Tulsiramji Gaikwad-Patil College of Engineering & Technology Nagpur

SCHEME OF INSTRUCTION

Programme: Electronics & Communication Engineering

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

Semester - VI

Sr.	Sr.CourseCourseNo.CategoryCoord		Course Title	т	LT	Р	Contact	Cradita	EXAM SCHEME				
No.			Course The	L			Hrs./Wk	Creatts	CT1	CT2	TA/CA	ESE	TOTAL
1	PCC	BEC3601	Internet of Things	3	-	-	3	3	15	15	10	60	100
2	PCC	BEC3602	Digital Image Processing	3	-	-	3	3	15	15	10	60	100
3	PEC	BEC3603-05	Program Elective-III	3	-	-	3	3	15	15	10	60	100
4	PEC	BEC3606-08	Program Elective-IV	3	-	-	3	3	15	15	10	60	100
5	OEC	B\$\$XX01-16	Open Elective –II	3	-	-	3	3	15	15	10	60	100
6	PCC	BEC3609	Internet of Things Lab	-	-	2	2	1	-	-	25	25	50
7	PCC	BEC3610	Digital Image Processing Lab	-	-	2	2	1	-	-	25	25	50
8	PCC	BEC3611	Software Simulation Lab (NS2,Lab View, MATLAB)	-	-	2	2	1	-	-	25	25	50
9	PROJ	BEC3612	Mini Project#	-	-	2	2	2	-	-	50	50	100
10	MCC	AU3612	Social Awareness	2	-	-	2	Audit	-	-	-	-	-
			Total	17	-	08	25	20	75	75	175	425	750

Every Student will undergo Industrial Training/Internship of Two weeks in summer vacation after B. Tech. V Sem. Examinations. * \$\$- CS, IT, EC, CE, ME, AE, BT

	L- Lecture			-Tutorial P-Practical					
	CT1- Class Test				TA/CA- Teacher Assessment/Continuous Assessment				
CT2- Class Test ESE- End Semester Examination (For Laboratory End Semester performance)						nance)			
Course Category	HSMC (Hum.,	BSC	ESC	PCC (Programme	PEC (Programme	OEC (Open	Project / Seminar	MCC (Mandatory	
	Soc. Sc, Mgmt.)	(Basic Sc.)	(Engg.	Core courses)	Elective courses)	Elective courses	/ Industrial	Courses)	
			Sc.)			from other	Training		
						discipline)			
Credits				09	06	03	02	Yes	
Cumulative Sum	05	24	24	38	06	03	02		

PROGRESSIVE TOTAL CREDITS :102+20 =122

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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 Open Elective									
Sr. No.	Course Code Course Title		Sr.	Course Code	Course Title					
			No.							
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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Reference Books					
R.1	Honbo Zhou, —The Internet of Things in the Cloud: A Middleware Perspectivel, CRC Press, 2012.				
R.2	Olivier Hersent, David Boswarthick, Omar Elloumi, —The Internet of Things – Key applications and Protocols ^{II} , Wiley, 2012				
R.3	Rethinking the Internet of Things: A Scalable Approach to Connecting Everything, by Francis daCosta, 1st Edition, Apress Publications, 2013				
Useful L	inks				
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				

Course Code	Course Outcomes	CL	Class Sessions
BEC3601.1	Explain the Classification and Design metrics of Embedded System.	2	9
BEC3601.2	Explain the different design levels of IoT and Architecture.	2	9
BEC3601.3	Analyze M2M Value Chains and Machine-to- Machine Communications	4	9
BEC3601.4	Analyze Communication Protocols, Sensor Networks	4	9
BEC3601.5	Analyze applications of IoT in real time scenario	4	9

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	(Tulsiram	n ji Gaikwad-Patil College of Engineering and Technology Wardha Road, Nagpur-441 108						
B.T	B.Tech Third Year (Semester-VI) Electronics and Communication Engineering								
BEC360)2: D	igital Image	Processing						
Т	eachi	ng Scheme		Examinat	ion Scheme				
Lectu	res	3 Hrs/week		CT-1	15Marks				
Tutori	al			СТ-2	15Marks				
Total Cr	edit	3		CA	10Marks				
				ESE	60Marks				
				Total	100Marks				
				Duration of ES	SE:03Hrs 00Min.				
			Course Contents						
Unit I	and A funda	Acquisition – Imagamentals in Digital Imaga Acquisition – Ima amentals - RGB, , DCT.	age Sampling and Quantization – Relati HSI models, Two-dimensional mathem	or visual Perception onships between pinatical preliminarie	on – Image Sensing ixels - Color image es, 2D transforms -				
Unit II	Spati Smoo Smoo Hom	al Domain: Gray othing and Sharp othing and Sharp omorphic filtering	v level transformations – Histogram pro ening Spatial Filtering, Frequency Doma pening frequency domain filters – Ide g, Color image enhancement.	cessing – Basics o in: Introduction to al, Butterworth an	f Spatial Filtering– Fourier Transform– d Gaussian filters,				
Unit III	Imag Adap Inver	e Restoration - de otive filters – Ban rse Filtering – Wie	egradation model, Properties, Noise mod d reject Filters – Band pass Filters – Note ener filtering	lels – Mean Filters ch Filters – Optimu	 Order Statistics – m Notch Filtering – 				
Unit IV	Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological watersheld.								
Unit V	Unit VNeed for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description,								
Text Boo	Text Books								
T.1	Fundamental of image processing by anil jain								
T.2	Digital image processing by rafael gonzalez								
T.3	Image	e processing the	fundamentals by wiley						

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Reference Books				
R.1	Fundamental of digital image processing by wiley-blackwell			
R.2	Digital image processing by rafael gonzalez			
Useful L	inks			
1	https://onlinecourses.nptel.ac.in/			
2	https://nptel.ac.in/courses/			
3 https://nptel.ac.in/courses/117105079				

Course Code	Course Outcomes	CL	Class Sessions
BEC3602.1	Understand the basic principle of image processing Image sampling and quantization ,Pixel, RGB	2	9
BEC3602.2	Describe the spatial domain and frequency domain, Smoothing and Sharpening frequency domain.	3	9
BEC3602.3	Analyze Image Restoration Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering	4	9
BEC3602.4	Examine Edge detection, Edge linking Hough transform – Thresholding	5	9
BEC3602.5	Examine data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG	4	9

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\mathbf{O}		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.T	ech T	hird Year (Ser	nester-VI) Electronics	s and Comm	unication En	gineering		
BEC360)3: A	ntenna and N	licrowave Engineerin	g				
Т	eachi	ng Scheme			Examinatio	n Scheme		
Lectu	res	3 Hrs/week			CT-1	15Marks		
Tutori	al	-			CT-2	15Marks		
Total Cre	edit	3			CA	10Marks		
					ESE	60Marks		
					Total	100Marks		
					Duration of ESE	:03Hrs 00Min.		
			Course Conte	ents				
Unit I	INT freq Rad Ape mate of a	RODUCTION uency bands, Ph iated by an An rture Efficiency ching, Friis tran- microwave rece	TO MICROWAVE S ysical concept of radiation tenna, Antenna Pattern C and Effective Area, Ante smission equation, Link b iver.	YSTEMS AN n, Near- and far Characteristics, enna Noise Ten budget and link	D ANTENNA -field regions, F Antenna Gain mperature and margin, Noise	S: Microwave Fields and Power and Efficiency, G/T, Impedance Characterization		
	RADIATION MECHANISMS AND DESIGN ASPECTS							
Unit II Radiation Mechanisms of Linear Wire and Loop antennas, Aperture antennas, Reflector antennas, Microstrip antennas and Frequency independent antennas, Design considerations and applications.						, Reflector onsiderations		
	AN	NTENNA ARRA	AYS AND APPLICATIO	ONS				
Unit III	Two unif	Two-element array, Array factor, Pattern multiplication, Uniformly spaced arrays with uniform and non-uniform excitation amplitudes, Smart antennas.						
	PA	SSIVE AND A	CTIVE MICROWAVE 1	DEVICES				
Unit IV	Microwave Passive components: Directional Coupler, Power Divider, Magic Tee, attenuator,							

resonator, Principles of Microwave Semiconductor Devices: Gunn Diodes, IMPATT diodes, Schottky Barrier diodes, PIN diodes, Microwave tubes: Klystron, TWT, Magnetron.

MICROWAVE DESIGN PRINCIPLES

Impedance transformation, Impedance Matching, Microwave Filter Design, RF and Unit V Microwave Amplifier Design, Microwave Power amplifier Design, Low Noise Amplifier Design, Microwave Mixer Design, Microwave Oscillator Design

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Text Books					
T.1	John D Krauss, Ronald J Marhefka and Ahmad S. Khan, "Antennas and Wave Propagation: Fourth Edition, Tata McGraw-Hill, 2006.				
T.2	David M. Pozar, "Microwave Engineering", Fourth Edition, Wiley India, 2012.				
Reference	Reference Books				
R.1	Constantine A.Balanis, —Antenna Theory Analysis and Design ^I , Third editio Page 7 of 20 India Pvt Ltd., 2005.				
R.2	R.E.Collin, "Foundations for Microwave Engineering", Second edition, IEEE Press, 2001				
Useful Links					
1	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				

Course Code	Course Outcomes	CL	Class Sessions
BEC3603.1	Evaluate the antenna parameters and link power budgets	3	9
BEC3603.2	Design and assess the performance of various antennas	3	9
BEC3603.3	Examine communication reliability using the gain of arrays antenna	3	9
BEC3603.4	Analyze blocks of microwave circuits and systems using passive and active microwave devices	4	9
BEC3603.5	Design a microwave system given the application specifications	4	9

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\mathbf{O}	Т	Tulsiramji Gaikwad-Patil College of Engineering and Technology Wardha Road, Nagpur-441 108 NAAC Accredited (A+ Grade) An Autonomous Institute affiliated to RTMNU NagpurImage: College of Engineering and Technology User Structure affiliated to RTMNU Nagpur					
B.Te	ech T	hird Year (Ser	nester-VI) Electronics and Com	munication En	gineering		
BEC360	4 : 0	ptical Comm	unication				
T	eachi	ng Scheme		Examinatio	on Scheme		
Lectu	res	3 Hrs/week		CT-1	15Marks		
Tutori	al	-		CT-2	15Marks		
Total Cre	dit	3		CA	10Marks		
				ESE	60Marks		
				Total	100Marks		
				Duration of ESI	E:03Hrs 00Min.		
			Course Contents				
Unit I	Introduction to Optical Fiber: Principle of optical fiber communication, Block diagram, Advantages and applications, Ray model, Total internal reflection phenomenon, Acceptance angle, acceptance cone, Numerical aperture. Structures and characteristics of various fibers such as step index, graded index, Single mode and multi mode fibers						
Unit II	Transmission Characteristics of Optical Fibers: Introduction, Attenuation, absorption, Scattering Losses, bending Losses, dispersion, Intra modal dispersion, Inter modal dispersion, Fiber alignment and joint loss, single mode fiber joints, fiber splices, fiber connectors and fiber couplers						
Unit III	Optical Sources: LED, Types of LED, LED Power and quantum efficiency. LASER - Principle of operation, Fabry-Perot laser and its properties. Optical Receivers : Photo detector - PIN diode, Avalanche Photo detectors, Structures and Properties, Introduction to optical Receiver, its Operation, receiver sensitivity, quantum limit, Eye diagrams, Coherent detection						
Unit IV	Analog and Digital links: Analog links-Introduction, overview of analog links, RF over fiber, key link parameters, Radio over fiber links, Digital links-Introduction point-to-point links, System considerations, link power budget, Rise time budget						
Unit V	Optical Networks: WDM concepts, overview of WDM operation principles, WDM standards, Elements of optical networks, SONET/SDH. Optical Interfaces, SONET/SDH Rings and Networks, High speed light wave Links, optical amplifiers , basic applications and types, semiconductor optical amplifiers , EDFA						

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Text Boo	oks
T.1	Optical Fiber Communication by Gerd Keiser4th Ed, MGH,2008-1
T.2	Optical Fiber Communications by John M. Senior Pearson Education, 3rd Impression, 2007
Reference	ee Books
R.1	Fiber optic communication by Joseph C Palais4th Edition, Pearson Education
R.2	Textbook on Optical Fiber Communication & Its Application by S.C. Gupta PHI Publication
R.3	Optical communication & Networks by M.N.Bandopadhyay, PHI Publications
Useful L	inks
1	https://youtu.be/K4S9p-mMq3o?si=LSmjgKmVCyv6BEO1
2	https://youtu.be/KIPFP8wke9M?si=3FE5K6Pj6_kzSEBs
3	https://youtu.be/IWC18op2yU8?si=eoP1757HR6tBJmW5

Course Code	Course Outcomes	CL	Class Sessions
BEC3604.1	Understand the basic elements and ray theory of optical fiber	2	9
BEC3604.2	Analyze the different kinds of losses ,signal distortion in optical wave	4	9
BEC3604.3	Classify optical source materials, LED structure , LASER diodes& optical receiver operation its performance	4	9
BEC3604.4	Analyzing the architecture and components of analog links & Digital links	4	9
BEC3604.5	Understand the operational principle of WDM, SONET and optical Amplifiers	2	9

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	Wardha Road, Nagpur-441 108						
	NAAC Accredited (A+ Grade)						
		An Auto	nomous Institute affiliated to RTM	INU Nagpur			
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B.T	ech I	hird Year(Sen	nester-VI) Electronics and Com	munication Eng	gineering		
BEC36 (5: M	IECHATRON	NICS	Γ			
T	eachir	ng Scheme		Examinatio	on Scheme		
Lectu	res	3 Hrs/week		CT-1	15Marks		
Tutori	al	-		СТ-2	15Marks		
Total Cre	edit	3		CA	10Marks		
				ESE	60Marks		
				Total	100Marks		
				Duration of ESE	:03Hrs 00Min.		
	1		Course Contents				
Unit I	INT and s eletr	RODUCTION: 1 simulation of ph omechanical sys	Mechatronics key elements, design p ysical systems, electrical system, mech tem coupling ,ball screw electronics c	rocess and issue n hanical translation ams, indexing med	nodeling process –rotation system chanism		
Unit II	SEN piezo wear	SORS: sensor pelectric sensor rable sensors for	characteristics and classifications , proximity sensor load cell, acceler robotics application signal conditioni	, position sensor erometer, gyrosco ng and data conver	rs, gas sensors, pe, inclinometer rsion		
Unit III	ACTUATORS; direct current motor and drive, stepper motor and drives, servomotor, drive, piezoelectric actuators shape memory alloy actuators pneumatics and fluid power actuators power sensation actuators.						
Unit IV	INDUSTRIAL AUTOMATION: Industrial revolution, basics components of automation, PLC commissioning and installation, architecture of PLC, PLC programming advanced instruction of PLC introduction of programmable automation controller (PAC) components and features ,SCADA scripting Graphical animation, PLC networking and communication Introduction to human machine interface.						
Unit V	CASE STUDY: Industry 4.0 defense systems ,Automotive Electronics , biomedical systems, agriculture system						
Text Boo	ks		· · · · · · · · · · · · · · · · · · ·				
T.1	Devd	as shetty and Ric	chard Mechatronics system design				
T.2	John	Hackworth and	F. Hackworth programmable logic co	ontrollers			

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Reference	Reference Books			
R.1	W.Bolton, Mechatronics, pearson education asia			
R.2	Natiigor mahalik, mechatronics principles concepts and application.			
Useful L	Useful Links			
1	https://nptel.ac.in/courses/112103174			
2	https://nptel.ac.in/courses/112107298			

Course Code	Course Outcomes	CL	Class Sessions
BEC3605.1	Understand the basic principle mechatronics	2	9
BEC3605.2	Analyze basics of sensors and their applications.	4	9
BEC3605.3	Analyze basic principle and applications actuators	4	9
BEC3605.4	Examine the industrial automation .	4	9
BEC3605.5	Study: case study of industry 4.0defence systems automation Electronics.	4	9

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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 Image: College of Engineering and Technology Wardha Road, Nagpur-441 108 B.Tech Third Year (Semester-VI) Electronics and Communication Engineering Estamination Scheme BEC3606: PLC and SCADA Examination Scheme						
Lectu	ires	3 Hrs/week		CT-1	15Marks	
Tutor	ial	-		CT-2	15Marks	
Total Cr	edit	3		CA	10Marks	
					100Marks	
			Course Contents	Duration of ESI	2:03Hrs 00iviin.	
Unit I	Unit IIntroduction to PLC :Role of automation in Industries, benefits of automation, Necessity of PLC, History and evolution of PLC, types –fixed/modular/dedicated, Overall PLC system, PLC Input and outputmodules (along with Interfaces), CPU, programmers and monitors, power supplies, selection criterionInterfacing of PLC with I/O devices: Input ON/OFF switching devices, Input analog					
Unit II	level Actuators-Electrical, pneumatic, hydraulicLimit switches, proximity sensors Control Elements- Mechanical, Electrical, Fluidvalves					
Unit III	Programming of PLC: Programming languages for PLC, Ladder diagram fundamentals, Rules for proper construction of ladder diagram Timer and counter-types along with timing diagrams, Reset instruction, latch instruction and control zones Developing ladder logicfor Sequencing of motors, ON OFF Tank level control, ON OFFtemperature control, bottle filling plant, car parking, trafficlight controller					
Unit IV	Advance function and Applications of PLC: Analog PLC operation and PLC analog signal processing, PIDprinciples, Motors Controls: AC motor and DCmotor controller, PLC Applications in developing systems- Tank level controllerusing analog signals, temperature controller using RTD, speedcontrol of electric motor.					
Unit V	Introduction to SCADA: Introduction, definitions and history of Supervisory Control and DataAcquisition, typical SCADA system Architecture, important definitionsHMI, MTU, RTU, communication means, Desirable Properties of SCADA system, advantages, disadvantages and applications of SCADA in Automatic sub station control &Water Purification System.					

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Text Boo	oks						
T.1	John Appl	John W. Webb, Ronald A. Reis, "Programmable Logic Controllers: Principles and Application", PHI Learning, New Delhi, 5th Edition					
T.2	John Progi	John R. Hackworth, Frederick D., Hackworth Jr., "Programmable Logic Controllers Programming Methods and Applications", PHI Publishers					
T.3	Stuar	t A Boyer, "SCADA supervisory control and da	ata acquisition", ISA	, 4th Revised edition			
Reference	ce Boo	ks					
R.1	Batte	n G. L., "Programmable Controllers", McGraw	Hill Inc.,Second Edi	tion			
R.2	Krish	na Kant, "Computer Based Industrial Control",	, PHI				
R.3	P. K.	Srivstava, "Programmable Logic Controllers w	vith Applications", B	PB Publications			
Useful L	inks						
1		https://www.youtube.com/watch?v=MS3qJq2jvu0					
2		https://www.youtube.com/watch?v=UQ16Cous_tY					
3		https://www.youtube.com/watch?v=_QbqLOSeYao					
			I				
Course	Code	Course Outcomes	CL	Class Sessions			
BEC36	06.1	Categorized PLC configuration using IO Modules	3	9			
BEC3606.2		Evaluate the physical parameters using PLC	3	9			
BEC36	06.3	Examine the operation of analog and digital devices using PLC programming	3	9			
BEC36	06.4	Execute the advance functions of PLC to control the speedof motors and temperature	4	9			
BEC36	06.5	Implement the industrial process to control the devices using SCADA.	4	9			

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	An Autonomous Institute affiliated to RTMNU Nagpur	

B.T	ech T	hird Year (Sei	nester-VI) Electronics and Cor	nmunication E	ngineering		
BEC36	07: W	vireless and S	ensor Network				
1	[eachi	ng Scheme	Examination Scher		ion Scheme		
Lectu	ires	3 Hrs/week		CT-1	15Marks		
Tutor	ial	-		СТ-2	15Marks		
Total Cr	edit	3		CA	10Marks		
				ESE	60Marks		
				Total	100Marks		
				Duration of ES	SE:03Hrs 00Min.		
			Course Contents				
	OVE	RVIEW OF	WIRELESS SENSOR NETWO	RKS: Single No	ode Architecture		
Unit I	Hard	ware Componer	nts Network Characteristics unique constraints and challenges, En-				
	Tech	nologies for Wi	eless Sensor Networks Types of wire	eless sensor networ	·ks.		
	ARC	HITECTURES	- Network Architecture Sensor Ne	etworks Scenarios	Design Principle,		
	Physi	ical Layer and	Transceiver Design Considerations,	Optimization Goa	and Figures of		
Unit II	Merit, Gateway Concepts, Operating Systems and Execution Environments introduction to						
	Tiny OS and nesC Internet to WSN Communication.						
	NETWORKING SENSORS MAC Protocols for Wiraloss Sansor Notworks Low Duty						
		WURKING SI	Welcoup Concepts SMAC PMA	C Protocol IEEE	802 15 4 standard		
	and '	ZigRee the Me	diation Device Protocol Wakeup P	C FIOLOCOI, IEEE	ddress and Name		
Unit III	And Ligber, the Mediation Device Protocol, wakeup Radio Concepts, Address and Name Management Assignment of MAC Addresses, Pouting Protocols Energy Efficient Pouting						
	Geographic Routing						
	0008	graphic Routing.					
	INF	INFRASTRUCTURE ESTABLISHMENT:- Topology Control, Clustering, Time					
Unit IV	Sync	hronization, Loc	alization and Positioning, Sensor Tas	king and Control.			
	SEN	SOR NETWOF	RK PLATFORMS AND TOOLS: S	ensor Node Hardw	vare – Berkelev		
Unit V	Mote	s, Programming	Challenges, Node level software plat	forms, Node level	Simulators, State		
	centr	ic programming					
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Page 15 of 27

Text Boo	oks					
T.1	Holge John	Holger Karl & Andreas Willig, "Protocols And Architectures for Wireless Sensor Networks", John Wiley, 2005.				
T.2	Feng Appro	Zhao & Leonidas J.Guibas, "Wireless Sensor Ne bach", Elsevier, 2007	tworks An Informatic	on Processing		
T.3	Walte Theor	enegus Dargie, Christian Poellabauer, "Fundamer y and Practice", John Wiley & Sons Publications	ntals of Wireless Sens , 2011.	sor Networks		
Reference	ce Bool	ζ <u>S</u>				
R.1	Kazen Applio	n Sohraby, Daniel Minoli, & Taieb Znati, "Wireless S cations", John Wiley, 2007	ensor NetworksTechno	logy, Protocols, and		
R.2	Anna	Hac, "Wireless Sensor Network Designs", John Wiley	<i>v</i> , 2003			
Useful L	inks					
1		https://nptel.ac.in/courses/106/105/106105160/				
2		https://onlinecourses.swayam2.ac.in/arp19_ap52/p	preview			
Course	e Code	Course Outcomes	CL	Class Sessions		
BEC3	607.1	Categorized PLC configuration using IO Modules	3	9		
BEC3607.2		Evaluate the physical parameters using PLC	3	9		
BEC3607.3		Examine the operation of analog and digital devices using PLC programming	3	9		
BEC3607.4		Execute the advance functions of PLC to control the speedof motors and temperature	4	9		
BEC3	607.5	Implement the industrial process to control the devices using SCADA.	4	9		

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-	Wardha Road, Nagpur-441 108	
	NAAC Accredited (A+ Grade)	
	An Autonomous Institute affiliated to RTMNU Nagpur	
B Tec	h Third Year (Semester-VI) Electronics and Communication Engine	ering

					88
BEC36	08: S	peech Proces	sing		
1	[eachi	ng Scheme		Examinat	ion Scheme
Lectu	ires	3 Hrs/week		CT-1	15Marks
Tutor	ial	-		СТ-2	15Marks
Total Cr	edit	3		CA	10Marks
				ESE	60Marks
				Total	100Marks
			C	Duration of ES	E:03Hrs 00Min.
			<b>Course Contents</b>		
Unit I	The Speech Signal: Fundamentals of Speech recognition, the process of speech production and perception in human beings, the speech production process, representing speech in time and frequency domains, speech sounds and features.				
Unit II	Signal Processing and Analysis methods for Speech Recognition: Spectral analysis models, The Bank-of-filters front-end processor, Linear predictive coding model for Speech recognition, Vector quantization.				
Unit III	Pattern Comparison Techniques: Introduction, Speech detection, Distortion measures- Mathematical considerations, Distortion measures- Perceptual considerations, Spectral distortion measures.				
Unit IV	Theory and Implementation of Hidden Markov Models: Introduction, Discrete time Markov processes, Extensions to Hidden Markov models, Three basic problems for HMMs, Types of HMMs, Continuous observation densities in HMMs, comparison of HMMs, Implementation issues for HMMs, HMM system for isolated word recognition.				
Unit V	Large Vocabulary continuous speech recognition: Introduction, Sub word speech units, sub word unit models based on HMMs, Training of sub word units, Language models for Large vocabulary speech recognition, Statistical language modeling, Perplexity of the language model, Overall recognition system based on sub word units.				

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Text Boo	oks					
T.1	Lawrence Rabiner and Biing-Hwang Juang, Fundamentals of Speech Recognition, Pearson Education, 2007.					
T.2	L. R.	Rabiner and S. W. Schafer, "Digital Processing	g of Speech Signals", Po	earson Education.		
Т.3	Douglas O"Shaughnessy, "Speech Communications: Human & Machine", 2nd Ed., Wiley India, 2000.					
Reference	ce Boo	iS				
R.1	Lawi Reco	ence Rabiner, Biing-Hwang Juang, B. Yegnan nition, Pearson Education, 2009.	arayana, Fundamentals	of Speech		
R.2	Claud	io Becchetti and Lucio Prina Ricotti, Speech R	ecognition, John Wiley	and Sons, 1999.		
R.3	Danie Natur Educ	l Jurafsky and James H Martin, Speech and La al Language Processing, Computational Lingu tion, 1 st Ed., 2000.	nguage Processing – A istics, and Speech Reco	n Introduction to ognition, Pearson		
Useful L	inks					
1	1 https://nptel.ac.in/courses/117105145					
2		https://ocw.mit.edu/courses/6-345-automatic-	speech-recognition-spr	<u>ing-2003/</u>		
3		https://www.classcentral.com/course/youtube-	digital-speech-process	<u>ing-47859</u> /		
Course	e Code	Course Outcomes	CL	Class Sessions		
BEC3608.1		<b>Determine</b> speech recognition principles, methods, models and implementation.	2	9		
BEC3608.2		<b>Examine</b> speech recognition principle & methods to characterize the speech sign and to recognize the speech.	es al 3	9		
BEC3608.3		AnalyzethePatternComparison8.3Techniques and Hidden Markov Models to recognize the speech.4		9		
BEC3608.4		<b>Examine</b> the speech recognition method pattern comparison techniques and Hidde Markov Models.	s, n 5	9		
BEC3608.5		<b>Examine</b> speech recognition systems usin sub word units for efficiency.	g 3	9		

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B.Te	<b>B.Tech Third Year (Semester-VI) Electronics and Communication Engineering</b>					
BEC36	<b>09: I</b> 1	nternet of T	hings with Embedded System	ms Lab		
1	<b>Teachi</b>	ng Scheme	Examination Scl		ion Sche	me
Pract	ical	2 Hrs/week		CA	25 Ma	arks
Total Cr	edit	1		ESE	25 Ma	arks
				TOTAL	50 Ma	arks
				Duration of ES	E: 02 Hrs	00Min.
Sr. No.			List of Experiments			CO
1	Le	d Control Using	Arduino Board.			CO2
2	Po	tentiometer and	IR Sensor Interfacing With Arduino			CO2
3	Co	ontrolling Two A	Actuators Using Arduino.			CO3
4	Cr	Creation of Things Speak Account.				CO3
5	Ac	Actuator Controlling Through Cloud.				CO4
6	5 DHT 11 sensor Data To Cloud.			CO4		
7	IO	T Based Air Pol	llution Control System.			CO4
8	TI	OS Sensor Interfa	acing With Arduino.			CO5
9	Ac	tuator Controlli	ng by Mobile Using Arduino.			CO5
10	То	Study of IOT w	vith other Application			CO5
Text Boo	ks					
T.1	Arshdeep Bahga, Vijay Madisetti, —Internet of Things – A hands-on approachl, Universities Press, 2015 .					
T.2	From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence: By Jan Holler, Vlasios Tsiatsis Academic Press, 2014.					
Т.3	Diete of Th	er Uckelmann, N hingsl, Springer,	1ark Harrison, Michahelles, Florian ( 2011.	Eds), —Architect	ing the I	nternet

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Reference	ce Books						
R.1	Honbo Zhou, —The Internet of Things in the Cloud: A Middleware Perspectivel, CRC Press, 2012.						
R.2	R.2 Olivier Hersent, David Boswarthick, Omar Elloumi, —The Internet of Things – Key applications and Protocols ^{II} , Wiley, 2012						
R.3	R.3 Rethinking the Internet of Things: A Scalable Approach to Connecting Everything, by Francis daCosta, 1st Edition, Apress Publications, 2013						
Useful L	inks						
1		https://archive.nptel.ac.in/courses/106/105	/106105166/				
2	2	https://nptel.ac.in/courses/106105166					
3	3	https://onlinecourses.nptel.ac.in/noc23_cs82/preview					
Course	e Code	Course Outcomes	CL	Lab Sessions			
BEC3609.1		Test Led Control Using Arduino Board.	4	2			
BEC3609.2		Examine MQTT protocol using Arduino.	4	2			
BEC3609.3		Design and conduct humidity, temperature using DHT 11 sensor and sent it to local server.	6	2			
BEC3609.4		Analyze temperature/humidity sensor and write a program to monitor temperature/humidity using Arduino.	4	2			
BEC3609.5		Design program to continuously monitor sensor reading through internet.	6	2			

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	Tul	siramji Gaikwad-Patil Techr Wardha Road, J NAAC Accredi Autonomous Institute a	College of Engineering a nology Nagpur-441 108 ted (A+ Grade) iffiliated to RTMNU Nagpu	und	G
B.Te	ech Third Year	(Semester-VI) Electron	ics and Communication	n Enginee	ring
BEC3610: Digital Image Processing Lab					
1	eaching Scheme		Examinatio	n Scheme	
P Tot	ractical	2 Hrs/week	ESE	25 Marks	, ,
100	alCrean	1	TOTAL	50 Marks	•
			Duration of ESE:	02 Hrs 00M	in.
Sr. No.		List of Exp	periment		СО
1	Simulation and Display of an Image, Negative of an Image(Binary & Gray Scale).				CO1
2	To Implementation of Relationships between Pixels.			CO 1	
3	To Implementation of Transformations of an Image.			CO2	
4	To Contrast stretching of a low contrast image, Histogram, and Histogram Equalization.			CO2	
5	To Display of FFT(1-D & 2-D) of an image				CO2
6	Implementation of image sharpening filters and Edge Detection using Gradient         Filters.			CO3	
7	Implementation of Image Smoothening Filters(Mean and Median filtering of an Image).			CO3	
8	Implementation of image restoring techniques.			CO4	
9	To detect edges in the image.			CO4	
10	Image Compression by HUFFMAN coding.			CO5	
Text Boo	ks				
T.1	Fundamental	of image processing by An	il Jain		
T.2	Digital image	processing by Rafael Gonz	alez		



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<b>Reference</b>	Reference Books				
R.1	Fundamental of digital image processing by Wiley-Blackwell				
R.2	Digital image processing by Rafael Gonzalez				
Useful Links					
1	https://nptel.ac.in/courses/117105079				
2	https://nptel.ac.in/courses/				

Course Code	Course Outcomes	CL	Lab Sessions
BEC3610.1	Examine Transformations of an Image, Pixel	3	2
BEC3610.2	Analyze Contrast stretching of a low contrast image,	4	2
BEC3610.3	<b>Evaluate</b> image sharpening filters and Edge Detection using Gradient Filters	5	2
BEC3610.4	<b>Explain</b> Image Smoothening Filters (Mean and Median filtering of an Image)	4	2
BEC3610.5	Analyze o image restoring techniques	4	2

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<b>B.</b> '	Tech 1	Third Year(Sen	nester-VI) Electronics and Com	munication Engine	eri	ng
BEC3	611: So	oftware Simul	lation Lab			
	Teachi	ng Scheme		Examination Se	chen	ne
Prac	ctical	2 Hrs/week		CA	2:	5 Marks
Total C	redit	1		ESE	2:	5 Marks
				TOTAL	5	0 Marks
				Duration of ESE: 02	Hrs	00Min.
Sr. No.			List of Experiment			СО
1	Generation of Various Signals and Sequences (Periodic and Aperiodic), such as Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.			CO1		
2	Operations on Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.			CO1		
3	Finding the Even and Odd parts of Signal/Sequence and Real and Imaginary parts of Signal.			CO2		
4	Convolution for Signals and sequences.				CO2	
5	Auto Correlation and Cross Correlation for Signals and Sequences.			CO3		
6	Verification of Linearity and Time Invariance Properties of a given Continuous/Discrete System.			CO3		
7	Verifi	cation of Samplin	ng Theorem.			CO4
8	Simulation of basic electrical Circuits.			CO4		
9	Design inverting, non-inverting amplifier using OPAMP.			CO5		
10	Design differential and summer amplifier using OPAMP. CO			CO5		
Text Bo	oks					
<b>T</b> .1	Sig	gnals & Systems	by Alan V. Oppenheim, Alan S. Wills	ky, S. Hamid Nawab		
T.2	Ramakant A. Gayakwad Op-Amps and Linear Integrated Circuits   Fourth Edition					



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Reference	Books
R.1	Harish ParthasarathyI.K. International Publishing House; Second Edition (August 2, 2006)
R.2	Rabaey Digital Integrated Circuits
Useful Lin	ks
1	https://archive.nptel.ac.in/courses/108/104/108104100/
2	https://archive.nptel.ac.in/courses/108/108/108108114/

Course Code	Course Outcomes	CL	Lab Sessions
BEC3611.1	<b>Implement</b> Periodic and a periodic signals and operations on signal	3	2
BEC3611.2	Analyze parts of signals and its convolution for sequence.	4	2
BEC3611.3	<b>Perform</b> correlation of signal and sequences with its linearity and properties.	3	2
BEC3611.4	<b>Perform</b> Sampling technique for signals and working of basic electrical signals.	3	2
BEC3611.5	<b>Design</b> Op-amp and verify operations of OPAMP	6	2

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D.Tet		nester-vi) Electronics and Con		gilleering			
BECXX0	5: Internet of Th	ings (OE)	1				
Tea	ching Scheme		Examinatio	on Scheme			
Lecture	s 3 Hrs/week		CT-1	15 Marks			
Tutorial	-		СТ-2	15 Marks			
Total Credi	it 3		CA	10 Marks			
			ESE	60 Marks			
			Total	100 Marks			
			Duration of ESE	: 03Hrs 00Min.			
		<b>Course Contents</b>					
Unit I f	<b>Introduction to IoT :-</b> IoT definition & Characteristics, Advantages and disadvantages, IoT functional blocks, sensing , actuation , Physical design of IoT, Logical design of IoT, Constraints affecting design in IoT .						
Unit II	<b>IOT Architecture:-</b> Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints-Introduction, Technical Design constraints, IoT reference model.						
Unit III	<b>M2M to IOT :-</b> Introduction, Basic Concepts, Difference between IoT and M2M, M2M Value Chains, IoT Value Chains, Machine to Machine Communication, M2M to IoT-Architecture, Design principles and capabilities.						

- Unit IVNetwork and Communication Aspects :-Wireless medium access issues, MAC protocol,<br/>Survey routing protocols, Sensor deployment & Node discovery, service model, service<br/>management and security.
- Unit VIndustrial IoT for Case Study: Introduction to different IoT tools, Introduction to Arduino<br/>and Raspberry Pi & Its Programming. Case Study on Smart Parking , Health care and<br/>Agriculture.

# Text Books

- T.1Arshdeep Bahga, Vijay Madisetti, —Internet of Things A hands-on approachl, Universities<br/>Press, 2015 .
- T.2From Machine-to-Machine to the Internet of Things: Introduction to a New Age of<br/>Intelligence: By Jan Holler, Stefan Avesand, 1st Edition, Academic Press, 2014.Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), —Architecting the Internet of

T.3 Things, Springer, 2011.

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Reference	ce Books			
R.1	Honbo Zhou, —The Internet of Things in the Cloud: A Middleware Perspectivel, CRC Press, 2012.			
R.2	Olivier Hersent, David Boswarthick, Omar Elloumi, —The Internet of Things – Key applications and Protocols ^I , Wiley, 2012			
R.3	Rethinking the Internet of Things: A Scalable Approach to Connecting Everything, by Francis daCosta, 1st Edition, Apress Publications, 2013			
Useful L	inks			
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				

Course Code	Course Outcomes	CL	<b>Class Sessions</b>
BECXX05.1	Understand design levels of IoT	2	9
BECXX05.2	Explain the design levels of IoT and Architecture	4	9
BECXX05.3	<b>Analyze</b> M2M Value Chain sand Machine-to- Machine Communications	4	9
BECXX05.4	Analyze Communication Protocols, Sensor Networks	3	9
BECXX05.5	<b>Demonstrate</b> Arduino and Raspberry Pi Platform for IoT application 4		9

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<b>B.Tech</b>	Third Year(Ser	nester-VI) Electronics and Communication Engineerir	ıg			
AU3612: So	cial Awarene	SS				
<b>Teaching Scheme</b>		Examination Schem	Examination Scheme			
Lectures	2 Hrs/week	СА				
Tutorial	-	ESE				
Total Credit	Audit	TOTAL				
<b>Course Activity</b>	•	<b>I</b>				
1	Social awareness trauma centers, c	ial awareness (Artisans-relates to engg, visit to hospitals, orphanages, police station, courts, ima centers, consumer forums).				
2	Social Service (teach in neighborhood, adopt an underprivileged school, village stay / visit (NSS), cleanliness drive, and skill transfer).					
		Course Contents	Hours			
Human beings live in relationship with their family members and with others in the society. As a society,						
mankind strives to achieve ordered and organized life through which an environment of cooperation and						
coexistence is expected. A healthy society creating an environment of fearlessness is a key for the mankind						
to achieve higher goals because it is society which makes us most human, most complete as people.						
Although as a society, our expectation is fearlessness, but due to lack of understanding of our role in a						
society, we fail to fulfill the expectation. The social awareness activity shall promote an understanding and						

society, we fail to fulfill the expectation. The social awareness activity shall promote an understanding and sharing of issues of societal problem through exposure to variety of artisans and different kind of organizations. It is expected that this exposure will enable the learners to appreciate social issues, problems and challenges. Each institution will offer a range of introductory activity based courses focusing on local artisans related to engineering so that students are sensitized to appreciate their problems and can take up some of the problems to solve while they do their regular studies. This course shall also include visits to visit to hospitals, orphanages, police station, courts, trauma centers, consumer forums so that they get exposed to different facets of societal problems. Care should be taken to give adequate representation to local and regional organizations and artisans. For example, Banaras has local traditions in Banarasi Saari, Toy making, etc and has almost all types of organizations. An institution in Banaras area can offer courses on these artisans. At the end of the course/semester, a student should be able to identify a social issue, prepare project report and give presentation on the selected issues. Contact hours per week should be 3-4 hours. Towards the end of the course, the institution can organize an exhibition in which all the students publicly demonstrate findings of their reports and their future plan of actions.

Chairman

Department of Electronics & Comm Telestramiti Gallward - Parti College of Engineering & Technology, Nagina

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Brincipal

Tulsiram) Gaikwad-Petil College Of Engineering & Technology, Nagour

Parmalani Tulsiramji Gaikwad-Patin

Tulsiramji Gaikwad-Patii College Of Engineering & Technology, Nagpur