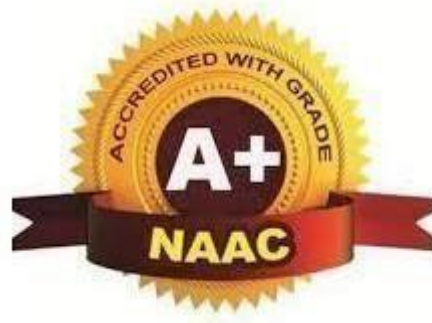




TULSIRAMJI GAIKWAD-PATIL
College of Engineering & Technology

Mohgaon, Wardha Road, Nagpur - 441 108

An Autonomous Institute



**DEPARTMENT OF ELECTRONICS & 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

Semester – V

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME				
									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	BEC3506-8	Program Elective-I	3	-	-	3	3	15	15	10	60	100
7	PEC	BEC3513-15	Program Elective-I Lab			2	2	1	-	-	25	25	50
8	PEC	BEC3509-11	Program Elective-II	4	-	-	4	4	15	15	10	60	100
9	OEC	B\$\$\$XX01-16	Open Elective-I	4	-	-	4	4	15	15	10	60	100
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

L- Lecture

T-Tutorial

P-Practical

CT1- Class Test 1

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	--

PROGRESSIVE TOTAL CREDITS : 78+24 =102


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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. No.	Course Code	Course Title
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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B.Tech Third Year (Semester-V) Electronics and Communication Engineering

BEC3501 : Analog and Digital Communication

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

Course Outcomes:

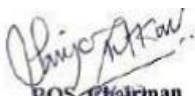
Students will be able to

- 1. Explain** the concepts of modulation and demodulation techniques of amplitude modulation
- 2. Determine** the concept of angle modulation in FM transmitter and receiver with radio receivers parameters.
- 3. Examine** the digital modulation schemes PCM, DM, ADM with their limitations
- 4. Apply** the digital pass band data transmission schemes of ASK, FSK, PSK, QAM, QPSK and FDM, TDM techniques.
- 5. Analyze** the line coding techniques and spread spectrum techniques of DSSS, FHSS and CDMA

Course Contents

Unit I	Analog and Digital Messages, Channel Effect, Signal-to Noise ratio and capacity, Analog Modulation: 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.
Unit II	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 FM, FM transmitter (broadcast and low power). Noise in FM systems. Radio Receivers :- Characteristics of Radio Receiver Sensitivity, Selectivity and Fidelity, TRF and Super heterodyne Radio Receiver.
Unit III	Sampling 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 IV	Pass 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 V	Line 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 Books	
T.1	B.P. Lathi, “Modern Digital and Analog Communication System”, Oxford University Press, 3 rd Edition, 2005
T.2	John G. Proakis, “Digital Communication”, McGraw Hill Inc, 5 th Edition, 2008.
T.3	Singh. R. P & Sapre. S. D, “Communication Systems: Analog & Digital,” 3 rd edition, McGrawHill Education, Seventh Reprint, 2016.
Reference Books	
R.1	Simon Haykin, “Communication Systems”, John Wiley & Sons, 4 th Edition, 20008.
R.2	Simon Haykin and Michael Moher, “Communication Systems,” 5 th edition, John Wiley & Sons, 2013
R.3	Shu Lin, Daniel Costello, “Error control coding – Fundamentals and Applications”, Prentice Hall, Upper Saddle River, NJ, 2 nd Edition, 2004.
Useful Links	
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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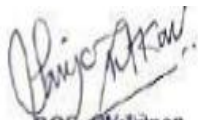

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B.Tech Third Year (Semester-V) Electronics and Communication Engineering			
BEC3502 : Digital Signal Processing and Application			
Teaching Scheme		Examination Scheme	
Lectures	3 Hrs/week	CT-1	15 Marks
Tutorial	0 Hrs/week	CT-2	15 Marks
Total Credit	3	TA	10 Marks
		ESE	60 Marks
		Total	100 Marks
		Duration of ESE: 03 Hrs 00 Min.	
Course Outcomes (CO)			
Students will be able to			
Identify discrete-time signals analytically and visualize them in the time domain.			
Apply discrete Fourier transform and verify its properties.			
Implement digital filters in a variety of structures.			
Design Digital Infinite Impulse Response and Finite Impulse Response filter			
Analyze Fast Fourier Transform algorithms			
Course Contents			
Unit I	Basic 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 domain sampling: definition of Discrete Fourier Transform & Properties of DFT, Inverse IDFT , DFT'S of typical time signals, linear convolution, Analytical ,Graphical Cross Correlation, Auto correlation. Circular convolution using DFT & IDFT.		
Unit III	Design of IIR Filter from analog filter using Impulse Invariance, Bilinear transformation, Butterworth and Chebyshev filter, IIR filter structure : Direct form-I, Direct form-II, Parallel & Cascade form.		
Unit 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	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	Digital Signal Processing and applications- 4 th edition, 2013 John G. Proakis McGraw-Hill		
2	Discrete time Signal Processing- 3 rd edition 2010 Alan Oppenheim,Ronald Schafer pearson		
3	Digital Signal Processing - A computer based approach-Publication- 4 th edition, 2013 Sanjit K. Mitra, McGraw-Hil		
Reference Books			
1	Digital Signal Processing- 3 rd Edition 2017 S Salivahanan ,A Vallavraj ,C Gnanapriya McGraw-Hill		

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



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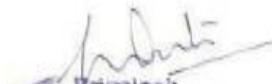
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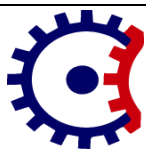
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Third Year (Semester V) B. Tech. Electronics & Communication Engineering

BEC3503: Control System Engineering

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

Course Outcomes (CO)

Students will be able to

Explain the principles of feedback control system.

Represent transfer function using block diagram reduction & signal flow graph

Analyze the time response of control system

Analyze the stability of control system using ruths and hurwitzs criteria.

Analyze the state space model

Course Contents

UnitI	Introduction to Control System: Introduction, Classification of Control system, Representation of Electrical, Mechanical, Electro mechanical with differential equation, Concept of Transfer Function and State space representation. Advantages of State Space representation over Classical representation
UnitII	Transfer Function, Block Diagram & Signal flow graph: Representation of Transfer Function of Electrical & Mechanical, Block diagram algebra, Signal flow graph and Mason's gain formula.
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	Stability & 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	State Space Analysis: 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	I.J.Nagrath, M.Gopal, "Control System Engineering", 6th Edition, New age International Publishers
2	B.C.Kuo, "Automatic Control System", PHI

3	B.S. manke, “Linear Control Systems”, Khanna Publishers
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/


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NAAC Accredited (A+ Grade)**An Autonomous Institute affiliated to RTMNU Nagpur****Third Year (Semester V) B. Tech. Electronics & Communication Engineering****BEC3504: Analog and Digital Communication Lab**

Teaching Scheme		Examination Scheme	
Practical	2 Hrs/week	CA	25 Marks
Total Credit	1	ESE	25 Marks
		Total	50 Marks
		Duration of ESE: 02 Hrs 00 Min.	

Course Outcomes (CO)

Students will be able to

- 1 **Analyze** the concepts of analog modulation and demodulation techniques by using AM
- 2 **Experiment** the Angle modulation using FM Modulation and Demodulation .
- 3 **Illustrate** the digital modulation techniques PCM ,DM,ADM and their limitations
- 4 **Analyze** the digital pass band data transmission schemes using ASK,FSK,PSK,QAM,QPSK and FDM,TDM techniques
- 5 **Demonstrate** the line coding techniques and spread spectrum techniques using DSSS, FHSS and CDMA

Sr. No.	List of Experiment	CO
1	Analyze the Generation of AM modulation and Demodulation.	CO1
2	Analyze the Generation of DSB-SC modulation and Demodulation.	CO1
3	Experiment the angle modulation using FM Modulation and Demodulation.	CO2
4	Examine the Generation of PAM, PPM, PWM modulation and demodulation.	CO3
5	Analyze the Generation of DM and ADM with analysis of step size.	CO3
6	Analyze the Generation and detection of Pulse Code Modulation Demodulation.	CO3
7	Analyze the Generation and detection of DPCM and its Demodulation.	CO3
8	Demonstrate the Generation and detection of PSK Modulation and Demodulation.	CO4
9	Examine the Generation of QPSK Modulation and Demodulation.	CO4
10	Simulate modulation techniques by using MATLAB	CO5

Text Books

1	B.P. Lathi, "Modern Digital and Analog Communication System", Oxford University Press, 3 rd Edition, 2005
2	John G. Proakis, "Digital Communication", McGraw Hill Inc, 5 th Edition, 2008.
3	Singh. R. P & Sapre. S. D, "Communication Systems: Analog & Digital," 3rd edition, McGrawHill Education, Seventh Reprint, 2016.

Reference Books

1	Simon Haykin, "Communication Systems", John Wiley & Sons, 4 th Edition, 20008.
2	Simon Haykin and Michael Moher, "Communication Systems," 5th edition, John Wiley & Sons, 2013

Useful Links

1	http://www.digimat.in/nptel/courses/video/117105143/L60.html
2	https://nptel.ac.in/courses/117/105/117105144

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

BEC3505: Digital Signal Processing & Application Lab

Teaching Scheme		Examination Scheme	
Practical	2 Hrs/week	CA	25 Marks
Total Credit	1	ESE	25 Marks
		Total	50 Marks
		Duration of ESE: 02 Hrs 00 Min.	

Course Outcomes (CO)

Students will be able to

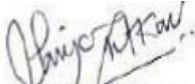
- 1 **Identify** discrete-time signals analytically and visualize them in the time domain.
- 2 **Apply** discrete Fourier transform and verify its properties.
- 3 **Design** digital filters in a variety of structures.
- 4 **Design** Digital Infinite Impulse Response and Finite Impulse Response filter
- 5 **Analyze** Fast Fourier Transform algorithms

Sr. No.	List of Experiment	CO
1	Plot following basic discrete time signals using MATLAB functions. Unit impulse, unit step, ramp, real and complex exponential and its representations.	CO1
2	Examine linear convolution of discrete signals using MATLAB functions.	CO1
3	Examine circular convolution of discrete signals using MATLAB functions.	CO1
4	Implement MATLAB program to compute cross-correlation of the given sequences with corresponding plot.	CO2
5	Implement MATLAB program to compute auto-correlation of given sequences with corresponding plot.	CO2
6	Design Butterworth IIR filters.	CO3
7	Design Chebyshev IIR filters.	CO3
8	Design FIR filters using windowing techniques.	CO4
9	Implement HP IIR filter for a given sequence.	CO4
10	Compute DFT and IDFT of discrete time signals.	CO5

Text Books

1	Digital Signal Processing and applications- 4th edition, 2013 John G. Proakis McGraw-Hill
2	Discrete time Signal Processing- 3 rd edition 2010 Alan Oppenheim, Ronald Schafer pearson
3	Digital Signal Processing - A computer based approach-Publication- 4 th edition, 2013 Sanjit

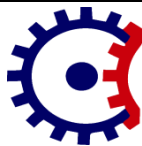
	K. Mitra, McGraw-Hil
Reference Books	
1	Digital signal processing- A practical approach 2 nd Edition, 2002.E. C. Ifeachar, B. W. Jarvis Pearson
2	Digital Signal Processing - A. Nagoor Kani 2nd Edition McGraw Hill.
Useful Links	
1	https://nptel.ac.in/courses/108/104/108104139/
2	http://nptel.ac.in/courses/117107095


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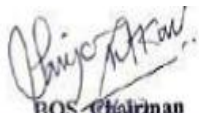
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Third Year (Semester-V) B.Tech. Electronics & Communication Engineering			
BEC3506: Digital System Design			
Teaching Scheme		Examination Scheme	
Lectures	3 Hrs/week	CT-1	15 Marks
Tutorial	0 Hrs/week	CT-2	15 Marks
Total Credit	3	TA	10 Marks
		ESE	60 Marks
		Total	100 Marks
		Duration of ESE: 03 Hrs 00 Min.	
Course Outcomes (CO)			
Students will be able to			
Examine programmable devices and discuss the architecture of CPLD and FPGA .			
Apply basic knowledge of Hardware Description Language, design flow and methodology.			
Analyze combinational circuits which give fundamental concepts and techniques used in digital electronics.			
Analyze sequential circuits and components used in the typical data path designs: Registers, Adders, Shifters, Comparators; Counters, Multiplier, Arithmetic Logical Units (ALU), RAM.			
Implement Computer-Aided Design (CAD) tools which is essential to the design of digital circuits.			
Course Contents			
Unit I	Digital Design Fundamentals, Combinational & Sequential design issues, Introduction to finite state machines, Moore & Mealy Machine, Introduction to programmable devices, PLA, PAL, PROM, Structure of CPLDs, Introduction to FPGA, Architecture, CLB, IOB, Programmable Interconnect Points, Different type of programmable switches used in PLDs.		
Unit II	HDL Based Design flow, Requirements of HDL, Design Methodologies, Different Modelling styles, Introduction to Verilog, Elements of Verilog, Verilog Module definition, Elements of Module.		
Unit III	Basic Concepts in Verilog, Reserved Keywords, Syntax & Semantics, Comments, Identifiers, Number Representation, System Representation, Verilog Ports, Verilog Data Types, Wire & Variables, Physical & Abstract, Constants, Parameter, Verilog Data Operators, Design entry in Verilog & Testbench, Compilation and synthesis, Timing analysis.		
Unit IV	Data Flow Modelling, Delay, Continuous Assignment, Delayed Continuous assignment, Structural Modelling Feature, Module Instantiation, Gate level Primitives, Gate Delays, Switch Level Primitives, User Defined Primitives.		
Unit V	Behavioral Modelling, Initial, Always, Procedural Assignment, Blocking and Non-Blocking assignments, Sequential & Parallel Blocks, Race around Condition, Timing Control, Procedural Statements, Conditional Statements if case loop repeat forever etc, Zero Delay Control, Event Based Timing Control, Compiler Directives, Assign De-assign, Force Release, Latch Models, FF Models, State Machine Coding ,Moore and Mealy Machines.		
Text Books			
1	Verilog Digital System Design” Zainalabedin Navabi Second Edition, Tata McGraw Hill , 2009		
2	Verilog HDL : A Guide to Digital Design and Synthesis Samir Palnitkar 2nd Edition , Prentice Hall India, 2003		

Reference Books

- 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/>


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Third Year (Semester-V) B.Tech. Electronics & Communication Engineering			
BEC3513: Digital System Design Lab			
Teaching Scheme		Examination Scheme	
Practical	2 Hrs/week	CA	25 Marks
Total Credit	1	ESE	25 Marks
		Total	50 Marks
		Duration of ESE: 02 Hrs 00 Min.	
Course Outcomes (CO)			
Students will be able to			
1	Analyze 2- bit adder/subtractor using XOR and NAND gates.		
2	Construct 4:1 multiplexers using logic gates and Implement full adder using 4:1 Multiplexers.		
3	Design and simulate of basic logic gates using HDL.		
4	Simulate the combinational circuits such as adders, subtractors, multiplexers and decoders using HDL.		
5	Simulate the sequential circuits such as counters and flip-flops using HDL.		
Sr. No.	List of Experiment		CO
1	Design and hardware implementation of 2 bit adder/subs tractor using XOR as well as NAND gate.		
2	4:1 Multiplexer using Universal gate & Realization of full adder using Multiplexer		
3	BCD adder using two binary adders		
4	3:8 decoder and realization of full adder		
5	Realization of R-S, D, J-K Flip Flop		
6	Realization of Mod 8 Up Down Ripple Counter		
7	Realization of synchronous Mod 2 Mod 3 Counter		
8	Modelling different types of gates		
9	Modelling of half adder, full adder		
10	Modelling D-Flip Flop		
Text Books			
1	Verilog Digital System Design” Zainalabedin Navabi Second Edition, Tata McGraw Hill , 2009		
2	Verilog HDL : A Guide to Digital Design and Synthesis Samir Palnitkar 2nd Edition , Prentice Hall India, 2003		
Reference Books			
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/		

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Third Year (Semester-V) B.Tech. Electronics & Communication Engineering			
BEC3507: Embedded Systems			
Teaching Scheme		Examination Scheme	
Lectures	3 Hrs/week	CT-1	15 Marks
Tutorial	0 Hrs/week	CT-2	15 Marks
Total Credit	3	TA	10 Marks
		ESE	60 Marks
		Total	100 Marks
		Duration of ESE: 03 Hrs 00 Min.	
Course Outcomes (CO)			
Students will be able to			
Examine the importance of Embedded Systems in Real life, Engineering and Industrial applications and also to observe importance of embedded processors over general systems.			
Implement programming 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			
Unit I	History, Definition, and Classification of Embedded System, Design Metric & Its optimization, Embedded System Design Challenges, Processor selection Criteria, Building blocks of typical Embedded System –Memory Architecture, Memory & Its Types, RISC and CISC.		
Unit II	Introduction to ARM, features, architecture, instruction set features, Concepts of RTOS ARM processor and Architecture, Register set, instruction set, programming, interrupts, stack, timers on-chip and off chip peripherals, interfacing and programming.		
Unit III	Analyzing Inbuilt of ADC and DAC of ARM7TDMI Microcontroller, Applications based on PWM, Interfacing of Temperature Sensor, USART, Bluetooth, USB Drive, LCD display, GSM and GPS Module.		
Unit IV	Protocol of Embedded System:- Bluetooth ,USB Drive,I2C Bus, CAN Bus, IEEE 802.11,,RS232,RS485 ,GPRS, IEEE 802.15, Modbus, Zigbee Architecture.		
Unit V	Architecture of the kernel, Task scheduler, Semaphores, Mailbox,Message queues , 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 edition		
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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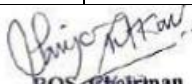
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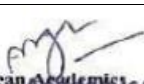


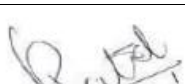
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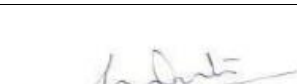
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Third Year (Semester-V) B.Tech. Electronics & Communication Engineering					
BEC3514: Embedded System Lab					
Teaching Scheme			Examination Scheme		
Practical	2 Hrs/week		CA	25 Marks	
Total Credit	1		ESE	25 Marks	
			Total	50 Marks	
		Duration of ESE: 02 Hrs 00 Min.			
Course Outcomes (CO)					
Students will be able to					
1	Demonstrate ARM 7 LPC 2148				
2	Interface the display devices				
3	Perform the Operation of actuating devices				
4	Generate the modulation waveform				
5	Interface external peripherals devices				
Sr. No.	List of Experiment				CO
1	Demonstrate LPC2148 NXP ARM7 Development Kit				CO1
2	Interface LED with ARM 7				CO2
3	Interface 7 segment display with ARM7 LPC2148.				CO2
4	Interface LCD with ARM 7 LPC2148.				CO2
5	Interface Relay with ARM 7 LPC2148.				CO3
6	Interface stepper motor .				CO3
7	Generate Pulse Width Modulation waveform				CO4
8	Execute the program for DAC with ARM7 (LPC2148) processor.				CO5
9	Interface Buzzer with ARM 7 LPC2148.				CO5
10	Interface Temperature Sensor				CO5
Text Books					
1	Mazidi Muhammad Ali , “8051 Microcontroller And Embedded Systems : Using Assembly And C”, Pearson Education 2007.				
2	Vahid Frank; Givargis Tony, “Embedded System Design”, Wiley India.				
Reference Books					
1	James K. Peckol, "Embedded systems- A contemporary design tool", John Wiley, 2008, ISBN: 978-0-471-72180-2.				
2	Yifeng Zhu, "Embedded Systems with Arm Cortex-M Microcontrollers in Assembly Language and C", 2 nd Ed. Man Press LLC 2015 ISBN: 0982692633 9780982692639				
Useful Links					
1	https://www.youtube.com/watch?v=uFhDGagZzjs				
2	https://dituniversity.digimat.in/nptel/courses/video/106105193/L28.html				


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Third Year (Semester-V) B.Tech.Electronics & Communication Engineering			
BEC3508:PE-1: Power Electronics			
Teaching Scheme		Examination Scheme	
Lectures	3Hrs/week	CT-1	15 Marks
Tutorial	0Hrs/week	CT-2	15 Marks
Total Credit	3	TA	10 Marks
		ESE	60 Marks
		Total	100 Marks
		Duration of ESE:03Hrs00Min.	
Course Outcomes (CO)			
Students will be able to			
1.Analyze the working and characteristics of power devices.			
2.Analyze the construction, operation, and steady-state characteristics of IGBT, Power MOSFET, and GTO devices.			
3.Determine the application of Power devices as controlled rectifier, AC-DC converters.			
4.Apply the Knowledge of Power Devices for conversion by using Choppers & Inverters.			
5.Illustrate the operation and the necessity of starters for three-phase induction motors and speed control techniques applicable to three-phase induction motors.			
Course 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, Principle of DIAC, P base control using TRIAC		
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. 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	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 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.		
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/

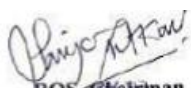

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Third Year (Semester-V) B.Tech.Electronics & Communication Engineering			
BEC3515: PE -1 Power Electronics Lab			
Teaching Scheme		Examination Scheme	
Practical	2Hrs/week	CA	25 Marks
Total Credit	1	ESE	25 Marks
		Total	50 Marks
		Duration of ESE:02Hrs00Min.	
Course Outcomes (CO)			
Students will be able to			
1	Examine the characteristics of Thyristor.		
2	Determine behavior of IGBT, MOSFET with the help of VI Characteristics		
3	Analyze behavior of rectifier with the help of controlled devices		
4	Illustrate concept of chopper, inverter with the help of characteristics		
5	Illustrate behavior of DC Motor and Inverter		
Sr.No.	List of Experiment	CO	
1	Determine VI Characteristics of SCR	CO1	
2	Determine VI Characteristics of TRIAC.	CO1	
3	Examine Characteristics of MOSFET	CO2	
4	Determine VI Characteristics of IGBT	CO2	
5	Analyze a single phase half wave controlled rectifier.	CO3	
6	Construct a single phase fully controlled converter and plot its response	CO3	
7	Analyze and plot the waveform of Parallel Inverter	CO4	
8	Examine and plot characteristics of DC Chopper	CO4	
9	Determine Series Inverter	CO5	
10	Examine Three Phase Induction Motor and DC motor	CO5	
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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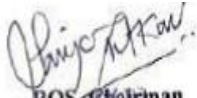

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Third Year (Semester-V) B.Tech. Electronics & Communication Engineering			
BEC3509: MEMS			
Teaching Scheme		Examination Scheme	
Lectures	3 Hrs/week	CT-1	15 Marks
Tutorial	-	CT-2	15 Marks
Total Credit	4	TA	10 Marks
		ESE	60 Marks
		Total	100 Marks
		Duration of ESE: 03 Hrs 00 Min.	
Course Outcomes (CO)			
Students will be able to			
Examine the operation of micro devices, micro systems and their applications			
Identify the MEMS fabrication process to micro devices, micro systems .			
Determine the design process of various sensor using the MEMS fabrication technique			
Evaluate the Designing of various actuator using the MEMS fabrication			
Validate the on micro and nano systems for photonics.			
Course Contents			
Unit I	INTRODUCTION TO MEMS AND MICROFABRICATION History of MEMS Development, Characteristics of MEMS-miniaturization - micro electronics integration - Mass fabrication with precision. Micro fabrication - microelectronics fabrication process- silicon based MEMS processes - new material and fabrication processing- points of consideration for processing.		
Unit II	MEMS FABRICATION TECHNOLOGIES Microsystem 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 technologies, Selection of packaging materials.		
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 ACTUATORS Design of Actuators: Actuation using thermal forces, Actuation using shape memory Alloys, Actuation using piezoelectric crystals, Actuation using Electrostatic forces (Parallel plate, Torsion bar, Comb drive actuators), Micromechanical Motors and pumps. Case study: Comb drive actuators.		
Unit V	NANOSYSTEMS AND QUANTUM MECHANICS Atomic Structures and Quantum Mechanics, Molecular and Nanostructure Dynamics: Shrodinger Equation and Wavefunction Theory, Density Functional Theory, Nanostructures and Molecular Dynamics, Electromagnetic Fields and their quantization, Molecular Wires and Molecular Circuits.		

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 Books	
1	Gabriel M. 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.pdf


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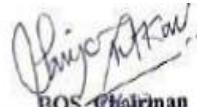

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Third Year (Semester-V) B.Tech. Electronics & Communication Engineering				
BEC3510:Information Theory and Coding				
Teaching Scheme			Examination Scheme	
Lectures	3 Hrs/week		CT-1	15 Marks
Tutorial	0 Hrs/week		CT-2	15 Marks
Total Credit	3		TA	10 Marks
			ESE	60 Marks
			Total	100 Marks
		Duration of ESE: 03 Hrs 00 Min.		
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				
Unit I	Information Theory & Source Coding:- Introduction to information theory, Entropy 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.			
Unit III	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.			
Unit IV	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: Introduction 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 Books	
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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Third Year (Semester-V) B.Tech. Electronics & Communication Engineering

BEC3511: Biomedical Instrumentation

Teaching Scheme		Examination Scheme	
Lectures	4 Hrs/week	CT-1	15 Marks
Tutorial	0 Hrs/week	CT-2	15 Marks
Total Credit	4	TA	10 Marks
		ESE	60 Marks
		Total	100 Marks
		Duration of ESE: 03 Hrs 00 Min.	

Course Outcomes (CO)

Students will be able to

Relate the principles of biomedical instrumentation to the physiological systems of the body

Illustrate the use of electrodes in capturing biopotential signals.

Analyze the impact of cardiovascular conditions on the performance of biomedical devices

Examine the use of diagnostic X-ray equipment in obtaining and interpreting medical images

Analyze the data obtained from monitoring instruments to assess patient health status

Course Contents

Unit I	Introduction to Biomedical instrumentation, development of biomedical instrumentation, biometrics, Physiological system of body, problems encountered in measuring a living system
Unit II	Basic transducer principle, active transducer, passive transducer, electrode theory, biopotential electrodes, biochemical transducers
Unit III	The heart and cardiovascular system, characteristics of blood flow, blood pressure measurement, heart sound measurement. Principles of ultrasonic diagnosis, temperature measurement, electrocardiograph, plethysmography, pulmonary function measurement spirometry, pulmonary function analyzers, respiratory gas analyzers.
Unit IV	Generation of ionizing radiation, instrumentation for diagnostic X-ray, special technique, instrumentation for medical use of radioisotopes, radiation therapy, EMG.
Unit V	Patient care and monitoring, the elements of intensive care monitoring , diagnosis, calibration, reparability of patient monitoring equipment, instrumentation for monitoring patient, pacemakers, defibrillators.

Text Books

T.1	Biomedical Instrumentation & Measurement, By Leaslie Cromwell, Fred Weibell, Erich A Pfeiffer, 2nd Edition ,PHI
T.2	Handbook of Biomedical Instrumentation, R.S.Khandpur, 2nd Edition, TMH

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

BECXX05 : Internet of Things (OE)

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

Course Outcomes (CO)

Students will be able to

Understand design levels of IoT

Explain the design levels of IoT and Architecture

Analyze M2M Value Chains and Machine-to Machine Communications

Analyze Communication Protocols, Sensor Networks

Demonstrate Arduino and Raspberry Pi Platform for IoT application

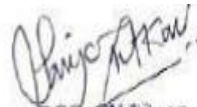
Course Contents

Unit I	Introduction to IoT :- 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	IOT Architecture :- 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	M2M to IOT :- 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 IV	Network and Communication Aspects :- Wireless medium access issues, MAC protocol, Survey routing protocols, Sensor deployment & Node discovery, service model, service management and security
Unit V	Industrial IoT for Case Study: Introduction to different IoT tools, Introduction to Arduino and Raspberry Pi & Its Programming. Case Study on Smart Parking , Health care and Agriculture.

Text Books

1	Arshdeep Bahga, Vijay Madiseti, —Internet of Things – A hands-on approach , Universities Press, 2015 .
2	From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence: By Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, 1st Edition, Academic Press, 2014.

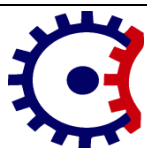
3	Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), —Architecting the Internet of Things , Springer, 2011.
Reference Books	
1	Honbo Zhou, —The Internet of Things in the Cloud: A Middleware Perspective , CRC Press, 2012.
2	Olivier Hersent, David Boswarthick, Omar Elloumi , —The Internet of 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


BOS Chairman
 Department of Electronics & Comm
 Tulsiramji Gaikwad-Patil College
 of Engineering & Technology, Nagpur


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


Vice-Principal
 Tulsiramji-Gaikwad-Patil
 College Of Engineering &
 Technology, Nagpur


Principal
 Tulsiramji Gaikwad-Patil
 College Of Engineering &
 Technology, 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

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	TA	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)

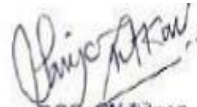
Course Contents

Unit I	History, Definition, and Classification of Embedded System, Design Metric & Its optimization, Embedded System Design Challenges, Processor selection Criteria, Building blocks of typical Embedded System – Core Types, Memory Architecture, Memory & Its Types, RISC and CISC.
Unit II	Introduction to ARM, features, architecture, instruction set features, Concepts of RTOS ARM processor and Architecture, Register set, instruction set, programming, interrupts, stack, timers on-chip and off chip peripherals, interfacing and programming.
Unit III	Analyzing Inbuilt of ADC and DAC of ARM7TDMI Microcontroller, Applications based on PWM, Interfacing of Temperature Sensor, USART, Bluetooth, USB Drive, LCD display, GSM and GPS Module.
Unit IV	Protocol of Embedded System:- Bluetooth , USB Drive,I2C Bus, CAN Bus, , IEEE 802.11,,RS232,RS485 ,GPRS, IEEE 802.15, Modbus, Zigbee Architecture.
Unit V	Architecture of the kernel, Task scheduler, Semaphores, Mailbox , Message queues , 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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