CO2
4	Perform structur	n a program for co res.	nditional statements in Python using if and if,	else decision	CO2
5	Implen	nent iterative logic	using while and for loops to repeat a set of in	structions.	CO3
6	Implen	Implement list operations to create, access, update (add/remove items), and delete list CO4			
7	elemen	ts.	C. 1	1 1	
/	Write a	program to struct	ure of tuples to create, access, update, and dele	ete tuple elem	ents. CO4
8	deletion	Verify the functionality of sets in Python programs to create, access, modification, and cO4 deletion of set elements.			
9	Implen	mplement a Python program that demonstrates the concept of simple inheritance by CO5			
	creating	g and utilizing rela	ted classes.		
10	Analyz conditi	e a Python program	m using user-defined exceptions to handle spec	cific runtime	CO5

Text Books		
T.1	Introduction to Python Programming by Gowrishankar S & Veena A	
T.2	PYTHON PROGRAMMING 2E by Reema Thareja	
T.3	PYTHON PROGRAMMING: USING PROBLEM SOLVING APPROACH by Reema Thareja	
Reference Books		

R .1	The Quick Python Book, 4th Edition By Naomi Ceder
R.2	Python Phrasebook by Brad Dayley
R.3	Python Essential Reference by David Beazley

Us	Useful Links	
1	https://onlinecourses.nptel.ac.in/noc24_cs57/preview_	
2	https://onlinecourses.nptel.ac.in/noc22_cs32/preview_	
3	https://onlinecourses.nptel.ac.in/noc24_cs45/preview_	

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