



DTE Code: 4151

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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 (V Sem)

Scheme & Syllabus

Session :- 2025-26



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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.



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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Vision of the Department

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

Mission of the Department

- 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.



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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



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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

Semester V

SN	Sem	Type	Bos	Sub. Code	Subject	T/P	Contact Hours			Credits	%				ESE
			/Dept.								Weightage	Duration Hours			
							L	P	Hrs		CT/ IA	CA	ESE	Total Marks	
FIFTH SEMESTER															
1	V	PCC	EC	BEC33501	Analog & Digital Communication	T	3	0	3	3	30	10	60	100	3
2	V	PCC	EC	BEC33502	Microcontroller and Embedded Systems	T	3	0	3	3	30	10	60	100	3
3	V	PCC	EC	BEC33504	Digital Signal Processing	T	3	0	3	3	30	10	60	100	3
4	V	MDM	IT	BIT33515	Artificial Intelligence	T	4	0	4	4	30	10	60	100	3
5	V	PEC	EC	BEC335XX	Program Elective-I	T	4	0	4	4	30	10	60	100	3
6	V	OE	EC	BEC33509	Open Elective-III	T	2	0	2	2	14	6	30	50	2
7	V	PCC	EC	BEC33503	Microcontroller and Embedded Systems Lab	P	0	2	2	1	0	25	25	50	2
8	V	PCC	EC	BEC33505	Digital Signal Processing Lab	P	0	2	2	1	0	25	25	50	2
9	V	PCC	EC	BEC33506	Analog & Digital Communication Lab	P	0	2	2	1	0	25	25	50	2
TOTAL FIFTH SEM							19	6	25	22	164	135	405	700	

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	–	12	4	6	–	–	–	–
Cumulative Sum	16 / 13	30	4	16	6	10	10	4

PROGRESSIVE TOTAL CREDITS: 83+22= 105

				June, 2025	1.00	Applicable for AY 2025-26 Onwards
Chairperson	Dean Academics	Vice-Principal	Principal	Date of Release	Version	

Department of Electronics & Communication Engineering
Tulsiramji Gaikwad-Patil College of Engineering and Technology, Nagpur
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Program Elective List for U.G.

Semester V	Semester VI	
Program Elective- I	Program Elective- II	Program Elective- III
BEC33515: Electromagnetic Field and Antenna	BEC33605: Microwave & Radar Engineering	BEC33608: Wave guide & Antenna
BEC33507: CMOS VLSI Design	BEC33606: HDL Using Verilog	BEC33609: VLSI Signal Processing
BEC33508: 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


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Principal
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Dr. Pragati Patil
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Open Elective List for U.G.

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

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

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


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Dr. Pragati Patil
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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	BEC33516	System Design Through Verilog	NPTEL/ESE	03
4	VI	BEC33611	Digital IC Design	NPTEL/ESE	03
		BEC33612	VLSI Design Flow: RTL to GDS	NPTEL/ESE	
5	VII	BEC34708	VLSI Physical Design	NPTEL/ESE	03
6	VIII	BEC34813	Internship(VLSI 1 month)	ESE	03
7		BEC34814	Capstone Project	ESE	
Total					18

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HOD	Dean Academics	Dr. Pragati Patil	Principal	Date of Release	Version	
Department of Electronics & Communication Engineering Tulsiramji Gaikwad-Patil College of Engineering and Technology, Nagpur	Department of Electronics & Communication Engineering Tulsiramji Gaikwad-Patil College of Engineering and Technology, Nagpur	Department of Electronics & Communication Engineering Tulsiramji Gaikwad-Patil College of Engineering and Technology, Nagpur	Department of Electronics & Communication Engineering Tulsiramji Gaikwad-Patil College of Engineering and 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	BEC33517	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					18

				June, 2025	1.00	Applicable for AY 2025-26 Onwards
HOD	Dean Academics	Dr. Pragati Patil	Principal	Date of Release	Version	
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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)

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
OR			
03	Internship(16 week)	-	08
Total			08


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Third Year (Semester-V) B.Tech. Electronics & Communication Engineering					
BEC33501: Analog and Digital Communication					
Teaching Scheme				Examination Scheme	
Lectures	3 Hrs/week			CT-1	15 Marks
Tutorial	0 Hrs/week			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 (CO)					
Students will be able to					
1	Illustrate the concepts of modulation and demodulation techniques for amplitude modulation.				
2	Determine the concept of angle modulation in FM transmitter and receiver .				
3	Examine the digital modulation schemes PCM ,DM,ADM with their limitations.				
4	Apply digital passband transmission techniques including shift keying and division multiplexing methods.				
5	Analyze the line coding techniques and spread spectrum techniques of DSSS,FHSS and CDMA				
Course Contents					
Unit I	Amplitude Modulation: Need for modulation, Amplitude Modulation - Time and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves - Switching modulator, Detection of AM Waves - Envelope detector, DSBSC modulation - time and frequency domain description, Generation of DSBSC Waves - Balanced Modulators, Coherent detection of DSB-SC Modulated waves, SSB modulation - time and frequency domain description, frequency discrimination and Phase discrimination methods for generating SSB.				
Unit II	Angle Modulation: Basic concepts of Phase Modulation, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave using Bessel functions, Narrow band FM, Wide band FM, Transmission bandwidth of FM Wave - Generation of FM Signal-Armstrong Method, Comparison of FM and AM., Concept of Pre-emphasis and de-emphasis.				
Unit III	Radio Receivers: - Receiver Types - Tuned radio frequency receiver, Superhetrodyne receiver Sampling and Analog to digital Conversion: -Sampling theorem, Sampling and signal reconstruction, Aliasing, Types of sampling, Quantization, Pulse Modulation: Types of Pulse modulation- PAM, PWM and PPM. Comparison of FDM and TDM.PCM Generation and Reconstruction, Quantization Noise, Non-Uniform Quantization and Companding, DPCM, Adaptive DPCM, DM and Adaptive DM, Noise in PCM and DM.				
Unit IV	Digital Modulation Techniques: ASK- Modulator, Coherent ASK Detector, FSK- Modulator, Non- Coherent FSK Detector, BPSK- Modulator, Coherent BPSK Detection. Principles of QPSK, Differential PSK and QAM. detection of QAM, FDM & TDM signal multiplexing				
Unit V	Line coding & Spread Spectrum Techniques: - line coding techniques, PN sequence generation technique, Spread spectrum Communications, Frequency Hopping Spread Spectrum (FHSS), Direct Sequence Spread Spectrum (DSSS), Code Division Multiple Access of DSSS, Error Detection and correction techniques Hamming code, Huffman code, Cyclic redundancy check				
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," 3rd 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," 5th 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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Third Year (Semester-V) B.Tech. Electronics & Communication Engineering

BEC33502 : Microcontroller & Embedded System

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

Illustrate the core concepts and programming techniques of the 8051 microcontroller.

Implement the interfacing of 8051 micro-controller with real life applications.

Examine working of Embedded Systems in Real life, Engineering and Industrial applications.

Analyze embedded systems based on ARM architecture with its features, functions, and operational capabilities.

Design RT embedded systems using kernel features and IPC, with practical applications in communication and automation.

Course Contents

Unit I	Comparison of microprocessor & micro-controller, Introduction to 8051 micro controllers, Pin diagram, architecture, features & operation, Ports, memory organization, SFR's, Flags, Counters/Timers, Serial ports. Interfacing of external RAM & ROM with 8051. 8051 ,Interrupt structure, Instruction set of 8051; data transfer, logical, arithmetic & branching instructions, Addressing modes
Unit II	Interfacing of Switches, keyboard, LED & LCD display, ADC & DAC Interface, Stepper motor Interface, DMA.
Unit III	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 IV	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 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	Andrew N Sloss, Dominic Symes and Chris Wright, ARM system developers guide, Elsevier, Morgan Kaufman publishers, 2008.
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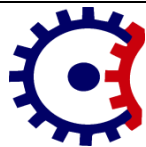
2	Shibu K V, “Introduction to Embedded Systems”, Tata McGraw Hill Education, Private Limited, 2 nd Edition.
Reference Books	
1	Steve Furber, ARM System-on-Chip Architecture, Second Edition, Pearson, 2015.
2	Raghunandan..G.H, Microcontroller (ARM) and Embedded System, Cengage learning Publication,2019
3	Raj Kamal, Embedded System, Tata McGraw-Hill Publishers, 2nd Edition, 2008.
Useful Links	
1	https://archive.nptel.ac.in/courses/108/105/108105102/
2	https://archive.nptel.ac.in/courses/106/105/106105193/



Head of Department of Electronics & Comm
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B.Tech Third Year (Semester-V) Electronics and Communication Engineering

BEC33504 : Digital Signal Processing and Application

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

Course Objectives:

1. **Classify** discrete-time signals analytically and visualize them in the time domain.
2. **Apply** discrete Fourier transform on discrete time signal and Its properties.
3. **Analyze** Fast Fourier Transform algorithms on discrete signals.
4. **Design** Digital Infinite Impulse Response Filters by using analog Filter.
5. **Implement** Digital finite Impulse Response filters using windowing techniques.

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	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
Unit IV	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 V	Design of Finite Impulse Response filter design using various windowing techniques: Rectangular, Hamming, Blackman, Finite Impulse Response filter structure : Direct & Cascade form.

Text Books

T.1	Digital Signal Processing and applications- 4 th edition, John G. Proakis McGraw-Hill
T.2	Discrete time Signal Processing- 3 rd edition Alan Oppenheim, Ronald Schafer pearson

T.3	Digital Signal Processing - A computer based approach-Publication- 4 th edition, Sanjit K. Mitra, McGraw-Hil
Reference Books	
R.1	Digital Signal Processing- 3 rd Edition S Salivahanan ,A Vallavraj ,C Gnanapriya McGraw-Hill
R.2	Digital signal processing- A practical approach 2 nd Edition,.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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Third Year (Semester-V) B.Tech. Electronics & Communication Engineering

BIT33515 : Artificial Intelligence

Teaching Scheme		Examination Scheme	
Lectures	4 Hrs/week	CT-1	15 Marks
Tutorial	- 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

Determine the working functionality of Artificial Intelligence with intelligent agents.

Describe the structure and function of problem-solving agents.

Apply adversarial search techniques to make optimal decisions in competitive environments

Illustrate First Order Logic for Knowledge Representation

Analyze Planning approaches in terms of efficiency, scalability, and applicability.

Course Contents

Unit I	Introduction: What is Artificial Intelligence? Foundations of AI, history, the state of art AI today. Intelligent Agents: agents and environment, good behaviour, nature of environment, the structure of agents
Unit II	Solving Problems by Searching: Problem solving agents, examples problems, searching for solutions, uninformed search, informed search strategies, heuristic functions. Beyond Classical Search: local search algorithms, searching with non-deterministic action, searching with partial observations, online search agents and unknown environments.
Unit III	Adversarial Search: Games, optimal decisions in games, alpha-beta pruning, stochastic games, partially observable games, state-of-the-art game programs. Logical Agents: Knowledge base agents, The Wumpus world, logic, propositional logic, propositional theorem proving, effective propositional model checking, agents based on propositional logic.
Unit IV	First Order Logic: Syntax and semantics, using First Order Logic, Knowledge engineering in First Order Logic. Inference in First Order Logic: propositional vs. First Order, unification and lifting, forward and backward chaining, resolution.
Unit V	Planning: Definition of Classical Planning, Algorithms for planning as state space search, planning graphs, other classical planning approaches, analysis of planning approaches, Time, Schedules and resources, hierarchical planning, Planning and Acting in Nondeterministic Domains, multiagent planning, Knowledge Representation: Categories and Objects, events, mental events and objects, reasoning systems for categories, reasoning with default information, Internet shopping world

Text Books

1	Artificial Intelligence: A Modern Approach by Stuart Russel and Peter Norvig Pearson, 3 rd edition, 2015
2	A First Course in Artificial Intelligence by Deepak Khemani, TMH, First edition, 2017
3	Artificial Intelligence: A Rational Approach by Rahul Deva Shroff, publishers 1 st edition 2018
Reference Books	
1	Artificial Intelligence by Elaine Rich, Kevin Knight and Shivashankar Nair, TMH, 3 rd edition, 2009
2	Artificial Intelligence & Soft Computing for Beginner by Anandita Das Bhattacharjee, SPD, 1st edition, 2013
Useful Links	
1	nptel.ac.in/shop/nptel/an-introduction-to-artificial-intelligence/?ut
2	nptel.ac.in/courses/112/103/112103280
3	nptel.ac.in/courses/106/106/106106140



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Third Year (Semester-V) B.Tech. Electronics & Communication Engineering				
BEC33515: Electromagnetic Field and Antenna				
Teaching Scheme			Examination Scheme	
Lectures	4 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				
1	Describe the Cartesian coordinate system , operation of vector calculus in Electromagnetic field.			
2	Analyze electric fields and flux using Coulomb’s and Gauss’s laws for charge distributions in symmetric and non-symmetric structures.			
3	Examine electrostatic field properties using potential theory, divergence theorem, and boundary conditions to verify current flow and energy density in conductors.			
4	Explain magneto static field concepts using Biot–Savart and Ampere’s laws, to verify magnetic flux, flux density in practical current configurations.			
5	Analyze the antenna fundamentals and its concepts of radiation mechanisms of VHF,UHF and Microwave antenna.			
Course Contents				
Unit I	Orthogonal coordinate systems: Cartesian, cylindrical, spherical and transformations, Gradient of a Scalar Field. Divergence of a Vector Field, Curl of a Vector Field, Laplacian Operator, Irrotational and solenoidal field.			
Unit II	Magnetic field: Coulomb’s law, Electric field intensity for different charge distribution: point, line surface, volume, Concept of electric flux, Gauss’s law and its application to field computation in symmetric structures and non-symmetric structures.			
Unit III	Electrostatic field: Divergence Theorem, Definition of Potential Field of System of Charge, Potential Gradient, Energy Density in Electrostatic Field. Current And Current Density, Conductor Properties and Boundaries Condition.			
Unit IV	Magneto static fields: Biot –Savart law and applications to infinite and finite current filament, Ampere’s Circuital law and applications to line charge, coaxial transmission cables, uniform current sheet charge, solenoid, Stroke’s Theorem Magnetic flux and magnetic flux density.			
Unit V	Antenna Fundamentals Directional Properties of Dipole Antennas, Two Element Array, Linear Arrays, Antenna Parameters: Antenna gain and directivity, Antenna impedance and efficiency Transmission Loss Between Antennas, Space Communications, Antenna- The radiation mechanism, Types of Antenna : Elementary doublet, Resonant & Non-resonant antenna, Dipole arrays, Folded Dipole and Yagi-Uda Antenna (VHF), UHF and Loop antenna and Logic periodic Antenna.			

Text Books	
T.1	Engineering Electromagnetics Seventh Edition William H. Hayt Tata McGraw – Hill
T.2	Field and Wave Electromagnetics Second Edition 21 Jan 2010 David K. Cheng Addison Wesley
Reference Books	
R.1	Electromagnetism Theory and application 2nd Edition 2009 Ashutosh Pramanik Prentice Hall.
R.2	Elements of Electromagnetics M. N. O. Sadku Oxford Press.
Useful Links	
1	https://archive.nptel.ac.in/courses/108/104/108104087/
2	https://archive.nptel.ac.in/courses/115/104/115104088/


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

BEC33507 : (PE-I) CMOS VLSI Design

Teaching Scheme		Examination Scheme	
Lectures	4Hrs/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

Analyze the structure and working principle of Metal-Oxide-Semiconductor (MOS) devices, including nMOS and pMOS enhancement-type transistors.

Illustrate operation of MOS inverters, including static load and transmission gate-based designs.

Examine the design and operation of basic combinational logic circuits using CMOS gates.

Analyze CMOS circuit performance by estimating resistance, capacitance, switching characteristics, power dissipation, and charge sharing effects.

Describe the VLSI process integration steps involved in fabricating CMOS circuits.

Course Contents

Unit I	Mos transistors theory: Introduction to The metal oxide semiconductor (MOS) structure, Long channel I-V characteristics, C-V characteristics. nMOS enhancement and pMOS enhancement transistor, threshold voltage, body effect, MOS effect, MOS device equations, small signal model for MOS transistor. Fabrication process flow- basic steps, the CMOS n-Well process, layout design rules, stick diagram.
Unit II	CMOS inverter : Principle of operation, dc characteristics, transient characteristics, β_n/β_p ratio, noise margin, static load MOS inverter, transmission gate, introduction to Bi-CMOS inverter.
Unit III	Study of CMOS logic: Study of combinational logic, gates, compound gates, multiplexers, and memory elements using CMOS technology.
Unit IV	Circuit characterization and performance estimation : Resistance and capacitance estimation, switching characteristics, power dissipation, charge sharing.
Unit V	VLSI design : VLSI processing integration, layout design rules, and stick diagram representation latch up, CMOS circuits and logic design: transistor sizing, fan-in, fan-out and physical design of simple logic gates, CMOS logic structures and clocking strategies.

Text Books

1	Neil H. E. Weste, K. Eshraghian, "Principal of CMOS VLSI design", Addison Wesley VLSI Series.
2	J. M. Rabaey, A. Chandrakasan, and B. Nikolic. "Digital Interrogated circuits, A Design Perspective", , PHI Publications .
3	Pucknell & K. Eshraghain, "CMOS VLSI Design", PHI Publications.

Reference Books	
1	S.M. Sze, “VLSI Technology”, McGraw Hill Publications.
2	Randall L Gei , “VLSI Design Technologies for Analog & Digital Circuits”, McGraw Hill Publications
Useful Links	
1	http://nptel.ac.in/courses/Webcoursecontents/IITBombay/VLSI%20Design/TOC.htm
2	http://nptel.ac.in/courses/117106092/1



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Third Year (Semester V) B.Tech. Electronics & Communication Engineering				
BEC33508: Instrumentation & Control System				
Teaching Scheme			Examination Scheme	
Lectures	3Hrs/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:03Hrs 00Min.	
Course Outcomes (CO)				
Students will be able to				
1	Illustrate the working principles of sensors used for measuring displacement, speed, level, and temperature.			
2	Derive the linear feedback principles & its mathematical models of control system.			
3	Implement system models using transfer functions, block diagram algebra, and signal flow graphs.			
4	Analyze the time response characteristics of first and second order control systems using standard test inputs.			
5	Evaluate control system stability based on characteristic equations, Routh-Hurwitz criterion, and graphical methods.			
Course Contents				
Unit I	Instrumentation System Elements: Displacement Sensors Potentiometer, Optical Encoders, Strain-Gauged Element, Capacitive Element, Speed Sensors Tachogenerator, Piezoelectric Sensor, Liquid Level, Ultrasonic Level Gauge Temperature Sensors, Resistance Temperature Detectors (RTDs), Thermistors Thermocouples.			
Unit II	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.			
Unit III	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 IV	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.			
Unit V	Stability & Root Locus: Stability of control systems, condition of stability, characteristics equation, Routh Hurwitz criterion, special cases for determining stability, relative stability. Graphical method.			

Text Books	
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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Third Year (Semester-V) B.Tech. Electronics & Communication Engineering					
BEC3509 : ICT in Rural Sector					
Teaching Scheme				Examination Scheme	
Lectures	02Hrs/week			CT-1	7 Marks
Tutorial	-			CT-2	7 Marks
Total Credit	02			TA	6 Marks
				ESE	30 Marks
		Total	50 Marks		
		Duration of ESE: 02 Hrs 00Min.			
Course Outcomes (CO)					
Students will be able to					
Identify key challenges in ICT in rural areas and role of ICT in global and Indian context characteristics.					
Exemplify the major challenges affecting ICT adoption, infrastructure deficiency and digital illiteracy.					
Analyze ICT tools and platforms used in agriculture, education, health, and governance.					
Course Contents					
Unit I	Rural Development and the Need for ICT: Definition and evolution of ICT, Components of ICT, Importance of ICT in development, Overview of ICT in global and Indian context Characteristics and challenges of rural areas, Role of ICT in poverty reduction and sustainable development, Government initiatives for rural ICT development.				
Unit II	Challenges of ICT: Infrastructure Deficiency, Digital Illiteracy, Affordability, Language and Content Relevance, Resistance to Change.				
Unit III	ICT tools and platforms : Use of ICT in crop planning, pest control, irrigation, Mobile apps for farmers ,Weather forecasting and agri-market information systems, Smart agriculture: IoT, drones, sensors, Digital classrooms and distance learning, E-learning platforms ,Bridging rural-urban education divide, Role of mobile technology and community radio, Telemedicine and mobile health , Health awareness campaigns through ICT, Monitoring systems for maternal and child health, Role of ICT during pandemics and emergencies				
Text Books					
1	Michelle Jacobs"Information and Communication Technologies in Agriculture" States Academic Press states academi cpress.com,2021				
2	Maitrayee Mukerji"ICTs and Development: A Study of Telecentres in Rural India"Palgrave Macmillan.				
3	Dr. Chandan Kumar Panda, Dr. Anil Paswan, Dr. Siya Ram Singh"Advances in ICT in Agriculture"				
Reference Books					
1	Venkata Reddy, K. Agriculture and Rural Development (Emerging Trends and Right Approach to Development), Hmalaya Publshing House Pvt., Ltd.				

2	Adivi Reddy. A. Extension education, Sri Lakshmi Press, Bapatla.
3	Dhahama O.P. & Bhatnagar, O.P., Education and Communication for Development, Oxford & IBH Publishing.
Useful Links	
1	http://kcl.digimat.in/nptel/courses/video/126104006/L44.html
2	http://tjsec.digimat.in/nptel/courses/video/126104006/L42.html
3	https://www.youtube.com/watch?v=KFAw_h0n0q0


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

BEC33503: Microcontroller and Embedded Systems Lab

Teaching Scheme		Examination Scheme	
Lectures	2Hr/Week	CT	-
Tutorials	-	CA	25 Marks
Total Credits	1	ESE	25 Marks
		Total	50 Marks

Duration of ESE:02Hrs

Course Outcomes:

1	Execute arithmetic, logical and bit manipulation instructions of 8051 for programming.
2	Analyze assembly programs for HEX to ASCII conversion and square root computation using low-level programming and memory operations.
3	Implement serial data transfer and seven-segment display interfacing between microcontroller kits.
4	Implement the interfacing of DAC and ADC with Microcontroller 8051.
5	Execute the program of stepper motor and traffic light Controller.

Sr.No.	List of Experiment	CO
1	Execute a program of arithmetic operations using 8051 microprocessor.	CO1
2	Execute an assembly Language Program for finding largest no. from a given array of 8-bit numbers.	CO1
3	Write an assembly language program to convert a HEX number to its equivalent ASCII code and display the result in the address field.	CO2
4	Write an assembly language program to find the square root of a given data.	CO2
5	Implement transfer data in serial communication protocol.	CO3
6	Implement interfacing of Seven segment LED display.	CO3
7	Implement a program to interface DAC with Microcontroller.	CO4
8	Implement a program to interface ADC with Microcontroller.	CO4
9	Implement interfacing of Stepper motor with Microcontroller.	CO5
10	Implement a program for traffic light controller using 8051 Microcontroller.	CO5

Text Books

T.1	Andrew N Sloss, Dominic Symes and Chris Wright, ARM system developers guide, Elsevier, Morgan Kaufman publishers, 2008.
T.2	Shibu K V, "Introduction to Embedded Systems", Tata McGraw Hill Education, Private Limited, 2nd Edition.

Reference Books

R.1	Steve Furber, ARM System-on-Chip Architecture, Second Edition, Pearson, 2015.
R 2	Raghunandan..G.H, Microcontroller (ARM) and Embedded System, Cengage learning Publication,2019
R.3	Raj Kamal, Embedded System, Tata McGraw-Hill Publishers, 2nd Edition, 2008.

Useful Links	
1	https://archive.nptel.ac.in/courses/106/105/106105193/
2	https://elearn.nptel.ac.in/shop/iit-workshops/completed/lab-workshop-on-embedded-c-and-arm-cortex-microcontrollers/?v=c86ee0d9d7ed
3	https://nptel.ac.in/courses/117104072


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

BEC33516: Digital Signal Processing & Applications Lab

Teaching Scheme		Examination Scheme	
Lectures	2Hr/Week	CT	-
Tutorials	-	CA	25 Marks
Total Credits	1	ESE	25 Marks
		Total	50 Marks

Duration of ESE: 02Hrs

Course Outcomes:

1	Demonstrate Discrete-Time Signals analytically and visualize them in the time domain.
2	Examine Discrete Fourier Transform on discrete time signal and It's properties.
3	Analyze Fast Fourier Transform algorithms on discrete time signals.
4	Design Digital Infinite Impulse Response Filters by using analog filters.
5	Implement Digital finite Impulse Response filters using windowing techniques.

Sr.No.	List of Experiment	CO
1	Plot and represent following basic discrete time signals. : Unit impulse, unit step, ramp, real and complex exponential and its representations.	CO1
2	Plot linear convolution of discrete time signals.	CO1
3	Plot circular convolution of discrete time signals.	CO1
4	Execute program to compute cross-correlation of the given sequences with corresponding plot.	CO2
5	Execute program to compute auto-correlation of given discrete- time signals With corresponding plot.	CO2
6	Compute DFT and IDFT of discrete time signals using Fast Fourier Transform.	CO3
7	Design Butterworth Infinite Impulse Response filters.	CO4
8	Design Chebyshev Infinite Impulse Response filters.	CO4
9	Implement Finite Impulse Response filter using Hamming windowing techniques.	CO5
10	Implement Finite Impulse Response filter using Hanning windowing techniques.	CO5

Text Books

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

Reference Books

R.1	Digital signal processing- A practical approach 2 nd Edition, 2002.E. C. Ifeachar, B. W. Jarvis Pearson
R 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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Third Year (Semester-V) B.Tech. Electronics & Communication Engineering

BEC33506: Analog and Digital Communication Lab

Teaching Scheme		Examination Scheme	
Lectures	2Hr/Week	CT	-
Tutorials	-	CA	25 Marks
Total Credits	1	ESE	25 Marks
		Total	50 Marks
		Duration of ESE:02Hrs	

Course Outcomes:

1	Demonstrate the concepts of analog modulation and demodulation techniques by using AM.
2	Analyze 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
5	Demonstrate the line coding techniques and spread spectrum techniques using DSSS, FHSS and CDMA.

Sr.No.	List of Experiment	CO
1	Perform Generation of AM modulation and Demodulation	CO1
2	Perform Generation of DSB-SC modulation and Demodulation	CO1
3	Perform Generation of FM Modulation and Demodulation	CO2
4	Perform Generation of PAM,PPM,PWM modulation and demodulation	CO3
5	Perform Generation and detection of Pulse Code Modulation and Demodulation	CO3
6	Examine the Generation of DM and ADM with analysis of step size	CO3
7	Perform Generation and detection of ASK, FSK Modulation and Demodulation	CO4
8	Perform Generation and detection of PSK Modulation and Demodulation	CO4
9	Examine the Generation of QPSK Modulation and Demodulation	CO4
10	Simulation of different line coding techniques using MATLAB	CO5

Text Books

T.1	B.P. Lathi, "Modern Digital and Analog Communication System", Oxford University Press, 3rd Edition, 2005
T.2	John G. Proakis, "Digital Communication", McGraw Hill Inc, 5th Edition, 2008.

Reference Books

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

Useful Links

1	https://nptel.ac.in/courses/117/105/117105143
2	https://nptel.ac.in/courses/117/105/117105144


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