III – I

Year/Sem	Sub. Code	Subject Name	L	T	P/D	C
III-I	8CC09	Digital Signal Processing	2	1	0	3

Course objectives: To develop skills for analyzing and synthesizing algorithms and systems that process discrete time signals, with emphasis on realization and implementation.

Course outcomes*:*

1. *Distinguish between CT and DT signals and systems and understand the growing need of DSP and study the concepts of discrete time signals and systems.*
2. *Represent periodic DT signals as a Fourier series; non-periodic DT signals as a Fourier Transform and use a powerful mathematical tool called DFT.*
3. *Compute the Fourier Transform of DT signals using the FFT algorithms.*
4. *Realize a digital IIR filter in several forms and structures for a given transfer function H(z)and can design IIR filter as per specifications .*
5. *Design of digital FIR filters by several methods as per the given specifications and can realize FIR Filter*
6. *Understand the need and implement the multirate sampling techniques.*

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	3	3				2			3	3	3	
CO2	2	3	3	3	3				2			2	3	3	
CO3	1	3	3	3	3				2			2	3	3	
CO4	2	3	3	3	3				2			2	3	3	
CO5	1	3	3	3	3				2			2	3	3	3
CO6	1	3	3	3	3				2			2	3	3	3
Overall		3	3	3	3				2			3	3	3	3

UNIT I : INTRODUCTION:

Introduction to Digital Signal Processing: Discrete time signals & sequences, Periodicity, linear shift invariant systems, stability, and causality, Linear constant coefficient difference equations, Block diagram representation of linear constant-coefficient difference equations,Frequency domain representation of discrete time signals and systems.

Applications: Contents form the foundation for DSP.

UNIT II : DISCRETE FOURIER TRANSFORM:

Discrete Fourier series representation of periodic sequences, Discrete-Time Fourier Transform(DTFT), Discrete Fourier transform (DFT): Properties of DFT, Relation between Z-transform and DFT, Convolution: Linear and circular convolutions, Overlap add and Overlap save methods, Computation of DFT.

Applications: Analysis of DT signals-Periodic and Aperiodic.

UNIT III : FAST FOURIER TRANSFORMS:

Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT.

Applications: Design of spectrally efficient system such as OFDM system.

UNIT IV: DIGITALIIR FILTERS:

ANALOG FILTER APPROXIMATIONS – Butterworth and Chebyshev Approximations.

IIR DIGITAL FILTERS: Design of IIR Digital filters from analog filters-Impulse Invariance, Step invariance and Bilinear Transformation methods, Design Examples, Analog-Digital transformations.Basic structures of IIR systems, Transposed forms,

Applications: Design of IIR digital filter conforming to given specifications.

UNITV: DIGITALFIR FILTERS:

FIR DIGITAL FILTERS:Characteristics of FIR Digital Filters, frequency response, Design of FIR Digital Filters using Fourier series method, Windowing Techniques-Rectangular, Triangular, Hamming, Hanning and Bartlett's Windows, Steps in Kaiser windowing method, Frequency Sampling technique, Comparison of IIR and FIR filters.Basic structures of FIR systems

Applications: Design of FIR digital filter conforming to given specifications.

UNIT VI: MULTIRATE DIGITAL SIGNAL PROCESSING:

Decimation, interpolation, sampling rate conversion. Introduction to DSP Processors.

Applications of Multirate Digital Signal processing: Design of digital filter banks and quadrature mirror filters etc.

TEXT BOOKS:

1. Digital Signal Processing – Alan V. Oppenheim, Ronald W. Schafer, PHI Ed., 2006
2. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education / PHI, 2007.
3. Digital Signal Processing: A Modern Introduction, Ashok Ambardar, 9th Indian Reprint, 2012, Cengage Learning.

REFERENCE BOOKS:

1. Digital Signal Processing: Andreas Antoniou, TATA McGraw Hill , 2006
2. Digital Signal Processing: MH Hayes, Schaum's Outlines, TATA Mc-Graw Hill, 2007.
3. DSP Primer - C. Britton Rorabaugh, Tata McGraw Hill, 2005.
4. Fundamentals of Digital Signal Processing using MatLab – Robert J. Schilling, Sandra L. Harris, Thomson, 2007
5. Discrete Time Signal Processing – A.V.Oppenheim

Year/Sem	Sub. Code	Subject Name	L	T	P/D	C
III-I	8C510	VLSI Design	3	0	0	3

Prerequisites:*EDC,STLD, LDICA*

Course Objectives*:*

The objectives of this course is to provide the students an in-depth knowledge on various aspects of VLSI circuits and their design including testing.

Course Outcomes*: After studying this course, the students will be able to*

CO1	*Understand the existing device technologies and IC fabrication process*
CO2	*Explore and analyze the electrical properties of the devices of CMMOS device.*
CO3	*Design basic logic gates, combinational and sequential circuits using CMOS logic.*
CO4	*Analyze the effects of parasitic on IC power and performance.*
CO5	*Design memory cells and basic data path units.*
CO6	*Explore the need for testing and design verification of VLSI circuits.*

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3
Overall		3	3	3	3				2			3	3	3	3

Syllabus Content

UNIT I

INTRODUCTION TO MOS TECHNOLOGIES: MOS, PMOS, NMOS, CMOS &BiCMOS

INTRODUCTION TO IC TECHNOLOGY AND FABRICATION PROCESS: VLSI Design Flow, Oxidation, Lithography, Diffusion, Ion Implantation, Metallisation, Encapsulation, Probe testing, Integrated Resistors and Capacitors [T1-CH1, 2 & 3].

Application – CMOS IC Manufacturing

UNIT II

BASIC ELECTRICAL PROPERTIES: Basic Electrical Properties of MOS and BiCMOS Circuits: Ids-Vds relationships, MOS transistor threshold Voltage, gm, gds, Figure of Merit (ω_o), Zpu/Zpd, Latch-Up in CMOS, Pass Transistors [T1-CH2]

INVERTERS: NMOS Inverter, Various Pull-Ups, CMOS Inverter Analysis and Design, Bi-CMOS Inverters [T1-CH2]

UNIT III

CIRCUIT DESIGN PROCESSES: MOS Layers, Stick Diagrams, Lamda-based CMOS Design rules for Wires, Contacts and Transistors, Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits, Limitations of Scaling. [T1-CH3]

GATES: CMOS Logic Gates and Structures, Switch logic, Layout Diagrams Gates [T1-CH5]
Application – IC Physical Design – NAND and NOR

UNIT IV
DELAYS: Sheet Resistance R_s and its concept to MOS, Area Capacitance Units, Calculations - C_g, τ-Delays, Driving large Capacitive Loads, Wiring Capacitances, Fan-in and fan-out [T1- CH 4 & 5, T2-CH4]
Semiconductor Integrated circuit Design: PLD's, Introduction to CPLD's and FPGA's.

UNIT V
MEMORY AND SUBSYSTEM DESIGN: Latches and Registers [T2-CH7]**,** Clocking strategies (Single Phase) [T1-CH5.5],Memory cells (SRAM & DRAM), Adders, Shifter, Multipliers and ALUs [T1- CH8]
Applications – SRAM Based FPGAs and Multiply and Accumulate (MAC) Units

UNIT VI
INTRODUCTION TO CMOS TESTING: CMOS Testing, Need for testing, Test Principles, Design Strategies for Test, Chip level Test Techniques, System-level Test Techniques [T1-CH7]
Applications – Implementation of basic ATPG

TEXTBOOKS:

1. Basic VLSI Design –Douglas A. Pucknell, Kamran Eshraghian, PHI, 3rd Edition,2005.
2. Principles of CMOS VLSI Design - Weste and Eshraghian, Pearson Education, Second Edition, 2009.
.

REFERENCES:

1. Chip Design for Submicron VLSI: CMOS Layout & Simulation, - John P. Uyemura, Thomson Learning.
2. Introduction to VLSI Circuits and Systems - John .P. Uyemura, JohnWiley, 2003.
3. Digital Integrated Circuits: A Design Perspective - John M. Rabaey, 2/E, 2002
4. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997.
5. VLSI Technology – S.M. SZE, 2nd Edition, TMH, 2003.

Syllabus for B. Tech (E.C.E.) III Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - I	**8DC05**	**Microprocessors and Microcontrollers**	**2**	**0**	**0**	**2**

Course objectives: To develop skills for programming and interfacing using 8086 Microprocessor and 8051 Microcontroller.

Course outcomes*:*

1. *Understand Architecture of 8086 and analyzing in single mode and in multi processor mode.*
2. *Understand instructions of 8086 and to write Assembly Language Programs*
3. *Interface I/0 devices with 8086*
4. *Understand Architecture of 8051 microcontroller.*
5. *Understand instructions of 8051 and to Interface I/0 devices with 8051*
6. *Understand the need advanced processors.*

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2								2	2	2	
CO2	2	2	2	2								2	2	2	
CO3	2	2	2	2								2	2	2	
CO4		2	2	2	3							2			
CO5		2	3	2	3		2					2			3
CO6		2	3	2	2		2					2			
Overall		2	3	2	2		2		2			2	2	2	3

UNIT - I

Architecture of 8086 Microprocessor: Memory segmentation, BIU and E.U General purpose registers. 8086 flag register and function of 8086 Flags. Pin diagram of 8086-Minimum mode and maximum mode of operation. Timing Diagram.

UNIT – II

Instruction set of 8086: Addressing modes of 8086. Assembly directives. Simple programs, procedures, and macros. Assembly language programs involving logical, Branch & Call instructions, sorting, evaluation of arithmetic expressions, string manipulation. Introduction to DOS and BIOS interrupts.

Applications: Design of an 8-bit Calculator

UNIT - III

Interfacing with 8086: Interfacing with RAMs, ROMs along with the explanation of timing diagrams. 8255 PPI – various modes of operation. Interfacing with key boards, ADCs, and DACs Stepper Motor .Interrupt structure of 8086. Vector interrupt table. Interrupt service routines. 8259 PIC Architecture and interfacing cascading of interrupt controller and its importance.

Applications: Interfacing of a Temperature sensor with 8086

UNIT - IV

The 8051 Architecture: Architecture of 8051 Micro controller, Memory Organization. Special Function Registers. Input/Output Ports and Circuits, External Memory, Counter and Timers, Serial data Input/Output, Interrupts.

UNIT – V

Instruction set of 8051: Programming the 8051, Data Transfer and Logical Instructions. Arithmetic Operations, Decimal Arithmetic. Jump and Call Instructions, Simple programs. Programs based on SFRs on Timers ,Interrupts.

Applications of 8051: Interfacing 7 segment LEDs, LCDs, Interfacing with ADCs. Interfacing with DACs.

UNIT – VI

Introduction to ARM Processors: Harvard and Von Neumann architectures, CISC & RISC Architecture CPU Registers, CPU Operating Modes, The ARM 7 TDMI architecture-ARM organization and implementation-The ARM instruction set-The Thumb instruction set-Basic ARM assembly language programs

TEXT BOOKS :

1. Advanced microprocessor & Peripherals - A.K.Ray&K.M.Bhurchandi, TMH, 2000.
2. Microprocessors and interfacing – Douglas V. Hall, TMH, 2nd Edition, 1999.
3. 8051 Microcontroller–Kenneth J. Ayala, Penram International/ Thomson, 3rd Edition, 2005.
4. The 8051 Microcontroller And Embedded Systems Using Assembly And C – Mazidi, Pearson Education India,2nd edition, 2008. Jane W. S Liu, " Real Time Systems" Pearson Higher Education ,3rd Edition, 2000.
5. Steve Furber, ARM System on-chip Architecture, Addison Wesley

REFERENCES :

1. Micro computer systems, The 8086/8088 Family Architecture, Programming and Design – Y.Liu and G.A. Gibson, PHI, 2nd Edition.
2. 8051 Micro Controllers and Embedded Systems – Dr. Rajiv Kapadia, Jaico Publishers.

Syllabus for B. Tech (E.C.E.) III Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - I	**8C511**	**Cellular and Mobile Communication**	**3**	**0**	**0**	**3**

Prerequisites: *Analog & Digital Communications*

Course Objectives*:*

The objectives of this course are

- *Be acquainted with the role of cellular and mobile communications in frequency management issues.*
- *Be acquainted with different interference factors influencing cellular and mobile communications.*
- *Be able to efficiently use the background behind developing different path loss and/or radio coverage in cellular environment*

Course Outcomes*: After studying this course, the students will be able to*

CO1	*Understand the working principle and limitations/advancements of conventional mobile telephone systems, cellular mobile systems and Advanced generations of cellular wireless systems*
CO2	*Analyze Frequency reuse concept and avoidance of Co-channel interference.*
CO3	*Explore the concepts of adjacent channel interference, its effects and avoidance mechanism.*
CO4	*Analyze signal reflections, path loss, propagation delay/loss, near and long distance propagation loss under different conditions, Merits of Lee model*
CO5	*Analyze frequency allocation of cellular systems*
CO6	*Demostrate the concept of handoff mechanism and dropped calls.*

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3
CO6															
Overall		3	3	3	3				2			3	3	3	3

Syllabus Content

UNIT I

INTRODUCTION TO CELLULAR MOBILE RADIO SYSTEMS:

Limitations of conventional mobile telephone systems, Significance of 800MHz, Basic cellular wireless systems; 1G, 2G, 2.5G, 3G, 4G, 5G cellular wireless systems; Uniqueness of mobile radio environment – Long term fading, factors influencing short term fading, parameters of mobile multi path fading: time dispersion parameters, coherence bandwidth, Doppler spread and coherence time. Types of small scale fading. Diversity techniques – time, space, frequency.

UNIT-II
FUNDAMENTALS OF CELLULAR RADIO SYSTEM DESIGN:

Concept of Frequency reuse, Co-channel Interference, Co-channel Interference Reduction Factor, desired C/I from a normal case in a omni directional Antenna system, System capacity, Trunking and grade of service; Improving coverage and capacity in cellular system – cell splitting, sectoring, micro cell zone concept.

UNIT-III
CHANNEL INTERFERENCE:

Measurement of real time Co-Channel Interference, Design of antenna system, Antenna parameters and their effects; Diversity techniques- Space diversity, polarization diversity, Frequency diversity and Time Diversity. Non-co-channel interference-Adjacent channel Interference, near end and far end interference, cross talk, effect on coverage and Interference by power decrease, antenna height decrease, effect of cell site components, UHF TV interference

Applications: Design of a cellular systems using frequency reuse factor (k=19) for directional and Omni-directional antenna systems

UNIT-IV
CELL COVERAGE FOR SIGNAL AND TRAFFIC :

Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, constant standard deviation, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long distance propagation, path loss from a point to point prediction model in different conditions, merits-of-LEE-model.

UNIT-V
FREQUENCY MANAGEMENT AND CHANNEL ASSIGNMENT:

Numbering and grouping, setup access and paging channels channel assignments to cell sites and mobile units, channel sharing and borrowing, sectorization, overlaid cells, non fixed channel assignment.
HANDOFF, DROPPED CALLS:

Handoff initiation, types of Handoff, delayed handoff, Advantages of handoffs, Power difference handoff, forced handoff, mobile assigned handoff and soft handoff, Intersystem handoff. Introduction to dropped call rates and their evaluation.

UNIT-VI

DIGITAL CELLULAR NETWORKS: GSM architecture, GSM channels, multiple access scheme, TDMA, FDMA, CDMA,WCDMA, SDMA, OFDM.

TEXTBOOKS :

1. Mobile Cellular Telecommunications – W.C.Y. Lee, Tata McGraw Hill, 2rd Edn., 2006.
2. Principles of Mobile Communications – Gordon L. Stuber, Springer International 2nd Edition, 2007.

REFERENCES:

1. Wireless Communications - Theodore. S. Rapport, Pearson education, 2nd Edn., 2002.
2. Wireless and Mobile Communications – Lee McGraw Hills, 3rd Edition, 2006.
3. Wireless Communication and Networking – Jon W. Mark and WeihuaZhqung, PHI, 2005.
4. Wireless Communication Technology – R. Blake, Thompson Asia Pvt. Ltd., 2004.

Syllabus for B. Tech (E.C.E.) III Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - I	**8C512**	**Antennas and Wave Propagations**	**2**	**1**	**0**	**3**

Prerequisites: *EMTL*

Course Objectives:

The objectives of this course are

- *To study and learn various antennas, their working principle, arrays and radiation patterns of antennas.*
- *To understand various techniques involved in various antenna parameter measurements.*
- *To understand the radio wave propagation in the atmosphere*

Course Objectives*: After studying this course, the students will be able to*

CO1	*Learning the radiation mechanism of antenna and antenna parameters*
CO2	*Design and analyze wire antennas and antenna arrays*
CO3	*Evaluate knowledge on Horn, Parabolic and Lens antennas.*
CO4	*Analysis of Horizontal Polarized antennas, Helical antennas , Patch antennas etc.*
CO5	*Understand the propagation mechanisms of ground wave, sky wave and space wave concepts.*
CO6	*Analysethe concepts of sky wave propagation .*

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2		2				2			2	3	2	1
CO2	3	3	3	2	3				2				3	3	1
CO3	3	3	3		3				2				3	3	1
CO4	3	3	3		3				3			2	3	3	1
CO5	2	2											2	1	
CO6	2	3											2	1	
Overall	3	3	3	2	3				2			2	2	2	1

Syllabus Content

Unit-I:

FUNDAMENTAL PARAMETERS OF ANTENNAS

Review of Electromagnetic Theory: Vector Potential, Solution of Wave Equation, Retarded Case, Hertizian Dipole. Antenna Characteristics: Radiation Pattern, Beam Solid Angle, Directivity, Gain, Input Impedance, Polarization, Bandwidth, Reciprocity, Equivalence of Radiation Patterns, Equivalence of Impedances, Effective Aperture, Vector Effective Length, Antenna efficiency.

Unit-II:

LINEAR WIRE ANTENNAS AND ARRAYS

Wire Antennas: Short Dipole, Radiation Resistance and Directivity, Half Wave Dipole, Monopole, Small Loop Antennas. Antenna Arrays: Linear Array and Pattern Multiplication, Two-Element Array, Uniform Array, BSA and EFA, EFA With increased Directivity. BSA with Non- uniform Amplitude Distributions and Binomial Arrays.

Unit-III:

APERTUREAND REFLECTOR ANTENNAS

Magnetic Current and its Fields, Uniqueness Theorem, Field Equivalence Principle, Duality Principle, Method Of Images, Pattern Properties, Slot Antenna, Horn Antenna, Pyramidal Horn Antenna, Reflector Antenna-Flat Reflector, Corner Reflector, Common Curved Reflector Shapes, Lens Antenna.

Applications: Design of parabolic reflector for DTH.

Unit-IV:

Long Wire, V and Rhombic Antenna, Yagi-Uda Antenna, Turnstile Antenna, Helical Antenna- Axial Mode Helix, Normal Mode Helix, Biconical Antenna, Log Periodic Dipole Array, Spiral Antenna, Microstrip Patch Antennas. Antenna Measurements: Radiation Pattern Measurement, Gain and Directivity.

Applications: Design of a 3-element Yagi guda Antenna for given specifications

Unit-V:

Surface Wave Propagation-Modes of Wave Propagation-Surface Wave Propagation and Surface Wave Tilt-Plane Earth Reflection, Reflection and Refraction of Waves-Field Strength due to Ground Wave-Multi-Hop Transmission. Tropospheric and Space Wave Propagation

UNIT VI:

Ionospheric Propagation: Structure of Ionosphere-Measures of Ionosphere Propagation-Critical Frequency-Angle of Incidence-MUF And LUF ,Optimum Working Frequency-Skip Distance, Virtual Height , Refractive Index of The Ionosphere, Effect of the Earth Magnetic Field and Fading

TEXT BOOKS -

1. John D. Kraus and Ronald J. Marhefka, *Antennas for All Applications* –TMH, 3rd Edn., 2003.
2. E.C. Jordan and K.G. Balmain ,*Electromagnetic Waves and Radiating Systems* –, PHI, 2nd ed., 2000. .

REFERENCES –

1. C.A. Balanis, *Antenna Theory* -John Wiley & Sons, 2nd ed., 2001.
2. K.D. Prasad, *Antennas and Wave Propagation* –, Satya Prakashan, Tech India Publications, New Delhi, 2001.
3. E.V.D. Glazier and H.R.L. Lamont ,*Transmission and Propagation* –, The Services Text Book of Radio, vol. 5, Standard Publishers Distributors, Delhi.
4. F.E. Terman*Electronic and Radio Engineering* –, McGraw-Hill, 4th edition, 1955.

John D. Kraus, *Antennas* – McGraw-Hill, 2nd ed, 1988.

Syllabus for B. Tech (E.C.E.) III Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - I	**8C517**	**Digital Design Through Verilog (PE-I)**	**3**	**0**	**0**	**3**

Prerequisites: *STLD, Programmaing concepts of any language*

Course Objectives:

The objectives of this course are

- *To introduce syntax, lexical conventions, data types and memory related to Verilog HDL.*
- *To design, test and implementation of thedigital hardware using various modeling styles.*
- *To design digital systems using FSM modeling.*

Course Outcomes*: After studying this course, the students will be able to*

CO1	*Understand levels of design description, concurrency, simulation and synthesis.*
CO2	*Apply language constructs, data types, operators available in verilog HDL.*
CO3	*Design combinational logic and sequential logic in gate level modeling.*
CO4	*Explain Gate and Switch level modeling.*
CO5	*Use system tasks, functions and UDPs.*
CO6	*Demonstrate SM charts and realize digital design using SM charts.*

CO	**Digital Design Through Verilog (7C615)**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	Understand levels of design description, concurrency, simulation and synthesis.			2									1	1		
CO2	Apply language constructs, data types, operators available in verilog HDL.		1			2								1	2	
CO3	Design combinationa l logic and sequential logic in gate level modeling.		1	3										2		
CO4	Explain Gate and Switch level modeling.		2	3	3	2								1	2	

CO5	Use system tasks, functions and UDPs.			1	2	3								2	3	
CO6	Demonstrate SM charts and realize digital design using SM charts.		3	3	3	1							1	3	1	
CO	Overall		2	2	3	2							1	2	2	

Syllabus Content

UNIT I

INTRODUCTION TO VERILOG HDL: Verilog HDL, Levels of Design Description, Concurrency, System Tasks, Simulation and Synthesis, Functional Verification.

LANGUAGE CONSTRUCTS AND CONVENTIONS: Introduction, Keywords, Identifiers, White Space, Characters, Comments, Numbers, Strings, Logic Values, Strengths, Data Types, Scalars and Vectors, Parameters, Operators. Verilog Module structure, Test bench module- Net types, Strengths and Contention Resolution, Delays.

UNIT-II

MODELING AT DATA FLOW LEVEL: Introduction, Continuous Assignment Structures, Delays and Continuous Assignments, Assignment to Vectors, Operators.

BEHAVIORAL MODELING: Introduction, Initial Construct, Always Construct, Assignments with delays, Blocking and Non blocking Assignments - Examples, Wait construct, Multiple Always Blocks, Design at Behavioral Level constructs- Case statements, i*f* and i*f*-else, repeat, for loop, while loop, forever loop. Other constructs- assign-deassign, disable, force-release.

UNIT-III

GATE LEVEL MODELING: Introduction, Gate Primitives- Illustrative Examples, Tri-State Gates, Design of Basic Circuits using Instantiation of Gate Primitives- Half, Full and Parallel Adders, Decoders, Multiplexers. Design of Flip-flops with Gate Primitives.

SWITCH LEVEL MODELING: Introduction, Basic Transistor Switches, CMOS Switch, Bi-directional Gates, Time Delays with Switch Primitives, Instantiations with Strengths and Delays, Strength Contention with Trireg Nets-Examples.

UNIT-IV

SYSTEM TASKS, FUNCTIONS, AND COMPILER DIRECTIVES: Introduction, Parameters, Path Delays, Module Parameters, System Tasks and Functions, File-Based Tasks and Functions, Compiler Directives, Hierarchical Access, User- Defined Primitives (UDP).

UNIT-V

COMPONENT TEST AND VERIFICATION: Test bench – combinational circuit testing, sequential circuit testing, test bench techniques, design verification, assertion verification.

UNIT-VI

DIGITAL SYSTEM DESIGN AND VERIFICATION:FSM Design (Moore and Mealy Machines) – Vending Machine design and verification , Derivation and Realization of Algorithmic State Machine Chart Design and Verification examples - Binary Multiplier, Dice game. Other design examples - RAM (Single &DualPort), UART Design.

Text Books

1. T.R. Padmanabhan and B. Bala Tripura Sundari, Design through Verilog HDL – WSE, 2004 IEEE Press.
2. Charles H Roth, Digital Systems Design using VHDL , Jr. Thomson Publications, 2004.
3. Samir Palnitkar, Verilog HDL , 2nd Edition, Pearson Education, 2009

References

1. Sunggu Lee, Advanced Digital Logic Design using Verilog, State machines and Synthesis for FPGAs, - Cengage Learning
2. Stephen. Brown and ZvonkoVranesic, Fundamentals of Logic Design with Verilog, TMH, 2005.
3. J. Bhaskar, A Verilog Primier, BSP, 2003.
4. Michael D. Ciletti, Advanced Digital Design with Verilog HDL, PHI, 2005.
5. Sunggu Lee, Digital Logic Design using Verilog, State machine and synthesis for FPGA, Cengage Learning, 2009.

Syllabus for B. Tech (E.C.E.) III Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - I	**8C518**	**Advanced Computer Architecture (PE-I)**	**3**	**0**	**0**	**3**

Course Objectives: *Students will learn about*

1. *Various basic computer architectures, data representations and instruction sets.*
2. *Arithmetic unit, control unit and efficient computation using pipelining*
3. *Memory organization and optimization*
4. *I/O Communications and interfaces*

Course Outcomes: *After completing this course, student should be able to*

1. *To analyze the internal architecture of the computer*
2. *Understand the different data types and instruction set, of the computer*
3. *Understand the memory structure of the computer and learn CISC & RISC.*
4. *Understand processor structure and function and know the input output interfacings*

CO	**COMPUTER ORGANIZATION AND ARCHITECTURE (7DC11)**	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	*To analyze the internal architecture of the computer*	1	1											1		
CO2	*Understand the different data types and instruction set, of the computer*	2	2	2										2		
CO3	*Understand the memory structure of the computer and learn CISC & RISC*	2	2	2										2		
CO4	*Understand processor structure and function and know the input output interfacings*	2	2	2										2		
CO		2	2	2										2		

Unit – I

Introduction: Organization and Architecture, Structure and Function – Computer Evolution - Brief history of computers – Designing for performance.
Computer System: Components, Function – Interconnection Structures – Bus interconnection – PCI.

Unit – II
Instruction Set: Characteristics – Operand Types – Operation Types – Addressing Modes – Instruction formats
CPU: Computer Arithmetic operations: ALU – Integer Representation and Arithmetic – Floating Point Representation and Arithmetic.

Unit – III
Computer Memory System Overview - Cache Memory Principles - Elements of Cache Design
Internal Memory - Semiconductor Main Memory - Error Correction - Advanced Dram Organization
External Memory - Magnetic Disk – Raid

Unit – IV
Characteristics of CISC and RISC
Control unit: Micro–Operations – Control of Processors – Hardwired Implementation.
Micro Programmed Control: Basic concepts – Control Memory - Microinstruction Sequencing – Conditional branching – Mapping of instruction – Microinstruction Execution – Microprogram Example

Unit – V
Processor Structure and Function - Processor Organization - Register Organization - Instruction Cycle - Instruction Pipelining - Instruction Execution Characteristics - The Use of a Large Register File - Compiler-Based Register Optimization - Reduced Instruction Set Architecture - RISC Pipelining

Unit – VI
Input/Output - External Devices - I/O Modules - Programmed I/O - Interrupt - Driven I/O - Direct Memory Access - I/O Channels and Processors.

TEXT BOOKS:
1. William Stallings, "Computer Organization and Architecture – Designing for Performance", Prentice Hall, 9th Edition, 2013
2. John P.Hayes, "Computer Architecture and Organization", Tata McGraw Hill, 3rd Edition, 2002.

REFERENCES:
1. Patterson, D. A., and Hennessy, J. L., "Computer Organization and Design: The Hardware/Software Interface", Morgan Kaufmann Publishers, 4th Edition, 2008.
2. D.A.Godse A.P.Godse, Computer Architecture & Organization, Technical Publications, 2007.
3. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization", Tata McGraw Hill, 5th Edition, 2002.
4. Morris Mano, " Computer Systems Architecture ", 3rd Edition, Pearson PHI Publication, 1993

Syllabus for B. Tech (E.C.E.) III Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - I	**8C519**	**Digital Image & Video Processing (PE-I)**	**3**	**0**	**0**	**3**

Course Objectives:

This course aims to:

1. Understand the image formation and its digital representation.
2. Learn representation of images in frequency domain and enhancement techniques.
3. Students would be able to solve the problems related to image compression and restoration.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Describe basic concepts of image processing system.
2. Summarize and compare various digital image transform techniques.
3. Demonstrate and survey digital image enhancement in practical applications.
4. Analyse the case study related to various techniques of image restoration.
5. Apply compression techniques on digital image.
6. Know the difference between analog video and digital video, different types of image formation and sampling of video signals.

UNIT-1: DIGITAL IMAGE FUNDAMENTALS&IMAGE TRANSFORMS

Elements of digital image processing systems, An image model, Basic relationships between pixels and basic transformation, Image acquisition, sampling and quantization, Image file formats, Two dimensional convolution, Two dimensional correlation, Two dimensional frequency responses.

UNIT-2: IMAGE ENHANCEMENT

Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, Smoothing spatial filters, Sharpening spatial filters. Frequency domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, Selective filtering.

UNIT-3: IMAGE RESTORATION

Image Degradation model, Algebraic approach to restoration, inverse filtering, Least mean square filter - Wiener filtering, Constrained least square restoration

UNIT-4: IMAGE SEGMENTATION AND RECOGNITION

Edge detection, Image segmentation: Region growing, Region splitting and merging, Edge linking, Morphological operations: Dilation, Erosion, Opening, Closing, Image recognition:

Patterns and pattern classes, Matching by minimum distance classifier, Statistical classifier, Matching by correlation.

UNIT-5: IMAGE COMPRESSION

Need for image compression, Image coding, Huffman coding, Run length encoding, Arithmetic coding, Vector Quantization, Block truncation coding, Transform coding, Image compression standards

UNIT-6:

Basic steps of Video Processing

Analog Video, Digital Video. Time-Varying Image Formation models: Three-Dimensional Motion Models, Geometric Image Formation, Photometric Image Formation, Sampling of Video signals and filtering operations.

TEXT BOOKS:

1. Rafeel C Gonzalez, Richard E Woods, 'Digital Image Processing', Pearson education, Inc., second edition, 2004.
2. Anil K Jain, 'Fundamentals of Digital Image Processing', Prentice hall of India
3. William K Pratt, 'Digital Image Processing' , John Wiley, New York, 2002
4. Video processing and communication – Yao Wang, JoemOstermann and Ya–quin Zhang.1st Ed., PHI.

REFERENCES:

1. Lim JS, 'Two Dimensional Signal and Image Processing' , Prentice - hall New Jersey, 1990
2. Sid Ahmed M A, 'Image processing Theory, Algorithms and architectures', Mc Graw Hill, 1995
3. J T Tou and R.C. Gonzalez, 'pattern Recognition Principles', Addison Wesley publishing company
4. E. Gose and R. Johnson Bough, 'pattern Recognition and Image Analysis', Prentice hall of India
5. Digital Video Processing – M. Tekalp, Prentice Hall International

Syllabus for B. Tech (E.C.E.) III Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - I	**8C520**	**Information Theory and Coding Techniques(PE-I)**	**3**	**0**	**0**	**3**

Prerequisites:PTSP,DC,M-II

Course Objectives: After studying this course, the students will be able to

CO1	Explain different kind of networking models
CO2	Define different addressing schemes for networks.
CO3	Detailed idea of data link layer protocol and medium access protocol
CO4	Gain the knowledge of router configuration and network layer protocols and their working.
CO5	Differentiate the IPv4 and IPv6 addressing schemes for different networks.
CO6	Gain the knowledge of application layer protocols like DHCP, DNS.

CO	**Information Theory and Coding Techniques(PE-I) 6C519**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	Explain different kind of networking models		3	3	3	3				2			3	3	3	
CO2	Define different addressing schemes for networks.		3	3	3	3				2			2	3	3	

CO3	Detailed idea of data link layer protocol and medium access protocol.		3	3	3	3				2			2	3	3	
CO4	Gain the knowledge of router configuration and network layer protocols and their working.		3	3	3	3				2			2	3	3	
CO5	Differentiate the IPv4 and IPv6 addressing schemes for different networks.		3	3	3	3				2			2	3	3	3
CO6	Gain the knowledge of application layer protocols like DHCP, DNS.															
CO	overall		3	3	3	3				2			3	3	3	3

Syllabus Content

Unit – I

Information Theory: Introduction, Measure of information, Average information content of symbols in long independent sequences, Average information content of symbols in long dependent sequences. Mark-off statistical model for information source, Entropy and information rate of mark-off source.

Unit – II

Source Coding: Encoding of the source output, Communication Channels, Discrete communication channels, Continuous channels, Shannon's encoding algorithm, Huffman Coding, Run-Length Encoding, Calculation of Coding efficiency and redundancy, Channel capacity for continuous channel and BSC.

Unit – III

Linear Block codes and cyclic codes

Introduction to Error Control Coding: Introduction, Types of errors, examples, Types of codes: Linear Block Codes: Matrix description, Error-Detecting and Error-correcting Capabilities of a Block code and Hamming codes.

Cyclic Codes: Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding ,Cyclic Hamming Codes, Shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes

Unit – IV

Convolution Codes: Encoding of Convolution Codes, Structural and Distance Properties, State diagram, Code tree diagram, Maximum-Likelihood decoding, Soft decision and hard decision decoding, the Viterbi algorithm.

Unit – V

Low Density Parity Check codes: Introduction, Matrix and Graphical representation, Galleger's method of construction, Regular and Irregular LDPC codes, other methods of constructing LDPC codes, Tanner graphs, Decoding of LDPC codes.

Unit – VI

Other coding techniques: BCH code, RS Code, Hamming Code, Golay Codes, Turbo codes- Definition, encoding and decoding process.

Text Books

1. Digital and analog communication systems, K. Sam Shanmugam, John Wiley, 1996.
2. Digital communication, Simon Haykin, John Wiley, 2003.

Reference Books:

1. ITC and Cryptography, Ranjan Bose, TMH, II edition, 2007

Digital Communications - Glover and Grant; Pearson Ed. 2nd Ed 2008

Syllabus for B. Tech (E.C.E.) III Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - I	**8C521**	**Digital Image Processing (PE-I)**	**3**	**0**	**0**	**3**

Course Objectives:

This course aims to:

1. Understand the image formation and its digital representation.
2. Learn representation of images in frequency domain and enhancement techniques.
3. Students would be able to solve the problems related to image compression and restoration.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Describe basic concepts of image processing system.
2. Summarize and compare various digital image transform techniques.
3. Demonstrate and survey digital image enhancement in practical applications.
4. Analyse the case study related to various techniques of image restoration.
5. Apply compression techniques on digital image.

UNIT-1: DIGITAL IMAGE FUNDAMENTALS

Elements of digital image processing systems, An image model, Basic relationships betweenpixels and basic transformation, Image acquisition, sampling and quantization, Image fileformats, Two dimensional convolution, Two dimensional correlation, Two dimensionalfrequency responses.

UNIT-2: IMAGE TRANSFORMS

Study analysis with examples of 2D transforms, Transforms: DFT, DCT, Walsh,Hadamard, Slant, Haar, KLT, Radon, Hough,

UNIT-3: IMAGE ENHANCEMENT

Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, Smoothingspatial filters, Sharpening spatial filters. Frequency domain methods: Basics of filtering infrequency domain, image smoothing, image sharpening, Selective filtering.

UNIT-4: IMAGE RESTORATION

Image Degradation model, Algebraic approach to restoration, inverse filtering, Least meansquare filter - Wiener filtering, Constrained least square restoration

UNIT-5: IMAGE SEGMENTATION AND RECOGNITION

Edge detection, Image segmentation: Region growing, Region splitting and merging, Edgelinking, Morphological operations: Dilation, Erosion, Opening, Closing, Image recognition:Patterns andpattern classes, Matching by minimum distance classifier, Statistical classifier,Matching bycorrelation.

UNIT-6: IMAGE COMPRESSION

Need for image compression, Image coding, Huffman coding, Run length encoding, Arithmeticcoding, Vector Quantization, Block truncation coding, Transform coding, Image compressionstandards

TEXT BOOKS:

1. Rafeel C Gonzalez, Richard E Woods, 'Digital Image Processing', Pearson education, Inc., second edition, 2004.
2. Anil K Jain, 'Fundamentals of Digital Image Processing', Prentice hall of India
3. William K Pratt, 'Digital Image Processing' , John Wiley, New York, 2002

REFERENCES:

1. Lim JS, 'Two Dimensional Signal and Image Processing' , Prentice - hall New Jersey, 1990
2. Sid Ahmed M A, 'Image processing Theory, Algorithms and architectures', Mc Graw Hill, 1995
3. J T Tou and R.C. Gonzalez, 'pattern Recognition Principles', Addison Wesley publishing company
4. E. Gose and R. Johnson Bough, 'pattern Recognition and Image Analysis', Prentice hall of India

Syllabus for B. Tech (E.C.E.) III Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - I	**8C522**	**Phased Array Antennas (PE-I)**	**3**	**0**	**0**	**3**

UNIT – I
Introduction to Antennas, fundamentals of various antennas

UNIT – II
Conventional Scanning Techniques: Mechanical versus electronic scanning, Techniques of Electronic scanning, Frequency, Phase and time delay scanning principle, Hybrid scanning techniques.
UNIT – III
Array Theory: Linear and Planar arrays, various grid configurations, Concept of cell and grid, Calculation of minimum number of elements, Radiation pattern, Grating lobe formation, Rectangular and triangular grid design of arrays.
UNIT – IV
Feed Networks for phased Arrays: Corporate Feed, Lens and Reflect feed Techniques, Optimum f/d ratio, basic building block for corporate feed network, Series, Parallel feed networks, Comparison of various feeding techniques, Antenna Array Architecture, Brick/ Tile Type construction.
UNIT –V
Frequency Scanned Array Design: Snake feed, Frequency-phase scanning, Phase scanning, Digital phase shifter PIN diode and Ferrite phase shifters for phased arrays, Beam pointing errors due to digitization, Beam pointing accuracy.
UNIT – VI
Search Patterns: Calculation of search frame time, airborne phased array design, Electronic scanning radar, parameter calculation, Application of phased arrays, Phased Array Radar Systems, Active Phased Array, TR/ATR Modules.

TEXT BOOKS:
1. Olliner, A.A, and G.H. Knittel, “Phased Array Antennas”, Artech House, 1972.
2. Kahrilas. PJ, “Electronic Scanning Radar Systems Design Handbook”, Artech House, 1976.

REFERENCE BOOKS:
1. Skolnik. MI, “Radar Handbook”, Mc Graw Hill, NY, Mc Graw Hills-2007
2. Galati,G-(editor), “Advanced Radar Technique and Systems”, Peter Peregrinus Ltd, London, 1993.

Syllabus for B. Tech (E.C.E.) III Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - I	**8DC71**	**Microprocessors and Microcontrollers Lab**	**0**	**0**	**2**	**1**

Course Objectives:

The objective of this course is to develop the Assembly language programming skills and real-time applications of Microprocessor as well as microcontroller.

Course Outcomes*: After studying this course, the students will be able to*

CO1	*Explore to write the Assembly Language Programs using Arithmetic instructions of 8086*
CO2	*Explore to write the Assembly Language Programs using String instructions of 8086*
CO3	*Explore to write the Assembly Language Programs for I/O interface with 8086*
CO4	*Explore to write the Assembly Language Programs using Arithmetic instructions of 8051*
CO5	*Explore to write the Assembly Language Programs using Timers and interrupts of 8051*

Mapping of Course Outcomes with Program Outcomes

	a (PO 1)	b (PO 2)	c (PO 3)	d (PO 4)	e (PO 5)	f (PO 6)	g (PO 7)	h (PO 8)	I (PO 9)	j (PO10)	k (PO10)	l (PO12)	m (PO13)
CO1		3	2		3								
CO2	2	2	3							2		2	
CO3		2	3						2				
CO4		2											3
CO5				2									3
Over all	**X**	**x**		**x**					**x**	x		X	x

Prerequisites:*STLD,LDICA*

Syllabus Content

Introduction to MASM/TASM, KIEL Assemblers

Familiarization with 8086, 8051 Kits

Cycle - I

8086 ALP using kit and MASM

1. Basic arithmetic and logical operations
2. Code conversion decimal arithmetic programs
3. String manipulation programs
4. Display a message on the screen of a computer using DOS / BIOS interrupts.

Cycle – II

Following peripherals and interfacing experiments to be implemented on 8086 and 8051 kits

1. A/D and D/A interfacing
2. Serial interfacing with PC
3. Keyboard and display interfacing
4. Stepper motor controller

Following simple programs may be given as lab assignment for students to executive at home by using 8086 emulator like EMU86 or MASM.

Write ALP and execute the program to

1. Find square of a number
2. Exchange two numbers
3. Find average of a given series of numbers
4. Add a constant to a series of values in memory & store the result back in memory
5. Find sum of cubes of a given series of numbers
6. Display squares of a given series of numbers in memory
7. Find factorial of a given number
8. Find largest number from a given series of numbers
9. Sort a series of given numbers in ascending order
10. Find whether the given number is even or odd number
11. Find sum of all even no.s from a given series of even and odd numbers
12. Find GCD of two given numbers
13. Find LCM of two given numbers
14. Display Fibonacci series
15. Reverse a String
16. Programs based on DOS/BIOS interrupts

Programs on 8051

1. Arithmatic Operations
2. Timers
3. Interrupts
4. Serial communication

Syllabus for B. Tech (E.C.E.) III Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - I	**8C577**	**VLSI Design Lab**	**0**	**0**	**4**	**2**

Prerequisites: *EDC, STLD, LDICA*

Course Outcomes*: After studying this course, the students must have demonstrated*

CO1	*An ability to use VLSI CAD Tools (NGSPICE, Xilinx, and Cadence).*
CO2	*An ability to understand and implement digital logic gates and circuits using SPICE and Verilog HDL.*
CO3	*An ability to perform physical design- layouts using Cadence EDA Tool.*
CO4	*An ability to implement combinatorial and sequential designs on FPGA boards (SPARTAN 3) using Xilinx tools.*
CO5	*An ability to use VLSI CAD Tools (NGSPICE, Xilinx, and Cadence).*

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3
Overall		3	3	3	3				2			3	3	3	3

Syllabus Content

PART A

The following Experiments are to simulate the design in Xilinx Vivado2017.1 using Verilog HDL and implement it on Artix 7 FPGA.

1. Design of all Logic Gates.
2. Design of Adders(Half Adder,FullAdder,Parallel Adder).
3. Design of 3-8 Decoder.
4. Design of 8-3 Encoder.
5. Design of 8*1Multiplexer.
6. Design of 4*1 Demultiplexer.
7. Design of Flip-flops:D,SR,JK,T.
8. Design of 4-bit Comparator.

PART B

The following Experiments are to Design and Verify the Operation using Cadence Tool.

1. Design and Simulatethe CMOS Inverter.
2. Design and Simulate the CMOS AND Gate.
3. Design and Simulate the CMOS OR Gate.

4. Design and Simulate the CMOS NAND Gate.
5. Design and Simulate the CMOS NOR Gate.
6. Design and Simulate the CMOS Ex-OR Gate.
7. Design and Simulate the CMOS Ex-NORGate.
8. Design and Simulate the Layout diagram for CMOS Inverter using 180nm Technology.

Note: Any Six Experiments From Each Part.

Part-D Lab Project –

1. Hierarchical design and layout of MSI circuits (multiplexer, decoders, etc.)
2. FPGA based traffic light controller using Verilog HDL
3. FPGA based Beverage Vending Machine
4. FPGA based UART serial communication interface
5. Implement 8-bit 3-stage pipeline processor
6. Using SPICE Implement 6T SRAM memory with read and write logic

Syllabus for B. Tech (E.C.E.) III Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - I	**8FC72**	**Python Programming Lab**	**0**	**0**	**4**	**2**

Course Objectives

Students will try to learn

- Basics of Python programming, Decision Making and Functions in Python, Object Oriented Programming using Python.
- To introduce to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like MS Windows, Linux and the required device drivers.

Course outcomes

Students will be able to

1. Apply knowledge for computer assembling and software installation and ability to solve the trouble shooting problems.
2. Apply the tools for preparation of PPT, Documentation and budget sheet etc.
3. Install and run the Python interpreter ,Create and execute Python programs.
4. Apply the best features of mathematics, engineering and natural sciences to program real life problems.
5. Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python, Express different Decision Making statements and Functions, Interpret Object oriented programming in Python.
6. Understand and summarize different File handling operations, explain how to design GUI Applications in Python.

Python Programming Lab

Week -1:

1. Use a web browser to go to the Python website http://python.org. This page contains information about Python and links to Python-related pages, and it gives you the ability to search the Python documentation.
2. Start the Python interpreter and type help() to start the online help utility.
3. Start Python interpreter and use it as Calculator.

Week -2:

4. If you run a 10 kilometer race in 43 minutes 30 seconds, what is your average time per mile? What is your average speed in miles per hour? (Hint: there are 1.61 kilometers in a mile).
5. The volume of a sphere with radius r is 5? (Use Sphere volume formula)

6. Suppose the cover price of a book is $24.95, but bookstores get a 40% discount. Shipping costs $3 for the first copy and 75 cents for each additional copy. What is the total wholesale cost for 60 copies?

Week -3:

7. A function object is a value you can assign to a variable or pass as an argument. For example, do_twice is a function that takes a function object as an argument and calls it twice:

```
def do_twice(f):
f()
f()
```

Here's an example that uses do_twice to call a function named print_spam twice.

```
def print_spam():
print 'spam'
do_twice(print_spam)
```

a. Type this example into a script and test it.

b. Modify do_twice so that it takes two arguments, a function object and a value, and calls the function twice, passing the value as an argument.

c. Write a more general version of print_spam, called print_twice, that takes a string as a parameter and prints it twice.

d. Use the modified version of do_twice to call print_twice twice, passing 'spam' as an argument.

8. Write a function that draws a grid like the following:

```
+ - - - - + - - - - +
|         |         |

|         |         |
```

```
|       |       |
+ - - - - + - - - - +
|       |       |
|       |       |
|       |       |
|       |       |
+ - - - - + - - - - +
```

Hint: to print more than one value on a line, you can print a comma-separated sequence.

9. Write a function called gcd that takes parameters a and b and returns their greatest common divisor.
10. Write a function called is_palindrome that takes a string argument and returns True if it is a palindrome and False otherwise. Remember that you can use the built-in function len to check the length of a string.

Week-4:

11. Write a function called is_sorted that takes a list as a parameter and returns True if the list is sorted in ascending order and False otherwise.
12. Write a function called has_duplicates that takes a list and returns True if there is any element that appears more than once. It should not modify the original list.
1. Write a function called remove_duplicates that takes a list and returns a new list with only the unique elements from the original. Hint: they don't have to be in the same order.
2. The wordlist I provided, words.txt, doesn't contain single letter words. So you might want to add "I", "a", and the empty string.
3. Write a python code to read a dictionary values from the user. Construct a function to invert its content. i.e., keys should be values and values should be keys.

Week-5:

4. If there are 23 students in your class, what are the chances that two of you have the same birthday? You can estimate this probability by generating random samples of 23 birthdays and checking for matches.
   Hint: you can generate random birthdays with the randint function in the random module.

5. How does a module source code file become a module object?

6. Why might you have to set your PYTHONPATH environment variable?
7. What is a namespace, and what does a module's namespace contain?
8. How do you make a module? Give an example of construction of a module using different geometrical shapes and operations on them as its functions.
9. What is the purpose of a _ _init_ _.py file in a module package directory? Explain with a suitable example.
10. Use the structure of exception handling all general purpose exceptions.

Week-6:

11. a. Write a function called draw_rectangle that takes a Canvas and a Rectangle as arguments and draws a representation of the Rectangle on the Canvas.

    b. Add an attribute named color to your Rectangle objects and modify draw_rectangle so that it uses the color attribute as the fill color.

    c. Write a function called draw_point that takes a Canvas and a Point as arguments and draws a representation of the Point on the Canvas.

    d. Define a new class called Circle with appropriate attributes and instantiate a few Circle objects. Write a function called draw_circle that draws circles on the canvas.

12. Write a Python program to demonstrate the usage of MRO in multiple levels of Inheritances.
13. Write a python code to read a phone number and email-id from the user and validate it for correctness.

Week-7:

14. Write a Python code to merge two given file contents into third file.
15. Write a Python code to open a given file and construct a function to check for given words present in it and display on found.

Week-8:

16. Import numpy, Plotpy and Scipy and explore their functionalities.
17. Write a GUI program to create a window wizard having two text labels, two text fields and two buttons as Submit and Reset.

Syllabus for B. Tech (E.C.E.) III Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - I	**8C591**	**Summer Industry Internship-I**	**0**	**0**	**1**	**1**

Course Objective:

The students undergo industrial training so that he/she become industry-ready.

Course Outcomes:

At the end of the training, the student is able to

1. Select the real-time problem in the industry.
2. Analyze the requirements with respect to the problem statement
3. Design the optimal solution for the problem.
4. Implement the solution using the appropriate modern tools.
5. Present and submit the report

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3							3	3	3	3	2		3
CO2	3	3		3					3	3	3	3	3		3
CO3	3	3	3	3					3	3	3	3	3		3
CO4	3	3			3				3	3	3	3	3	3	3
CO5									3	3	3	3			3
Overall		3	1	1	1				3	3	3	3	3	1	3

Student shall carryout the project in industry during summer vacation for 3-6 weeks. There is internal and external Evaluation. Internal Evaluation carries 30 marks and external Evaluation carries 70 marks, Total 100 marks.

Syllabus for B. Tech (E.C.E.) III Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - I	**8FC24**	**Cyber Security**	**2**	**0**	**0**	**0**

Course Objectives:

- To familiarize with network security, network security threats, security services, and countermeasures.
- To be aware of computer security and Internet security.
- To study the defensive techniques against these attacks.
- To familiarize with cyber forensics.
- To be aware of cyber crime related to mobile and laptop etc.
- To acquire knowledge relating to Cyberspace laws and Cyber crimes.
- To understand ethical laws of computer for different countries, Offences under the Cyberspace and Internet in India.

Course Outcomes:

At the end of this course the student will be able to

1. The students will be able to understand cyber-attacks, types of cybercrimes.
2. Realize the importance of cyber security and various forms of cyber attacks and countermeasures.
3. Get familiar of cyber forensics.
4. Get familiar with obscenity and pornography in cyber space and understand the violation of Right of privacy on Internet.
5. Cyber laws and also how to protect them self and ultimately the entire Internet community from such attacks.
6. Elucidate the various chapters of the IT Act 2008, power of Central and State Government to make rules under IT Act 2008.

UNIT-I: Introduction to cyber Security

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc.,

UNIT-II: Cyber Forensics:

Introduction to cyber forensic, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

UNIT-III: Cybercrime: Mobile and Wireless Devices:
Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops and desktop.

UNIT-IV: Cyber Security: Organizational Implications:
Introduction cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.
Cybercrime and Cyber terrorism: Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

UNIT-V: Privacy Issues:
Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc.

UNIT-VI: Cyberspace and the Law &Miscellaneous provisions of IT Act.
Introduction to Cyber Security Regulations, International Law. The INDIAN Cyberspace, National Cyber Security Policy. Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threats.
Other offences under the Information Technology Act in India, The role of Electronic Evidence and miscellaneous provisions of the IT Act.2008.

Cybercrime: Examples and Mini-Cases
Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances. Mini-Cases: The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

TEXT BOOKS:
1. Nina Godbole and SunitBelpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley
2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

REFERENCE BOOKS:
1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&F Group.
3. Debby Russell and Sr. G.T Gangemi, "Computer Security Basics (Paperback)", 2ndEdition, O' Reilly Media, 2006.

4. Wenbo Mao, “Modern Cryptography – Theory and Practice”, Pearson Education, New Delhi, 2006.
5. Cyberspace and Cybersecurity, George Kostopoulos, Auerbach Publications, 2012.
6. Cyber Forensics: A Field Manual for Collecting, Examining, and Preserving Evidence of Computer Crimes, Second Edition, Albert Marcella, Jr., Doug Menendez, Auerbach Publications, 2007.
7. Cyber Laws and IT Protection, Harish Chander, PHI, 2013

III – II

Syllabus for B. Tech (E.C.E.) III Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - II	**8EC47**	**Computer Networks**	**2**	**0**	**0**	**2**

Course Objective:

1. The objective of the course is to equip the students with a general overview of the concepts and fundamentals of computer networks.
2. Familiarize the students with the standard models for the layered approach to communication between machines in a network and the protocols and functions of the various layers.

Course Outcomes:

At the end of this course, the student will be able to

1 Classify network topologies and apply the same to different networks with the knowledge acquired from the network reference models and fundamentals of computer networks
2 Illustrate the design issues of data link layer and detect the transmission errors and flow control problems
3 Categorize the Channel allocation issues, MAC protocols such as ALOHA, CSMA and CSMA/CD and MAC addresses with IEEE 802.X and wireless LAN.
4 Distinguish the knowledge of the several routing algorithms and Internetworking concepts.
5 Obtain and use the skills of subnetting and routing mechanisms
6 Distinguish the knowledge of the functions of transport and application layer

UNIT I

Introduction: Uses of Computer Networks, Types of networks: WAN, LAN, MAN, Network Topologies, Reference models: OSI, TCP/IP.

Physical Layer: Transmission media: magnetic media, twisted pair, coaxial cable, fiber optics, wireless transmission.

UNIT II

Data link layer: Design issues in data link layer: framing, flow control, error control, Error Detection and Correction: Parity, CRC checksum, Hamming code, Flow Control: Sliding Window Protocols, Applications: Data link layer protocols HDLC, PPP.

UNIT III

Medium Access sub layer: Channel allocation problem, MAC Protocols: ALOHA, CSMA, CSMA/CD, MAC addresses, IEEE 802.X, Standard Ethernet, Wireless LANS. Bridges, Types of Bridges.

UNIT IV

Network Layer: Design issues in Network Layer, Virtual circuit and Datagram subnets-Routing algorithm: Shortest path routing, Flooding, distance vector routing, Link state routing, Hierarchical routing, Broad casting, Multi casting, Routing for mobile hosts.

Internetworking: Concatenated Virtual Circuits, Connectionless internetworking, Tunneling, Internetwork routing, Fragmentation

UNIT V

Network layer in internet: IPv4, IP addresses, Sub netting, Super netting, NAT.Internet control protocols: ICMP, ARP, RARP, DHCP**.**
Congestion Control: Principles of Congestion, Congestion Prevention Policies.
Congestion Control in datagram Subnet: Choke packet, load shedding, jitter control.
Quality of Service: Leaky Bucket algorithm and token bucket algorithm.

UNIT VI
Transport Layer: Transport Services, Connection establishment, Connection release and TCP and UDP protocols.
Application Layer: Domain name system, FTP, HTTP, SMTP, WWW.

Textbook & Course Materials

Required Textbooks

1. Computer Networks — Andrew S Tanenbaum, 4th Edition. Pearson Education/PHI
2. Data Communications and Networking – Behrouz A. Forouzan.Third Edition TMH.
3.Data Communication and Networks-Bhushan Trivedi-OXFORD Publications.

Recommended Textbooks & Other Readings

1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education
2. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson

Syllabus for B. Tech (E.C.E.) III Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - II	**8C613**	**Microwave and Optical Communications**	**3**	**0**	**0**	**3**

Prerequisites: *EMWTL, AWP*

Course Objectives:

The objectives of this course are

- *To have fundamental understanding of microwave components and circuits in terms of scattering parameters, electrical characteristics of waveguides and transmission lines through electromagnetic field analysis*
- *To expose the students to the basics of signal propagation through optical fibers, optical sources and detectors.*

Course Objectives*: After studying this course, the students will be able to*

CO1	*Distinguish microwave frequencies and analyze Rectangular and circular wave guides.*
CO2	*Formulate various passive components with the help of scattering matrix*
CO3	*Explore different linear beam tubes*
CO4	*Analyze Cross field tubes and slow wave structures.*
CO5	*Analyze the propagation of light in optical fibers and to characterize various optical sources.*
CO6	*Understand the principle of various Losses, Dispersion and to characterize various Optical Detectors.*

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3
CO6		3	3	3	3				2			2	3	3	3
Overall		3	3	3	3				2			3	3	3	3

UNIT-I

Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguides – TE/TM mode analysis, Cut-off Frequencies, Dominant Modes, Mode Characteristics – Phase and Group Velocities, Wavelength and Impedance Relations; Dominant and evanescent modes; Power Transmission and Power Losses in Rectangular Wave Guide, Related Problems.

UNIT-II

Introduction to micro strip lines, losses, Coupling Mechanisms – Probe, Loop, Aperture types. Waveguide Discontinuities – Waveguide irises, Tuning Screws and Posts. Matched Load, Waveguide Attenuators, Phase Shifters. Waveguide Multiport Junctions – E and H plane Tees, Magic Tee, Hybrid Ring; Directional Couplers. Scattering Matrix– Significance, Formulation and Properties, Directional Coupler, Magic Tee, Circulator and Isolator. Related Problems.

Ferrite Components: Ferrite Characteristics, Faraday rotation, Gyrator, Isolator, and Circulator

UNIT-III

Limitations and Losses of conventional tubes at microwave frequencies. Microwave tubes – O type and M type classifications. O-type tubes: 2 Cavity Klystrons – Structure, Reentrant Cavities, Velocity Modulation Process and Applegate Diagram, Bunching Process. O/P Power and Efficiency, Reflex Klystrons – Structure, Applegate Diagram and Principle of working, Bunching process, Power Output, Efficiency Electronic Admittance; Oscillating Modes and o/p Characteristics, Related Problems.

UNIT-IV

Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT and Amplification Process (qualitative treatment), Suppression of Oscillations, Gain Considerations. four propagation constants.

M-TYPE TUBES: Introduction, Cross-field effects, Magnetrons – Different Types, 8-Cavity Cylindrical Travelling Wave Magnetron operations and o/p characteristics. PI mode and its significance. – Hull Cut-off Condition.

UNIT-V

Introduction, Ray Theory Transmission, Total Internal Reflection, Acceptance Angle, Numerical Aperture, Skew Rays. Fibers- Modes, V Number, Mode Coupling, Step Index Fibers, Graded Index Fibers. Single Mode Fibers- Cut off Wavelength, Mode Field Diameter, Effective Refractive Index.

Optical Sources: Construction and working principles of LED and LASER diaodes.

UNIT-VI

Transmission Characteristics Of Optical Fiber -Attenuation - Material Losses absorption in silica glass fiber - Linear and Non Linear Scattering Losses - Intra and Inter-Modal Dispersion - All Over Fiber Dispersion - Optical fiber connectors, fiber alignment and Joint Losses - Fiber Splicer - Fiber Connectors - Expanded Beam Connectors - Fiber Couplers.

Optical Detectors: Physical principles of PIN and APD, Comparison of Photo detectors.

TEXT BOOKS

1. Microwave Devices and Circuits – Samuel Y. Liao, PHI, 3rd Edition, 1994.
2. Microwave Principles – Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss, CBS Publishers and Distributors, New Delhi, 2004.
3. Optical Fiber Communications – Gerd Keiser, Mc Graw-Hill International edition, 3rd Edition, 2000.
4. Micro Wave and Radar Engineering – M. Kulkarni, Umesh Publications, 1998

REFERENCES

1. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.
2. Microwave Circuits and Passive Devices – M.L. Sisodia and G.S.Raghuvanshi, Wiley Eastern Ltd., New Age International Publishers Ltd., 1995.
3. Microwave Engineering, RaghuvanshiG.S. , 1st edition, Cengage Learning
4. Microwave Engineering Passive Circuits – Peter A. Rizzi, PHI, 1999.

5. Electronic and Radio Engineering – F.E. Terman, McGraw-Hill, 4th ed., 1955.
6. Elements of Microwave Engineering – R. Chatterjee, Affiliated East-West Press Pvt. Ltd., New Delhi, 1988.
7. Optical Fiber Communications – John M. Senior, PHI, 2nd Edition, 2002

Syllabus for B. Tech (E.C.E.) III Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - II	**8EC45**	**Artificial Intelligence**	**2**	**0**	**0**	**0**

Course objective:

To learn the distinction between optimal reasoning Vs. human like reasoning. To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities. To learn different knowledge representation techniques. To understand the applications of AI, namely game playing, theorem proving, and machine learning.

COURSE OUTCOMES:

At the end of this course the student will be able to

1. Learn the distinction between optimal reasoning Vs human like reasoning and formulate an efficient problem space for a problem expressed in natural language. Also select a search algorithm for a problem and estimate its time and space complexities.
2. Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.
3. Learn different knowledge representation techniques.
4. Understand the concepts of state space representation, exhaustive search, heuristic search together with the time and spacecomplexities.
5. Comprehend the applications of Probabilistic Reasoning and Bayesian Networks.
6. Analyze Supervised Learning Vs. Learning DecisionTrees

UNIT - I

Introduction to AI, Intelligent Agents, Problem-Solving Agents, Searching for Solutions, Breadth-first search, Depth-first search, Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces.

UNIT-II

Games, Optimal Decisions in Games, Alpha–Beta Pruning, Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Knowledge-Based Agents, Logic, Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses.

UNIT-III

Representation, Syntax and Semantics of First-Order Logic, Using First Order Logic, Knowledge Engineering in First-Order Logic. Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution. **Knowledge Representation:** Ontological Engineering, Categories and Objects, Events.

UNIT-IV

Definition of Classical Planning, Algorithms for Planning with State Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches. Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Multi agent Planning.

UNIT-V

Acting under Uncertainty, Basic Probability Notation Bayes' Rule and Its Use, Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, The

Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First- Order Probability, Other Approaches to Uncertain Reasoning; Dempster-Shafer theory.

Unit-VI

Learning: Forms of Learning, Supervised Learning, Learning Decision Trees.

TEXT BOOKS:

1. Artificial Intelligence A Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education.

REFERENCES:

1. Artificial Intelligence, 3rd Edn., E. Rich and K. Knight(TMH)
2. Artificial Intelligence, 3rd Edn., Patrick Henny Winston, PearsonEducation.
3. Artificial Intelligence, ShivaniGoel, PearsonEducation.
4. Artificial Intelligence and Expert systems – Patterson, PearsonEducation.

Syllabus for B. Tech (E.C.E.) III Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - II	**8AC07**	**Linear Control system**	**3**	**0**	**0**	**3**

Course Objective: Students learn about fundamental concepts of time and frequency domain analysis of a given system.

Course Outcomes: Students

1. Learn basic concepts of control systems.
2. Study about time response analysis.
3. Learn basic concepts of stability and root locus method.
4. Study about frequency response analysis.
5. Learn basic concepts stability analysis in frequency domain.
6. Learn fundamentals of state space analysis.

UNIT – I INTRODUCTION:

Concepts of Control Systems- Open Loop and closed loop control systems and their differences- Classification of control systems, Feed-Back Characteristics, Effects of feedback. Mathematical models – Differential equations, Impulse Response and transfer functions – Translational and Rotational mechanical systems

Transfer function representation:

Transfer Function of Synchro transmitter and Receiver, Block diagram representation of systems considering electrical systems as examples -Block diagram algebra – Representation by Signal flow graph - Reduction using Mason's gain formula.

UNIT-II TIME RESPONSE ANALYSIS:

Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems, PID controllers.

UNIT – III STABILITY ANALYSIS IN S-DOMAIN:

The concept of stability – Routh's stability criterion – qualitative stability and conditional stability – limitations of Routh's stability.

Root Locus Technique: The root locus concept - construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci.

UNIT – IV FREQUENCY RESPONSE ANALYSIS:

Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots.

UNIT – V STABILITY ANALYSIS IN FREQUENCY DOMAIN:

Polar Plots-Nyquist Plots-Stability Analysis.

CLASSICAL CONTROL DESIGN TECHNIQUES: Compensation techniques – Lag, Lead, Lead-Lag Controllers design in frequency Domain.

UNIT – VI STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS:

Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and its Properties.

TEXT BOOKS:

1. Automatic Control Systems 8th edition –B. C. Kuo 2003– John wiley and sons.
2. Control Systems Engineering – I. J. Nagrath and M. Gopal, New Age International (P) Limited, Publishers, 2nd edition.

REFERENCES:

1. Modern Control Engineering – Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd., 3rd edition, 1998.
2. Control Systems – N.K. Sinha, New Age International (P) Limited Publishers, 3rd Edition, 1998.
3. Control Systems Engg. – NISE 3rd Edition – John wiley.
4. "Modeling & Control of Dynamic Systems" – Narciso F. Macia George J. Thaler, Thomson Publishers.

Syllabus for B. Tech (E.C.E.) III Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - II	**8C623**	**Analog and Mixed Signal Design (PE-II)**	**3**	**0**	**0**	**3**

Course Objectives:

This course will introduce design and analysis of mixed-signal integrated circuits. Apply principles of hierarchical mixed signal CMOS VLSI, from the transistor up to the system level, to the understanding of CMOS circuits and systems

Course Outcomes*: After studying this course, the students will be able to*

CO1	*Understand the concepts of Switched capacitors Circuits*
CO2	*know the concepts of PLLS*
CO3	*study concepts of Data Converter Fundamentals*
CO4	*Explore the concepts of Nyquist Rate A/D Converters and develop its applications*
CO5	*Understand concepts of the Oversampling Converters and Continuous-Time Filters*
CO6	*Understand concepts of concepts of Continuous-Time Filters, CMOS Trans conductors*

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2	3	3	3	3	3				3			3	3	3	3
CO3															
CO4	3	3	3	3	3				3			3	3	3	3
CO5	3	3	3	3	3				3			3	3	3	3
C06	3	3	3	3	3				3			3	3	3	3
Overall	2	2	2	2	2				2			2	2	2	2

UNIT I

Switched Capacitor Circuits: Introduction to Switched Capacitor circuits basic building blocks, Operation and Analysis, Non-ideal effects in switched capacitor circuits, Switched capacitor integrators first order filters, Switch sharing, Biquad filters.

UNIT II

Phased Lock Loop (PLL): Basic PLL topology, Dynamics of simple PLL, Charge pump PLLs Lock acquisition, Phase/Frequency detector and charge pump, Basic charge pump PLL, Non-ideal effects in PLLs-PFD/CP non idealities, Jitter in PLLs, Delay locked loops, applications.

UNIT III

Data Converter Fundamentals: DC and dynamic specifications, Quantization noise, Nyquist rate D/A converters- Decoder based converters, Binary-Scaled converters, Thermometer-code converters, Hybrid converters.

UNIT IV

Nyquist Rate A/D Converters: Successive approximation converters, Flash converter, Two-step A/D converters, Interpolating A/D converters, Folding A/D converters, Pipelined A/D converters, Time-interleaved converters.

UNIT V

Oversampling Converters: Noise shaping modulators, Decimating filters and Interpolating filters, Higher order modulators, Delta sigma modulators with multi-bit quantizers, Delta sigma D/A.

UNIT VI

Continuous-Time Filters: Introduction to Gm-C Filters, Bipolar Trans conductors, CMOS Trans conductors Using Triode and Active Transistors, Bi CMOS Tran conductors, MOSFET-C Filters.

Text Books:

1. Design of Analog CMOS Integrated Circuits- BehzadRazavi, TMH Edition, 2002

2. Analog Integrated Circuit Design- David A. Johns,Ken Martin, Wiley Student Edition, 2013

Reference Books:

1. CMOS Mixed-Signal Circuit Design - R. Jacob Baker, Wiley Interscience, 2009.

2. CMOS Analog Circuit Design –Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.

Syllabus for B. Tech (E.C.E.) III Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - II	**8C624**	**Embedded C Programming (PE-II)**	**3**	**0**	**0**	**3**

Course Objectives:

The objectives of this course are

- *To provide basic knowledge in embedded system design using Embedded C.*
- *To make the learners understand concept and applications of Embedded C Programming in various fields including industrial automation..*

Course Outcomes*: After studying this course, the students will be able to*

CO1	*Demonstrate the use of development software for a particular application and choosing appropriate OS.*
CO2	*Understanding and building basic embedded system using 8051.Understanding its design*
CO3	*Design of embedded systems and implementation of switch reading.*
CO4	*Demonstrate the concepts of OOP's theory inheritance and functions in embedded C to support modular programming.*
CO5	*Learning the need for realtime implementation in Embedded C..*
CO6	*Case study of 'Intruder Alarm" toachihve real time hands on.*

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3
Overall		3	3	3	3				2			3	3	3	3

Syllabus Content

UNIT – I:

Programming Embedded Systems in C

Introduction ,What is an embedded system, Which processor should you use, Which programming language should you use, Which operating system should you use, How do you develop embedded software, Conclusions

UNIT – II:

Introducing the 8051 Microcontroller Family

Introduction, What's in a name, The external interface of the Standard 8051, Reset requirements ,Clock frequency and performance, Memory issues, I/O pins, Timers, Interrupts, Serial interface, Power consumption ,Conclusions

UNIT – III:

Reading Switches

Introduction, Basic techniques for reading from port pins, Example: Reading and writing bytes, Example: Reading and writing bits (simple version), Example: Reading and writing bits (generic version), The need for pull-up resistors, Dealing with switch bounce, Example: Reading switch inputs (basic code), Example: Counting goats, Conclusions

UNIT – IV:

Adding Structure to the Code

Introduction, Object-oriented programming with C, The Project Header (MAIN.H), The Port Header (PORT.H), Example: Restructuring the 'Hello Embedded World' example, Example: Restructuring the goat-counting example, Further examples, Conclusions

UNIT – V:

Meeting Real-Time Constraints

Introduction, Creating 'hardware delays' using Timer 0 and Timer 1, Example: Generating a precise 50 ms delay, Example: Creating a portable hardware delay, Why not use Timer 2?, The need for 'timeout' mechanisms, Creating loop timeouts, Example: Testing loop timeouts, Example: A more reliable switch interface, Creating hardware timeouts, Example: Testing a hardware timeout, Conclusions

UNIT – VI:

Case Study: Intruder Alarm System

Introduction, The software architecture, Key software components used in this example, running the program, the software, Conclusions

TEXT BOOKS:

1. Embedded C - Michael J. Pont, 2nd Ed., Pearson Education, 2008

REFERENCE BOOKS:

1. PICmicro MCU C-An introduction to programming, The Microchip PIC in CCS C - Nigel Gardner

Syllabus for B. Tech (E.C.E.) III Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - II	**8C625**	**Transform Techniques (PE-II)**	**3**	**0**	**0**	**3**

Course Objectives

1. To learn basics of two-dimensional transform.
2. Understand the various two-dimensional transform definition, properties and applications.
3. Understand the design of filter Bank structure.
4. To learn the fundamentals of wavelet, transform and special wavelets.

Course Outcomes: On completion of this course student will be able to:

1. The student will learn basics of two-dimensional transforms.
2. Understand the definition, properties and applications of various two-dimensional transform.
3. Understand the basic concepts of wavelet transform.
4. Understand the special topics such as wavelet packets, Bi-orthogonal wavelets e.t.c.

UNIT –I

Review of Signals, classification of signals, Vector Analogy and Signal Analogy, Vector space, Hilbert spaces, Need of Transform techniques

UNIT -II

Fourier Analysis: Fourier basis, FT- Limitations of Fourier Analysis, Need for time-frequency analysis, DFT, 2D-DFT: Definition, Properties and Applications, IDFT, Hilbert Transform, STFT.

UNIT -III

Transforms: Walsh, Hadamard, Haar and Slant Transforms, DCT, DST, KLT, – definition, properties and applications

UNIT -IV

Continuous Wavelet Transform (CWT): Short comings of STFT, Need for wavelets, Wavelet Basis- Concept of Scale and its relation with frequency, Continuous time wavelet Transform Equation- Series Expansion using Wavelets- CWT- Tiling of time scale plane for CWT. Important Wavelets: Haar, Mexican Hat, Meyer, Shannon, Daubechies.

UNIT -V

Multi Rate Analysis and DWT: Need for Scaling function – Multi Resolution Analysis, Two-Channel Filter Banks, Perfect Reconstruction Condition, Relationship between Filter Banks and Wavelet Basis, DWT, Structure of DWT Filter Banks, Daubechies Wavelet Function, Applications of DWT.

UNIT -VI

Special Topics: Wavelet Packet Transform, Multidimensional Wavelets, Bi-orthogonal basis- BSplines, Lifting Scheme of Wavelet Generation, Multi Wavelets

TEXT BOOKS:

1. Wavelet Transforms-Introduction theory and applications -RaghuveerM.Rao and Ajit S. Bopardikar, Pearson Edu, Asia, New Delhi, 2003.
2. “Insight into Wavelets from Theory to practice “, Soman. K. P, Ramachandran. K.I, Printice Hall India, First Edition, 2004.

Syllabus for B. Tech (E.C.E.) III Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - II	**8C626**	**Software Defined Radio(PE-II)**	**3**	**0**	**0**	**3**

Course Objectives

1. This course describes the fundamental radio components and how these components are implemented in software.
2. The principles of software architecture to support the SDR will be developed. Policy and cooperation mechanisms that enable SDR to interoperate will be developed.
3. Basic principles of Cognitive Radio (CR) which is an extended form of SDR will be introduced.
4. In this course you will study SDR & CR and investigate their role in future communication systems.

Course Outcomes

Students who successfully complete this course will have

1. *An ability to make system-level decisions for software-defined radio technology and products*
2. *An ability to implement smart antenna algorithms*
3. *Knowledge of digital hardware architectures and understanding of development methods*
4. *An understanding of middleware in SDR*
5. *Understanding of analog RF components&Understand the basic principles of Cognitive Radio*

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3
Overall		3	3	3	3				2			3	3	3	3

UNIT I

Introduction to SDR

What is a Software Radio? The need for Software Radios, Characteristics and benefits of a Software Radio, Design principles of Software Radio

UNIT-II

Radio frequency implementation issues

The purpose of the RF Front-End, Dynamic range: The principal challenge of receiver design. RF receiver front-end topologies, Enhanced flexibility of the RF Chain with Software Radios, Importance of the components to overall performance, Transmitter architectures and their Issues, noise anddistortion in the RF Chain, ADC and DAC distortion

UNIT-III

Digital hardware choices

Key hardware elements, DSP Processors, Field Programmable Gate Arrays, Trade-offs in using DSPs, FPGAs and ASICs, Power management issues, Combination of DSPs, FPGAs, and ASICs.

UNIT-IV

Digital generation of signals

Comparison of direct digital synthesis with analog signal synthesis, Approaches to direct digital synthesis, Analysis of spurious signals, Spurious components due to periodic jitter, Band pass signal generation, Performance of direct digital synthesis systems, Hybrid DDS-PLL Systems, Applications of Direct Digital Synthesis, Generation of random sequences.

UNIT-V

Analog to digital and digital to analog conversion

Parameters of ideal data converters, Parameters of practical data converters, Techniques to improve data converter performance, Common ADC and DAC architectures

UNIT-VI

Introduction to Cognitive Radio

Motivation of Cognitive Radio, Dynamic Spectrum Access, User hierarchy in cognitive radio networks, Usage scenarios for cognitive radio, Cognitive Cycle, Spectrum Management: spectrum sensing, spectrum decision, spectrum mobility, spectrum sharing, Classification of spectrum sensing techniques..

Text Books:

1. J.H. Reed, '*Software-Radio, A Modern Approach to Radio Engineering* ', Prentice-Hall, 2002
2. EzioBiglieri, Andrea. J. Goldsmith, Larry J. Greenstein, Narayan B. Mandayam,H. Vincent Poor, '*Principles of Cognitive Radio'*, Cambridge University Press.

References:

1. Joseph Mitola*'Software Radio Architecture: Object-Oriented Approaches to Wireless Systems Engineering*' Wiley-Interscience; 1st edition2000
2. Yong Soo Cho,Jaekwon Kim, Won YoungYang, Chung G. Kang '*MIMO-OFDM Wireless Communications with MATLAB*' John Wiley & Sons (2010).
3. Mohamed Ibnkahla' Cooperative Cognitive Radio Networks, The Complete Spectrum Cycle', CRC Press.

Syllabus for B. Tech (E.C.E.) III Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - II	**8C627**	**Artificial Neural Networks (PE-II)**	**3**	**0**	**0**	**3**

Course Objectives:

The objectives of this course are

- *To study the concepts of Artificail intelligence and computer vision and also the applications of Neural networks*

Course Outcomes*: After studying this course, the students will be able to*

CO1	*Understand the concepts of Artificial Intelligence*
CO2	*Illustrate the concepts of Artificial Neural system*
CO3	*I*llustrate *computer vision*
CO4	*Explain Probabilistic models and neural networks*
CO5	*Illustrate concept Neural language*
CO6	*Explain applications of Neural networks*

CO	**Artificial Neural Networks (**7C725 **)**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	*Understand the concepts of Artificial Intelligence*	3	2	2	2									3		
CO2	*Illustrate the concepts of Artificial Neural system*	2	2	3	2									3		
CO3	*I*llustrate *computer vision*	2	2	2	3								2	3		
CO4	*Explain Probabilistic models and neural networks*	2	2	2	2								2	3		
CO5	*Illustrate concept Neural language*	2	2	2	2								2	3		
CO6	*Explain applications of Neural networks*	2	2	3	3								2	3		
Overall PO mapping		2	2	2	3								2	3		

UNIT - I

Artificial Intelligence: Definition, Study of AI techniques, problems and Problems space, AI characteristics, Heuristics. Problem solving Methods: Forward and backward reasoning, problem trees, problem graph, hill climbing, search method, problem reduction, constraint satisfaction, means and analysis, game playing, mini max algorithms, alphabetic heuristics.

UNIT - II:

Introduction:

Introduction to ANS (Artificial Neural systems) Technology, ANS simulation, Types of Neural Networks: Hopfield, perceptron and related models, Adaline and Madaline: Adaline and the Adaptive Linear Combiner, the Madaline and simulating the Adaline. Essential vector operations, Lateral Inhibition and Sensory Processing.

UNIT - III

Computer Vision:

Perception, early processing, representation and recognition of scenes, Guzman‟s algorithms of spurting objects in a scene, Waltz algorithm.

UNIT - IV:

Probabilistic Models, Fuzzy ARTMAP and Recurrent Networks:-Probabilistic Neural Networks, General Regression Neural Networks, Fuzzy ARTMAP, Recurrent Back propagation Neural Networks, Hybrid Learning Neural Networks:-Counter propagation Network, Radial basis Function Networks.

UNIT - V

Neural Language understanding problems, syntactic analysis, semantic analysis, augmented transition networks.

UNIT - VI

Application of Neural Networks:- Design and optimization of Systems: Non-Linear optimization, Inverse design

problems, Pattern Recognition Applications: Control Chart pattern Recognition, Recognition of Machine-Cells in a group technology layout. Complex pattern Recognition tasks: Pattern mapping, Temporal patters, pattern variability, Neocognitron, Addition of lateral inhibition and Feedback to the Neocognitron.

SUGGESTED READING:

1. Elaine Rich, Artificial Intelligence, Mc Graw Hill, 1985. 2. Nilson, Principles of Artificial Intelligence. 3. Winston, The Psychology of Computer.
2. Nilson, Principles of Artificial Intelligence. 3. Winston, The Psychology of Computer.
3. James A. Freeman and David M. Skapura,Neural Networks; Algorithms Applications and Programming Techniques, Pearson Education, India,2008.
4. James A. Anderson ,An introduction to Neural Networks ,PHI,2003.
5. B.Yegnanarayana,Artificial Neural Networks, PHI Publications India,2006.
6. M.Ananda Rao and J.Srinivas, Neural Networks: Algorithms and Applications, Narosa Publications 2009.

Syllabus for B. Tech (E.C.E.) III Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - II	**8C628**	**Satellite Communications(PE-II)**	**3**	**0**	**0**	**3**

Prerequisites: *MWOC*

Course objectives*:*

The course objectives of this course are

- *To introduce the working principles and various design aspects of satellite sub-systems.*
- *To get acquinted with the multiple access techniques and the working principle of GPS systems.*

Course Objectives*: After studying this course, the students will be able to*

CO1	*Demonstrate the orbital mechanics.*
CO2	*Design the satellite subsystem.*
CO3	*Estimate the C/N and able to measure the relevant values.*
CO4	*Evaluate the satellite link.*
CO5	*Recall Multiple access concepts and discuss earth station technology*
CO6	*Apply the knowledge of GPS in real time applications.*

Mapping of Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3
Over		3	3	3	3				2			3	3	3	3

all															

Syllabus Content

UNIT-I

INTRODUCTION

Origin of Satellite Communications, Historical Back-ground, Basic Concepts of Satellite Communications, Kepler's laws of orbital motion. Frequency allocations for Satellite Services, Applications, Future Trends of Satellite Communications.

ORBITAL MECHANICS AND LAUNCHERS

Orbital Mechanics, Look Angle determination, Orbital perturbations, Orbit determination, launches and launch vehicles, Orbital effects in communication systems' performance

UNIT-II

SATELLITE SUBSYSTEMS

Attitude and orbit control system, telemetry, tracking, Command and monitoring, power systems, communication subsystems, Satellite antenna Equipment reliability and Space qualification.

UNIT-III

SATELLITE LINK DESIGN

Basic transmission theory, system noise temperature and G/T ratio, Design of down link and up link.

UNIT-IV

MULTIPLE ACCESS

Frequency division multiple access (FDMA) Intermediation, Calculation of C/N. Time division Multiple Access (TDMA) Frame structure, Examples. Satellite Switched TDMA. Onboard processing, DAMA, Code Division Multiple access (CDMA),Spread Spectrum transmission and reception.

Applications: Design of a Remote sensing satellite in IRS-4.

UNIT-V

EARTH STATION TECHNOLOGY

Introduction, Transmitters, Receivers, Antennas, Tracking systems, Terrestrial interface, Primary power test methods.

Low Earth Orbit And Geo-Stationary Satellite Systems: Orbit consideration, coverage and frequency considerations, Delay & Throughput considerations, System considerations.

UNIT VI

SATELLITE NAVIGATION & THE GLOBAL POSITIONING SYSTEM

Radio and Satellite Navigation, GPS Position Location principles, GPS Receivers and codes, Satellite signal acquisition, GPS Navigation Message, GPS signal levels, GPS receiver operation, GPS C/A code accuracy, Differential GPS.

TEXT BOOKS

1. Timothy Pratt, Charles Bostian and Jeremy Allnutt, *Satellite Communications* – WSE, Wiley Publications, 2nd Edition, 2003.
2. Wilbur L. Pritchard, Robert A Nelson and Henri G.Suyderhoud, *Satellite Communications Engineering* –2nd Edition, Pearson Publications, 2003.

REFERENCES

1. M. Richharia, *Satellite Communications Design Principles* – BS Publications, 2nd Edition, 2003.
2. D.C Agarwal, *Satellite Communication* - Khanna Publications, 5th Ed.
3. 3K.N. Raja Rao, . *Fundamentals of Satellite Communications* – PHI, 2004
4. Dennis Roddy, *Satellite Communications* – McGraw Hill, 2nd Edition.

Syllabus for B. Tech (E.C.E.) III Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - II	**8C678**	**Antenna Simulation Lab**	**0**	**0**	**4**	**2**

Prerequisites:

AWP, EMTL

Course Objectives:

The objectives of this lab is

- *To perform laboratory experiments on designing of various antennas and measure the performance parameters.*

Course Outcomes*: After studying this laboratory course, the students will be able to*

CO1	*Understand the design of dipole antenna for various frequencies.*
CO2	*Understand the design of monopole antenna for variation in radius of the wire*
CO3	*Design of Microstrip patch antenna in different shapes*
CO4	*Understand the design of standard horn antenna*
CO5	*Analyze the characteristics of yagi-uda antenna*
CO6	*Verify the radiation pattern of different types of antenna*

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3
CO6		3	3	3	3				2			2	3	3	3
Overall		3	3	3	3				2			3	3	3	3

Syllabus content:

1. Dipole antenna
2. Dipole antenna with lambda variation
3. Monopole antenna
4. Monopole antenna with wire radius variation
5. Microstrip rectangular patch antenna
6. Microstrip circular patch antenna
7. Horn antenna
8. Yagi-uda antenna
9. Radiation pattern measurement of dipole antenna
10. Radiation pattern measurement of patch antenna

11. Radiation pattern measurement of yagi-uda antenna
12. Radiation pattern of broad side antenna array
13. Radiation pattern of End fire antenna array

Syllabus for B. Tech (E.C.E.) III Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - II	**8EC65**	**Computer Networks Lab**	**0**	**0**	**2**	**1**

Course Objectives:

To provide an understanding of the design concepts of framing Error Detection & correction, Routing, Congestion concepts and Network tools.

Course Outcomes:

At the end of this course, the student will be able to

1. Implement and analyze framing methods of data link layer.
2. Implement and analyze framing methods of data link layer.
3. Illustrate and implement error detection & correction techniques.
4. Implement different Routing Algorithm.
5. Understand basic Network Commands.
6. Use of Wireshark and NS-2 tools

Computer Networks Lab Exercises:

1. Implement the data link layer framing methods such as

   a) Character / Byte stuffing

   b) Bit stuffing.

2. Implement on a data set of characters the three CRC polynomials

   a) CRC 12

   b) CRC 16

   c) CRC CCITT.

3. Implement Hamming code for error detection and error correction

4. Implement Dijkstra's algorithm to compute the shortest path through a graph.

5. Take an example subnet graph with weights indicating delay between nodes. Now obtain Routing table for each node using distance vector routing algorithm.

6. Implement Congestion control using Leaky-Bucket Algorithm

7. Execute the basic Networking Commands

   i. Arp ii. Hostname

   iii. ipconfig iv. ipconfig/all

   v. Ipconfig/renew vi. Ipconfig/release

   Vii. Ipconfig/flushdns viii. Pathping

ix. Ping x. Route

xi. tracert

Beyond Syllabus

1. Installation of NS-2

2. Demonstration of NS-2

Syllabus for B. Tech (E.C.E.) III Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - II	**8CC79**	**Digital Signal Processing Lab**	**0**	**0**	**4**	**2**

Prerequisites:*SS,PTSP, Basic Simulation Lab*

Course Objectives*: After completing this course, the students will have demonstrated*

CO1	*To Understand the frequency response of a given systems*
CO2	*Design of FIR & Butterworth and chebyshev approximations and converting them to IIR filters*
CO3	*Transforming an analog filter to its digital equivalent*
CO4	*Sampling rate conversion Interpolation and decimation*
CO5	*An ability to use TMS320c6713 for different algorithms*

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3
Overall		3	3	3	3				2			3	3	3	3

Syllabus Content

Tools to be used: MATLAB, CC Studio, TMS320C6713

1. Impulse response of first order and second order systems.
2. Program to find frequency response of LP/HP filters (difference equation/ transfer function).
3. To find Circular convolution of given sequence with and without built in function.
4. To find the DFT/IDFT, FFT of given DT signals with and without built in functions.
5. To find Power Spectral Density of a sequence.
6. To implement IIR filter (LP/HP/BP)
   a) Butterworth filter
   b) Chebyshev Type-I and Type-II filters
7. To design FIR filter (LP/HP) using windowing technique
   a) Using rectangular window
   b) Using triangular window
   c) Using Kaiser Window
8. Down sampling and up sampling of given sequence by specified factor.
9. Conversion of Analog filter to Digital Filter.
   a) impulse invariant transformation

b) bilinear transformation

10. Generation of DTMF signals
11. Noise removal: Add noise above 3 KHz and then remove, interference suppression using 400 Hz tone.

The following experiments are to be implemented using CCS

1. Study the architecture of DSP chips-TMS 320C 5X/6X Instructions
2. To find Linear convolution of given sequence.
3. To find Circular convolution of given sequence
4. To find the DFT & FFT of given sequence
5. Generation of DTMF Signals
6. Implementation of Decimation Process & Interpolation Process.

Syllabus for B. Tech (E.C.E.) III Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - II	**8C692**	**Group Project**	**0**	**0**	**2**	**1**

Pre-Requisites: All Courses till this semester

*After studying this course, the students will be able to***:**

i. use the concepts, in conceptualizing, designing and executing the modules of the projects.

ii. exhibit the interest in learning the modern tools and technologies.

iii. inculcate an enthusiasm to use the creative ideas to build the innovative projects

iv. improve communicative skills and team working skills

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
Overall		3	3	3	3				2			3	3	3	3

A group project shall be carried out by a group of students consisting of 2 to 3 in number in third year 2nd semester. This work shall be carried out under the guidance of the teacher and shall involve design, fabrication, software development or any other significant activity. This can be of interdisciplinary nature also.

There will be 100 marks in total with 30 marks of internal evaluation and 70 marks of external

The **internal evaluation** shall consist of:

Day to day work	:	15 marks
Report	:	05 marks
Demonstration / presentation	:	10 marks
		30 marks
End examination	:	70 Marks.

External Evaluation of the project (viva-voce) shall be conducted by a committee appointed by the Chief Superintendent. The end examination will be carried out by a committee consisting of an external examiner, head of the department, a senior faculty member and the supervisor.

Syllabus for B. Tech (E.C.E.) III Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - II	**8C668**	**Comprehensive Viva Voce**	**1**	**0**	**0**	**1**

Pre-Requisites: All Courses till this semester

*On completion**:***

1. Comprehend the concepts in the core and elective courses.
2. Exhibit technical knowledge to face interviews.
3. Exhibit lifelong Learning skills for higher education and to pursue Professional practice.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3									3		3	1		3
CO2	3									3		3	1		3
CO3	3									3		3	1		3
Overall	3									3		3	1		3

Comprehensive Viva Voce will be conducted in second year second semester for 100 marks. Out of 100 marks 30 marks are evaluated internally and 70 marks for external evaluation.

Internal:

Comprehensive Viva Voce is conducted twice in a semester and evaluated for 30 marks each and average will be considered for internal.

Internal Examination : 30 Marks
End examination : 70 Marks.

External Evaluation of the project (viva-voce) shall be conducted by a committee appointed by the Chief Superintendent. The end examination will be carried out by a committee consisting of an external examiner, head of the department, and subject experts.

Syllabus for B. Tech (E.C.E.) III Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - II		**Summer Industry Internship - II: Evaluation will be done along with 4-1 courses**				

Course Objective:

The students undergo industrial training so that he/she become industry-ready.

Course Outcomes:

At the end of the training, the student is able to

1. Select the real-time problem in the industry.
2. Analyze the requirements with respect to the problem statement
3. Design the optimal solution for the problem.
4. Implement the solution using the appropriate modern tools.
5. Present and submit the report

Mapping of Course Outcomes with Program Outcomes

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3							3	3	3	3	2		3
CO2	3	3		3					3	3	3	3	3		3
CO3	3	3	3	3					3	3	3	3	3		3
CO4	3	3			3				3	3	3	3	3	3	3
CO5									3	3	3	3			3
Overall		3	1	1	1				3	3	3	3	3	1	3

Student shall carryout the project in industry during summer vacation for 3-6 weeks. There is internal and external Evaluation. Internal Evaluation carries 30 marks and external Evaluation carries 70 marks, Total 100 marks. Evaluation is carried out in B.Tech IV year I semester (7^{th} Semester).

IV– I

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C714**	**Internet of Things and Applications**	**2**	**1**	**0**	**3**

Course Objectives: The student will learn about

1. *Terminology, technology and applications of IoT*
2. *Sensors and Actuators required to build an IoT system*
3. *Necessary Wireless Networks and protocols*
4. *Raspberry PI3 as a hardware platform for IoT sensor interfacing and*
5. *Various IoT application as case studies*

Course Outcomes: After completing this course, student shall be able to

1. *Build a simple IoT System for a given application*
2. *Describe and utilize necessary protocols for communication and management of an IoT system*
3. *Design, Develop and Illustrate IoT applications using Raspberry PI platform and Python Scripting*

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	2	3				3			2	2	3	2
CO2	1	2	3	2	3				3			2	2	3	2
CO3	1	2	3	2	3				3			2	2	3	2
Overall	1	2	3	2	3				3			2	2	3	2

Unit – 1- Introduction to IoT

Part A - Introduction

IoT terms and basic definitions, IoT vs M2M, Characteristics of IoT, IoT Eco-System, IoT applications and marketplace and IoT Reference Model

Part B – Sensor and Actuators

Introduction to transducers, sensors and actuators, Sensor – classification and types, Actuators – Classification and types.

Unit 2–Embedded Platform for IoT – Rpi 3

Embedded Platform brief introduction - Ardiuno, Raspberry Pi 3 and Intel Galileo

RPI-Interfaces (serial, SPI, I2C) Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

Unit 3 – IoT Wireless Networks

Introduction to WSN and its architecture – Network topologies, Issues, Challenges and Security, WSN Technologies and its application - WiFi, Bluetooth, Zigbee, LoRa.

Unit 4 – IoT Protocol
Characteristics and Architecture of MQTT, XMP, DDS, AMQP, COAP and REST and their comparison

Unit 5 - IoT Design Methodology
Process and requirement, Level Specification, Domain model and service specification, IoT application Development

Unit 6: Case Studies Illustrating IoT Application
Home Automation – Smart Lighting, Home intrusion detection, Cities – Smart parking, Environment – Weather monitoring system, Weather reporting bot, Air pollution monitoring, Forest fire detection, Agriculture – Smart irrigation,

Text Books

1. Internet of Things, Author(s): Srinivasa K.G. | Siddesh G.M. | HanumanthaRaju R, ISBN: 9789386858955, Cengage Publications, 2018
2. Internet of Things A Hands on Approach by ArshdeepBahga, Vijay Madisetti Publisher Universities Press. ISBN – 978 81 7371 954 7

Reference books

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1 st Edition, Academic Press, 2014.
2. Peter Waher, "Learning Internet of Things", PACKT publishing, BIRMINGHAM – MUMBAI
3. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer
4. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118- 47347-4, Willy Publications

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C715**	**Advanced Communications and Networks**	**3**	**0**	**0**	**3**

Prerequisites: Signals and Systems, Communication Theory or equivalent

After studying this course, the students will be able to

1. Describe and determine.
2. Describe.
3. Describes.
4. Describes.
5. Describes.
6. Describe and.

Unit-I:

Spread Spectrum Communications:–Spreading sequences- Properties of Spreading Sequences,Pseudo- noise sequence, Gold sequences, Kasami sequences, Walsh Sequences, Orthogonal Variable Spreading Factor Sequences, Barker Sequence, Complementary Codes

Digital Modulation DQPSK ,8PSK, 16PSK, 8QAM, 16QAM,

Direct sequence spread spectrum:

DS-CDMA Model, Conventional receiver, Rake Receiver ,Synchronization in CDMA, Power Control, Soft handoff, Multiuser detection – Optimum multiuser,detector, Liner multiuser detection.

Unit-II:

Wireless Networking: Introduction, Differences between wireless and fixed telephone networks,Development of wireless networks, Traffic routing in wireless networks, Wireless data services, Common channel signalling, ISDN, SS7.
Applications: Ethernet

Unit-III

Mobile IP And Wireless Access Protocol: Mobile IP: IP Packet Delivery, Agent Discovery, Tunneling And Encapsulation, IPV6-Network Layer In The Internet- Mobile IP Session Initiation Protocol WAP Architecture-overview, WML scripts, WAP service, WAP session protocol, Wireless transaction, Wireless datagram protocol.

Unit-IV:.
Wireless LANs: Introduction, Fundamentals of WLANs, Network Architecture, IEEE802.11standards, WiFi Protocols – 802.11b, 802.11g, 802.11a, 802.11n, 802.11ac; Frequency allocation - 802.11b, 802.11g, 802.11a; Modulation and coding schemes - 802.11b, 802.11g, 802.11a, 802.11n; Security, Hot spots, Virtual private networks, HIPERLAN standard.

Unit-V:

Wireless PANs/IEEE 802.15x: Introduction to IEEE 802.15x Technologies: Wireless PAN Applications and Architecture, IEEE 802.15.1 Physical Layer Details, Bluetooth Link Controllers Basics, Bluetooth Link.

Broad Band Wireless MANs/IEEE 802.16x: Introduction to WMAN/IEEE 802.16x Technology, IEEE 802.16Wireless MANs, IEEE 802.16 MAC Layer Details

Unit-VI: Orthogonal Frequency Division Multiplexing and MIMO System

Basic Principles of Orthogonality, Single vs Multicarrier Systems, OFDM Block Diagram and Its Explanation, FDM Signal Mathematical Representation, Selection parameter for ModulationPulse shaping in OFDM, Space Diversityand System,MIMO Based System Architecture, Long-Term Evolution:, LTE Architecture, Enhanced Node B, Core network, Radio channel components, TD-LTE,VoLTE.

TEXT BOOKS:

1. Data Communication and Computer Networking - B. A.Forouzan, 3rd ed., 2008, TMH.
2. Advanced Electronic Communication Systems - W. Tomasi, 5 ed., 2008, PEI.

3.Wireless Communications by S.Rappaport.
4.Wireless Networks by Clint Smith and Daniel Collins

REFERENCES:

1. Data Communications and Computer Networks - Prakash C. Gupta, 2006, PHI.
2. Data and Computer Communications - William Stallings, 8th ed., 2007, PHI.
3. Data Communication and Tele Processing Systems - T. Housely, 2nd Edition, 2008, BSP.
4. Data Communications and Computer Networks- Brijendra Singh, 2nd ed., 2005, PHI.

5.Telecommunication System Engineering – Roger L. Freeman, 4/ed., Wiley-Interscience, John Wiley & Sons, 2004.

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C716**	**Intellectual Property Rights**	**1**	**0**	**0**	**1**

Course Objective:

This course is intended to impart awareness on intellectual property rights and various regulatory issues related to IPR

Course Outcomes:

CO1	Demonstrate a breadth of knowledge in Intellectual property
CO2	Overview of Patents, Searching ,filling and drafting of Patents
CO3	Overview of copyright & GI .
CO4	Overview of Trade Mark & Trade Secret,
CO5	Overview of Integrated Circuit and Industrial Design.
CO6	Knowledge about different national and international : Conventions and Treaties Governing the IPRs

CO	**Intellectual Property Rights(6GC49)**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	Demonstrate a breadth of knowledge in Intellectual property						3		3							
CO2	Overview of Patents, Searching ,filling and drafting of Patents						3									
CO3	Overview of copyright & GI .						2		3							
CO4	Overview of Trade Mark & Trade Secret,						3		3							
CO5	Overview of Integrated Circuit and Industrial Design						3		3							
CO6	Knowledge about different national and international : Conventions and Treaties Governing the IPRs						3		2							
CO	Overall						3		3							

Unit I: Introduction to IPR: Discovery, Invention, Creativity, Innovation, History & Significance of IPR, Overview of IPR -Patent, Copyright, Trade Mark, Trade Secret , GI, Industrial Design & Integrated Circuit, Non-patentable criteria

Unit II: Patents: Patents- Patentability Criteria, Types of Patents-Process, Product & Utility Models, Software Patenting and protection, Patent infringement- Case studies- Apple Vs Samsung, Enfish LLC Vs Microsoft, Overview of Patent search-Types of Searching, Public & Private Searching Databases, Basics of Patent Filing & Drafting, Indian Patents Law

Unit III: Copyrights and Geographical Indications: Types of Copyrights, Procedure for filing, copyright infringement, Copyright Law, Geographical Indications -Tirupati Laddu , Darjeeling Tea, Basmati rice

Unit IV: Trademark and Trade secrets: Trade Marks –Commercial importance, protection, registration, Case Studies- Sabena and Subena, Castrol Vs Pentagon, Trade Secrets- Case Studies- Kentucky Fried Chicken (KFC), Coca-Cola

Unit V: Protection of Industrial Designs & Integrated Circuits: Industrial Designs – Scope, protection, filing, infringement; Integrated Circuits & Layout design, Semiconductors, Unfair competition, Designs Act.

Unit VI: International Conventions & Treaties: Overview of WTO, GATT, TRIPS, WIPO, Berne Convention, Rome convention, Paris Convention, Patent Cooperation Treaty (PCT), Madrid Protocol, Budapest Treaty, Hague agreement

Text Book:

1. Deborah E. Bouchoux, Intellectual Property for Paralegals – The law of Trademarks, Copyrights, Patents & Trade secrets, 3rd Edition, Cengage learning, 2012
2. N.S. Gopalakrishnan & T.G. Agitha, Principles of Intellectual Property, Eastern Book Company, Lucknow, 2009.

References

1. M. M. S. Karki , Intellectual Property Rights: Basic Concepts, Atlantic Publishers, 2009
2. Neeraj Pandey & Khushdeep Dharni, Intellectual Property Rights, Phi Learning Pvt. Ltd
3. Ajit Parulekar and Sarita D' Souza, Indian Patents Law – Legal & Business Implications; Macmillan India ltd, 2006.
4. B. L. Wadehra. Law Relating to Patents, Trade Marks, Copyright, Designs & Geographical Indications; Universal law Publishing Pvt. Ltd., India 2000.
5. P. Narayanan; Law of Copyright and Industrial Designs; Eastern law House, Delhi, 2010.

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C729**	**VLSI Physical Design (PE-III)**	**3**	**0**	**0**	**3**

This course is introduced to help VLSI career aspirants in the field of VLSI Physical Design. It coverscomplete details from VLSI design specification till VLSI IC physical design flow, helps to acquiresufficient skills as needed by Industry.
Course modules cover industry needed in depth knowledge to handle challenges in VLSI Back EndFlow. Students will learn complete knowledge from netlist to GDS2, by working on advancedlower nanometer technology nodes.
The course will benefit VLSI Engineers seeking to enter into VLSI backend design job. In this role engineers will be working for Block & full chip level Physical Design Implementation.
The main focus of the course is to make students understand physical design of IC from netlistthrough GDSII, creating physical layout representation for each logical functions within blocks toenable IC fabrication process. Through this course emphasis will be given on learning throughpractical backed by theoretical concepts taught during class room & extended lab sessions.

Prerequisite Courses - Digital Logic Design, VLSI and Digital Design Through Verilog

CAD Tool - Cadence - Innovus, Tempus, Genus, Xcelium, and Others..

Units 1 - Introduction

Overview of ASIC/SOC design flow, Digital Design Concepts and Physical Design flow setup. Review of ASIC fundamentals & fabrication methodologies. Design Strategies - a) Simulation and synthesis issues, b) RTL design strategies, c) Static timing analysis.

Units 2 - Design Standard Cell Libraries

Design of combinational circuits, Implementation and analysis of combinational circuits like, adders, comparator, multiplier etc., Design of sequential circuits (Synchronous and Asynchronus), Design of Finite State Machines (FSM).
Design data preparation, process technologies and standard cell libraries. Understanding of standard cell technology parameters, netlist generation and technology mapping. Reviewing timing constraints and IO constraints. Low power and low area design concepts
Exercises on Cadence Tool - Writing RTL for ASIC design flow, Understand ASIC Design Flow with 4-bit Counter Design

Units 3 - Static Timing Analysis

Introduction to STA, Comparison with DTA, Timing Path and Constraints, Different types of clocks,
Clock domain and Variations, Clock Distribution Networks, How to fix timing failure, Introductions
to timing static and dynamic hazards, Path delay, Gate delay, Metastability states, Sequential

timing delays like set-up time, hold time, Maximum frequency, violations, slew, slack, Delay

analysis, Sequential logic pad to set up, pad to pad, clk to next Reg, Reg to o/p and Reg to Reg. violations wrt sequential circuit.

Units 4 - Design Floor Planning - Power Planning

Design plan for hierarchical and flat design implementation, better partition techniques and flowsetup. Special cells and IO cells usage planning, congestion removal techniques and implementation constraint setup. Understanding various floor planning techniques, setting up guidelines for better floor planning and meeting design goals. IO PAD placement planning, powerplanning. Adding power rings and power mesh.

Units 5 - Clock Tree Synthesis and Routing

Implementation of clock tree in placed design, understanding various aspects of timing parameters like clock setup/hold, skew and latency issues, Adding buffers in clock tree and implementing clock tree. Analyzing timing reports after clock tree synthesis and fixing issues. Various types of routing, trial route, special route, global routing and detailed routing. Analyzing routed design checking post routed design issues, DRC checks, timing checks, optimization of routing constraints

Units 6 - Design Checks and Signoff

Doing complete path and module based timing analysis, checking timing optimizer reports, identifying failing paths, fixing issues. Extracting capacitor table values for the design. IR drop andelectro migration analysis. Perform DRC, Logical Equivalence checking, generating detailed timing/power reports, generating power reports. GDS-II generation.

Books

Physical Design Essentials: An ASIC Design Implementation Perspective by *Khosrow Golshan*, ISBN 0-387-36642-3

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C730**	**Embedded System Design using ARM(PE-III)**	**3**	**0**	**0**	**3**

On completion of this course you should be able to:

1. Understand the basic architecture of Embedded System and their classification.
2. Explore the architecture of ARM processor.
3. Understand the addressing modes and data processing instructions of ARM processor.
4. Understand the ARM thumb instruction set and its capabilities.
5. Use both assembly and C language based ARM programming and Explore the memory management techniques in ARM.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3
Overall		3	3	3	3				2			3	3	3	3

UNIT-I

Introduction to embedded system:

Embedded system architecture, classifications of embedded systems, challenges and design issues in embedded systems, fundamentals of embedded processor and microcontrollers, CISC vs. RISC, fundamentals of VonNeuman/Harvard architectures, types of microcontrollers, selection of microcontrollers.

UNIT –II:

ARM Architecture:

ARM Design Philosophy, Registers, Program Status Register, Instruction Pipeline, Interrupts and Vector Table, Architecture Revision, ARM Processor Families.

UNIT –III:

ARM Programming Model – I:

Instruction Set: Data Processing Instructions, Addressing Modes, Branch, Load, Store Instructions, PSR Instructions, Conditional Instructions.

UNIT –IV:

ARM Programming Model – II:

Thumb Instruction Set: Register Usage, Other Branch Instructions, Data Processing Instructions, Single-Register and Multi Register Load-Store Instructions, Stack, Software Interrupt Instructions

UNIT –V:

ARM Programming:

Simple C Programs usingFunction Calls, Pointers, Structures, Integer and Floating Point Arithmetic, Assembly Code using Instruction Scheduling, Register Allocation, ConditionalExecution and Loops.

UNIT –VI:

Memory Management:

Cache Architecture, Polices, Flushing and Caches, MMU, Page Tables, Translation, Access Permissions, Context Switch.

TEXT BOOKS:

1. ARM Systems Developer's Guides- Designing & Optimizing System Software – Andrew N. Sloss, Dominic Symes, Chris Wright, 2008, Elsevier.

REFERENCE BOOKS:

Embedded Microcomputer Systems, Real Time Interfacing – Jonathan W. Valvano – Brookes / Cole, 1999, Thomas Learning.

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C731**	**DSP Processors and Architectures(PE-III)**	**3**	**0**	**0**	**3**

Course Objectives:

The objectives of this course are

- To study the architecture of Digital Signal Processors and Interfacing of processor to I/O devices

Course Outcomes: After studying this course, the students will be able to

CO1	Understand the concepts of DFT,FFT digital filters
CO2	Illustrate the concepts of Computational Accuracy in DSP Implementations
CO3	Explain the Architectures for Programmable DSP Devices:
CO4	Explain Programmable Digital Signal Processors
CO5	Distinguish Analog Devices Family of DSP Devices .
CO6	Illustrate Interfacing Memory and I/O Peripherals to Programmable DSP Devices

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3		3				3			3	2	3	3
CO2	3	3	3	3	3				3			3	3	3	3
CO3															
CO4	3	3	3	3	3				3			3	3	3	3
CO5															
CO6															
Overall	2	2	2	2	2				2			2	2	2	2

UNIT I

Introduction to DSP Processors: Differences between DSP and other μp architectures, their comparison and need for special ASPs, RISC & CISC CPUs .

UNIT II

Overview of DSP processor design: fixed point DSPs– Architecture of TMS 320C 5X, C54X Processors , addressing modes, Assembly instructions, Pipelining and on-chip peripherals. Floating point DSPs: Architecture of TMS 320 – IX.

UNIT III

Data formats, F.P. operations, addressing modes, instructions, pipelining and peripherals.

UNIT IV

DSP interfacing & software development tools: I/O interfacing with A/D converters, PCs, Dual port RAMS, EPGAs,

UNIT V

DSP tools – Assembler, debugger, c-compiler, linker, editor, code composer studio.

UNIT VI

Applications using DSPs adaptive filtering, spectrum analysis, Echo cancellation modems, voice synthesis and recognition. Brief ideas of AD, Motorola DSP CPUs and their comparison with TI CPU S.

SUGGESTED READING:

1. C. Marren& G. Ewess, "A Simple Approach to Digital Signal Processing", WILEY Inter-science, 1996.
2. K. Shin, "DSP Applications with TMS 320 Family", Prentice Hall, 1987.
3. B. Ventakaramani, M. Bhaskar, "Digital Signal Processes, Architecture Processing and Applications", Tata Mc Graw Hill, 2002.

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C732**	**Ad hoc and Wireless Sensor Networks(PE-III)**	**3**	**0**	**0**	**3**

Pre-requisites:

Probability & Stochastic process, Cellular mobile Communications

Course Objectives**:**

This course is intended to impart to the students the principlesof

1. To study about the basics of wireless networks
2. To understand the challenges in wired vs. wireless domain in computer networks.
3. To study about various types of wireless networks, i.e cellular networks, Bluetooth, Ad hoc networks and wireless sensor networks.
4. To study about various network security attacks and key management.

Course Outcome:

Upon completion of this module, students will be able to:

1. Understand the under lying technologies of wireless networks.
2. Specify and identify deficiencies in existing wireless protocols for MAC layer and Network layer, and then go onto formulate new and better protocols.
3. Understand the technology behind the cellular network, installation of base station, Bluetooth etc.
4. To master the concepts of ad hoc networks and the design / performance issues in wireless local area networks and wide area networks.
5. To be familiar with contemporary issues in networking technologies.

Mapping of Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3

Overall		3	3	3	3				2			3	3	3	3

UNIT 1: Ad Hoc Wireless Networks: Introduction, Issues in Ad Hoc Wireless Networks, Ad Hoc Wireless Internet.

UNIT 2: MAC Protocols for Ad Hoc Wireless Networks: Issues in Designing a MAC Protocol for Ad Hoc Wireless Networks, Classifications of MAC Protocols. Contention-based protocols.

UNIT 3: Routing Protocols for Ad Hoc Wireless Networks: Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classifications of Routing Protocols, DSDV, DSR, AODV and ZRP. Differences between Table-driven and On-demand routing protocols.

UNIT 4: Multi-cast routing in Ad Hoc Wireless Networks: Issues in Designing a Multicast Routing Protocol, Classifications of Multicast Routing Protocols, MAODV, ODMRP, Differences between Tree- and Mesh-based protocols.

UNIT 5:
Transport layer in Ad Hoc Wireless Networks: Introduction, Issues in Designing a Transport layer protocol, why does TCP not perform well in Ad-hoc wireless networks.
Security in Ad Hoc Wireless Networks: Introduction, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management.
QoS in Ad-hoc Wireless Networks: Introduction, Issues and challenges in providing QoS in Ad-hoc wireless networks, classifications of QoS solutions.

UNIT 6: Energy Management in Ad Hoc Wireless Networks: Introduction, Need for Energy Management in Ad-hoc Wireless Networks. Classification of Energy Management Schemes. Battery Management Schemes – DLL solutions. Transmission Power Management Schemes – DLL solutions, Network layer solutions, Higher layer solutions.

Text Books:

1. C. S. Ram Murthy, B. S. Manoj, *Ad Hoc Wireless Networks: Architectures and Protocols*, Prentice Hall of India , 2nd Edition, 2005
2. RaminHekmat, *Ad-hoc Networks: Fundamental Properties and Network Topologies*, Springer , 1st Edition, 2006
3. C. Siva Ram Murthy and B. S. Manoj, Ad hoc Wireless Networks Architecture and Protocols, 2nd edition, Pearson Edition, 2007.
4. Charles E. Perkins, Ad hoc Networking, Addison – Wesley, 2000.

References:

1. C. S. Ram Murthy, B. S. Manoj, *Ad Hoc Wireless Networks: Architectures and Protocols*, Prentice Hall of India , 2nd Edition, 2005

2. RaminHekmat, *Ad-hoc Networks: Fundamental Properties and Network Topologies*, Springer, 1st Edition, 2006.
3. Stefano Basagni, Marco Conti, Silvia Giordano and Ivan stojmenovic, Mobile ad-hoc networking, Wiley-IEEE press, 2004.
4. Mohammad Ilyas, The handbook of ad-hoc wireless networks, CRC press, 2002.
5. T. Camp, J. Boleng, and V. Davies " A Survey of Mobility Models for Ad-hoc Network" Research, "Wireless Commun, and Mobile Comp. Special Issue on Mobile Ad-hoc Networking Research, Trends and Applications, Vol. 2, no. 5, 2002, pp. 483 – 502.
6. A survey of integrating IP mobility protocols and Mobile Ad-hoc networks, Fekri M. bduljalil and Shrikant K. Bodhe, IEEE communication Survey and tutorials, no: 12007.

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C733**	**Computer Vision (PE-III)**	**3**	**0**	**0**	**3**

Prerequisites: Signals & Systems, Linear Algebra, Basics of Probability

Objectives:
Computer Vision focuses on development of algorithms and techniques to analyze and interpret the visible world around us. This requires understanding of the fundamental concepts related to multi-dimensional signal processing, feature extraction, pattern analysis visual geometric modeling, stochastic optimization etc. Knowledge of these concepts is necessary in this field, to explore and contribute to research and further developments in the field of computer vision. Applications range from Biometrics, Medical diagnosis, document processing, mining of visual content, to surveillance, advanced rendering etc.

Upon completion of this course, students should be able to:
1. Recognize and describe both the theoretical and practical aspects of computing with images. Connect issues from Computer Vision to Human Vision
2. Describe the foundation of image formation and image analysis. Understand the basics of 2D and 3D Computer Vision.
3. Become familiar with the major technical approaches involved in computer vision. Describe various methods used for registration, alignment, and matching in images.
4. Get an exposure to advanced concepts leading to object categorization and segmentation in images.
    1. Build computer vision applications.

Course Outcomes: At the end of the course the student will be able to:
CO1 -Development of algorithms and techniques to analyze and interpret the visible world.
CO2 -Apply feature extraction methods for computer processing.
CO3 -Implement pattern recognition algorithms for real world problems CO4 Design of face detectionand recognition algorithms

Detailed Syllabus:
Unit -I
Digital Image Formation and Low-level processing: Overview and State-of-the-art,Fundamentals of Image Formation, Transformation: Orthogonal, Euclidean, Affine, Projective,etc; Fourier Transform, Convolution and Filtering, Image Enhancement, Restoration, HistogramProcessing.

Unit-II
Depth estimation and Multi-camera views: Perspective, Binocular Stereopsis: Camera andEpipolar Geometry; Homography, Rectification, DLT, RANSAC, 3-D reconstructionframework; Auto-calibration.

Unit -III

Feature Extraction : Edges - Canny, LOG, DOG; Line detectors (Hough Transform), Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, SURF, HOG, GLOH, Scale-SpaceAnalysis- Image Pyramids and Gaussian derivative , Gabor Filters and DWT.

Unit -IV

Image Segmentation: Region Growing, Edge Based approaches to segmentation, Graph-Cut,Mean-Shift, MRFs, Texture Segmentation; Object detection.

Unit -V

Pattern Analysis: Clustering: K-Means, K-Medoids, Mixture of Gaussians, Classification:Discriminant Function, Supervised, Un-supervised, Semi-supervised; Classifiers: Bayes, KNN.

Unit -VI

Motion Analysis: Background Subtraction and Modeling, Optical Flow, KLT, Spatio-TemporalAnalysis, Dynamic Stereo; Motion parameter estimation.
Use Cases on Finger print recognition, Face detection and recognition, medical Diagnosis etc

Text Book(s):

1. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited 2011.
2. D. A. Forsyth, J. Ponce, Computer Vision: A Modern Approach, PHI Learning 2009.
3. R.C. Gonzalez and R.E. Woods, Digital Image Processing, Pearson Education.

Reference(s):

1. Shah M., Fundamentals of Computer Vision, 1997.
2. Szeliski R., Computer Vision: Algorithms and Applications, Springer, 2011.
3. Forsyth D. & Ponce J., Computer Vision - A Modern Approach, Prentice Hall, 2002.

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C734**	**Radar Systems (PE-III)**	**3**	**0**	**0**	**3**

Prerequisites: *MWE*

Course Objectives*:*

The objectives of this course are

- *Be acquainted with the principle and working of various types of Radar Systems.*
- *To study the principles of phased arrays.*

Course Outcomes*: After studying this course, the students will be able to*

CO1	*Recognise the basics of Radar systems and its applications and its frequencies (Understand)*
CO2	*Differentiate the Radar parameters, how it affects the Range measurement. (Analyse)*
CO3	*Recall the Doppler Effect, and draw backs of CW radars. (Remember)*
CO4	*Discuss the basic concepts of Moving target indicators and evaluate the draw backs of MTI Radars.(Understand)*
CO5	*Differentiate concept of scanning and tracking. (Analyse)*
CO6	*Understand various types of displays and different phased arrays*.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3
Overall		3	3	3	3				2			3	3	3	3

SYLLABUS CONTENT

Unit-I

Nature of Radar, Maximum Range, Radar equation. Block diagram. Radar frequencies and applications. Prediction of Range performance. MDS, Rx Noise, Modified range equation. Related problems.

Unit-II

SNR

Envelope Detectors. Integration of Radar Pulses. RCS of Targets (simple targets-sphere, cone-sphere. PRF and Range Ambiguities. System losses.

Unit-III

CW AND FMCW RADAR:

Doppler Effect. CW Radar, Block diagram, Applications of CW Radar. Rx bandwidth requirements. FM CW Radar, Block diagram and characteristics. FM- CW Altimeter.

UNIT-IV

MTI RADAR

Block diagram of MTI Radar with Power Amplifier and Power Oscillators. Non Coherent MTI Radar. Delay line Cancellers. Double Cancellation. Blind Speeds. Filter Characteristics, Limitations to MTI performance. MTI vs Pulse Doppler Radar. Staggered PRF, Range gated Doppler Filters.

UNIT – V

TRACKING RADARS

Tracking Radars: Sequential lobing. Conical Scan. Mono Pulse tracking Radars. Phase Comparison Mono Pulse.

Matched filter Receiver: MFR Response Characteristics & derivation. Correlation Functions & Cross Correlation Receiver, Efficiency of Matched Filter, Matched Filter with Non White Noise.

UNIT – VI

RADAR RECEIVERS

Noise Figure & Noise Temperature, Radar Displays, Types of Duplexers.

Phased arrays: basic concepts, Beam steering and beam width changes. Series Vs parallel feeds. Applications, Advantages & limitations. ECCM.

TEXT BOOKS

1. Merrill I. Skolnik, *Introduction to Radar Systems,*McGraw-Hill, 2nd Edition, 1981.

REFERENCES

1. Merrill I.Skolnik,*Introduction to Radar systems,McGraw-Hill,3rd* Edition ,2001.
2. Byron Edde, *Radar Principles,Technology,Applications.* Pearson Edition, 2004.

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C735**	**Design Verification using System Verilog (PE-IV)**	**3**	**0**	**0**	**3**

Course Description:

This course gives a student an in-depth introduction to the main SystemVerilog enhancements to the Verilog hardware description language (HDL), discusses the benefits of the new features, and demonstrates how design and verification can be more efficient and effective when using SystemVerilog constructs.

The course is broken down into two modules: The Design module examines improvements for RTL design and synthesis; the Verification module explores verification enhancements such as object-oriented design, assertions and randomization.

Prerequisites:

- A working knowledge of Verilog HDL
- The ability to navigate a file system and use a text editor
- A basic understanding of digital hardware design and verification

Course Outcomes

CO1	*Understand the UVM concepts*
CO2	*Explore the class instances and functions*
CO3	*Comprehend the UVM Configurations*
CO4	*Analyzing UVM sequences and Modeling in UVM*
CO5	*Developing Reusable Test benches using UVM and Analyzing the Case studies of Layered test bench for SPI, APB and AXI.*

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3
Overall		3	3	3	3				2			3	3	3	3

Syllabus Contents:

Unit-1 : Introduction to Functional Verification: What is Verification?, What do we verify?, Verification Abstractions, Behavioral level, Transaction level, Functional / RTL level, Gate level, Transaction level; Importance of (Functional) Verification in Chip design life cycle, Verification goals; Overview of various Functional Verification techniques: Simulations, FPGA Prototyping, Emulation, HW/SW Co-verification, Formal Verification, Semiformal Verification, Models of Functional

Verification. Black box, White box, Gray box, Verification Hierarchy: Chip-level, Cluster / Subsystem level, IP level, Module / Unit level.

Unit- 2 : Overview of SoC Architectures and Functional Verification Environment: What is an SoC ?, Advantages of SoCs over conventional ASICs?, Typical components of an SoCs, Sample SoC Architectures, Typical SoC based Testbench environment , Stimuli Generators, Hard coded, Direct Stimuli from the environment, Stimuli from the model of the environment (BFMs), Random Stimuli Generation; Predictors: Golden/Reference Model, More Abstract (Functional, Transaction Level), Hardwired response, Response database; Transactors, Monitors , Scoreboards , Coverage Collectors - Coverpoints, Property Checkers - Assertions.

Unit-3 :SystemVerilog Language Concepts: Evolution of SystemVerilog : Differences between Verilog and System Verilog HDL, New features added in System Verilog (New Data type additions, Arrays - Fixed, Packed, Dynamic, Queues, Associated, Structures & Unions, New Operators, New additions to Subroutines, New additions to Procedural statements & Control flow, Concurrency: Fork.join, Fork..join_any, Fork..join_none, Automatic Variables, Interfaces, Program block);

Unit-4 : Object Oriented Programming Concepts-I: Classes : Encapsulating properties & methods, Object memory creation, Working with Object handles, Object copying : Shallow and Deep copy, Object cloning, Object protection, Object variables Vs Class variables: Static keyword, Object Randomization, Randomization Seed - A deep look, Randomization variables, Constraint Block, Weighted Randomization, Controlling Randomization, Solve order, Inline Constraints - with constraints, Object Inheritance, Limitations of Inheritance, Polymorphism and Methods overriding ,

Unit-5: Object Oriented Programming Concepts-II: Virtual Interfaces, Inter thread Synchronization & Communication: Events, Semaphores, Mailboxes, Packages, Assertions, Immediate assertions, Procedural assertions, Temporal operators, Boolean operators, Sequences, Properties, Functional Coverage: Cover points & Bins, Covergroups, Cross coverage, Sampling coverpoints, Calculating functional coverage, Interfacing with C - DPI, Compiler Directives.

Unit-6 : Advanced Testbench Design using SystemVerilog: Introduction to Layered testbench, architecture, Driver, Monitor, Transactor, Generator, Configurations - Device, Transaction, Scoreboard, Reference models, Bus function models.

Textbooks:

1. SystemVerilogFor Verification: A Guide to Learning the Testbench Language Features *by Chris Spear & Greg Tumbush (3rd Edition/5th Edition).*
2. A Practical Guide ForSystemVerilog Assertions by SrikanthVijayaraghavan& MeyyappanRamanathan.

Reference Books:

1. A Practical Guide ForSystemVerilog Assertions by SrikanthVijayaraghavan& MeyyappanRamanathan.
2. Logic Design and verification using System Verilog by Donald Thomas

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C736**	**Embedded Real Time Operating Systems (PE-IV)**	**3**	**0**	**0**	**3**

***Course outcomes**:*

1. Understand the Basic concepts of UNIX operating Systems and files, commands usage.

2.Understand the Real time Systems concepts and classification of Real time systems.

3. Design concepts of scheduling algorithms and its applications.

4. Understand the Interprocess communications and its applications in Real time systems.

5. Understand the Exceptional handling andInterrupts and Timers

6. Understand the case study of RTOS.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3
CO6		3	3	3	3				2			2	3	3	3
Overall		3	3	3	3				2			3	3	3	3

UNIT – I

Introduction: Introduction to UNIX/LINUX, Overview of Commands, File I/O,(open, create, close, lseek, read, write), Process Control (fork, vfork, exit, wait, waitpid, exec).

UNIT - II

Real Time Operating Systems: Brief History of OS, Defining RTOS, The Scheduler, Objects, Services, Characteristics of RTOS, Defining a Task, Tasks States and Scheduling, Task Operations, Structure, Synchronization, Communication and Concurrency. Defining Semaphores, Operations and Use, Defining Message Queue, States, Content, Storage, Operations and Use.

Unit III: Scheduling

Commonly used Approaches to Real Time Scheduling Clock Driven, Weighted Round Robin, Priority Driven, Dynamic Vs State Systems, Effective release time and Dead lines, Offline Vs Online Scheduling.

UNIT - IV

Inter-process Communication

Inter-process Communication and Synchronization of Processes, Tasks and Threads- Multiple Process. Problem of Sharing data by multiple tasks & routines, Inter-process communication

UNIT - V

Exceptions, Interrupts and Timers: Exceptions, Interrupts, Applications, Processing of Exceptions and Spurious Interrupts, Real Time Clocks, Programmable Timers, Timer Interrupt Service Routines (ISR), Soft Timers, Operations.

UNIT - VI

Case Studies of RTOS: RT Linux, Micro C/OS-II, Vx Works, Embedded Linux, and Tiny OS.

TEXT BOOK:

1. Embedded Systems- Architecture, Programming and Design by Rajkamal, 2nd ed., 2008,TMH.
2. Real Time Systems- Jane W. S. Liu- PHI.
3. Real Time Systems- C.M.Krishna, KANG G. Shin, 1996, TMH
4. Qing Li, "Real Time Concepts for Embedded Systems", 2011, Elsevier.

REFERENCE BOOKS:

1. Rajkamal, "Embedded Systems- Architecture, Programming, and Design", 2007, TMH.
2. W. Richard Stevens, Stephan A. Rago, "Advanced UNIX Programming", 2006, 2nd Edition, Pearson.
3. Dr. Craig Hollabaugh, "Embedded Linux: Hardware, Software and Interfacing", 2008, 1st Edition, Pearson.

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C737**	**Bio-Medical Signal Processing (PE-IV)**	**3**	**0**	**0**	**3**

Course Objectives:

This course aims to:

1. Provide the introduction to and insight into various biomedical signals
2. Provide the understanding of basic and advanced methods to process the biomedical signals using modern tool like MATLAB.
3. Provide the basic understanding of common biomedical instruments

Course Outcomes:

Upon completing this course, students will be able to:

1. Identify the various biomedical signals and their acquisition process
2. Demonstrate the ability to apply the signal processing techniques to analyze the biomedical signals
3. Demonstrate the ability to design the biomedical signal processing algorithm with usage of modern tools

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	1	3	3			2	2			3	3	
CO2	3	3	3	3	3	3			2	3	2	2	3	3	
CO3	3	3	3	3	3	3		2	2			2	3	3	3
Overall		3	3	3	3			2	2	3	2	2	3	3	3

UNIT-I

Basic understanding of biomedical signal, Physiological aspects, Biomedical signal acquisition process and related instruments, Electroencephalogram (EEG), Electrocardiogram (ECG), Electromyogram (EMG), Phonocardiogram (PCG),Photoplethysmography (PPG), Respiratory and Lung sound signals. Basic characteristics and associated pathologies. Biomedical instruments and their working principles.

Case study: Reading the biomedical signals (EEG, ECG, EMG, PCG) in MATLAB.

UNIT-II

Basics of signal processing, review of time and frequency domain signals, Characteristics of Biomedical Signals, Stationary and non-stationary, Linear and non-linear, Chaotic and random signals. Time-series analysis, statistical parameters, Higher order statistics (HOS), Types of distributions, statistical significance tests (Kruskal-Wallis).

Case study: Statistical analysis of biomedical signals in MATLAB environment.

UNIT-III

Revision of Fourier transform (FT), FFT algorithm, and short time Fourier transform (STFT). Limitations of FT and STFT. Time-Frequency (TF) analysis of Biomedical Signals, its need and tools. Basic concepts behind wavelet transform, discrete wavelet transform (DWT), types, advantages and applications.

Case study: Application of FT and STFT, and WT on EEG, ECG, and PCG signals in MATLAB environment.

UNIT-IV

Steps involved in classification of biomedical signals, Preprocessing, Revision of digital filters depending on methods and applications (IIR, FIR, Chebyshev, High pass, low pass, bandpass, notch filters). Noise removal process in biomedical signals with applications.

Case study: Application of digital filters and their effect of noisy signals like ECG (High frequency noise and baseline wander removal), EEG, EMG, PCG, and Lung sound signals in MATLAB environment.

UNIT-V

Feature extraction process, statistical and time domain features, frequency domain features, time-frequency analysis based features. Applications of STFT, DWT for biomedical signal classification. Feature selection using Kruskal-Wallis statistical test. Introduction to basic signal classification process.

Case study: Analysis and feature identification for classifying PCG signals into various heart valve disease categories in MATLAB environment.

UNIT-VI

Biomedical signal processing using signal decomposition method. Empirical mode decomposition (EMD). Introduction to Hilbert-Huang transform (HHT). Advantages, applications, and limitations of EMD method. Introduction to Empirical wavelet transform (EWT). Introduction to variational mode decomposition (VMD).

Text Book:

1. Rangaraj M Rangayyan ,"Biomedical Signal Analysis" –, IEEE Press, 2001
2. Biomedical Digital Signal Processing – Willis J Tomkins, PHI, 1993.
3. Practical Guide for Biomedical Signals Analysis Using Machine Learning Techniques A MATLAB® Based Approac, Elsevier publications • 2019

References:

1. Biomedical Digital Signal Processing Principles and Techniques-D C Reddy, TMH, 2005
2. Biomedical Signal Analysis, 2nd Edition Rangaraj M. Rangayyan ISBN: 978-0-470-91139-6 May 2015 Wiley-IEEE Press.

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C738**	**MIMO OFDM System (PE-IV)**	**3**	**0**	**0**	**3**

Pre-requisites:

Probability & Stochastic process, Cellular mobile Communications

Course Objectives:

This course is intended to impart to the students the principlesof

- The fundamental concepts and design principles in "Multiple-Input Multiple-Output" (MIMO) wireless communications –channel capacity, antenna diversity, space-time coding.
- The fundamental concepts in "Orthogonal Frequency-Division Multiplexing" (OFDM) communications – transmission, synchronization, peak-to-average power ratio (PAPR) reduction.
- This fundamental concepts of massive MIMO will present a comprehensive analytical development of the various concepts in massive MIMO and mmWave MIMO technologies for 5G together with practical insights and problem solving.

Course Outcome:

After Learning this course, the student will be able to gain knowledge and understanding of:

CO1. OFDM's transceiver architecture
CO2. The problem of PAPR and how to reduce thePAPR.
CO3. To understand how the OFDM receiver performs synchronization
CO4. Channel modeling and propagation
CO5. MIMO Capacity, space-time coding
CO6. Massive MIMO and mmWave MIMO technologies for 5G

CO	**MIMO OFDM - PE-IV(6C735)**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	OFDM's transceiver architecture		2										2	2		2
CO2	The problem of PAPR and how to reduce the PAPR.		2	2									2	2		2
CO3	To understand how the		2										2	2		2

	OFDM receiver performs synchronization															
CO4	Channel modeling and propagation		2	2	2	2							2	2		2
CO5	MIMO Capacity, space-time coding		2	2	2	2							2	2	2	2
CO6	Massive MIMO and mmWave MIMO technologies for 5G												2	2	2	2
CO	Overall		2	2	2	2							2	2	2	2

UNIT 1: Fast Fading Wireless Channel Modeling ,Rayleigh/Ricean Fading Channels ,BER Performance in Fading Channels ,Diversity modeling for Wireless Communications ,BER Performance Improvement with diversity ,Types of Diversity – Frequency, Time, Space.

UNIT 2: OFDM Basics I: Introduction to OFDM Effect- Multicarrier Modulation and Cyclic Prefix-Channel model and SNR performance- OFDM Issues of PAPR- Frequency and Timing Offset Issues.

UNIT 3:Bit Error Rate Analysis: BER Analysis for Space Time Coding, Transmit Beamforming , Receiver Selection Combining, Receiver Equal Combining, Receiver Maximal Ratio Combining.

UNIT 4: Introduction to MIMO, Beam forming Antennas, Diversity: Receive- antenna diversity; Transmit-antenna diversity, MIMO Diversity and applications ,MIMO Channel Capacity of ZF,LMMSE,MMSE .

UNIT 5:Introduction to MIMO: MIMO Channel Capacity-SVD and Eigen modes of the MIMO Channel-MIMO Spatial Multiplexing – BLAST-MIMO Diversity – Alamouti, OSTBC, MRT-MIMO - OFDM.

UNIT 6:Introduction to 5G Wireless Technologies: Key specs and New Techniques for 5G,Introduction to MIMO Wireless Communication Systems ,Channel Estimation for MIMO Systems, Multi-user MIMO Wireless Systems ,Introduction to Massive MIMO Wireless Systems ,Generalized Spatial Modulation, mm Wave MIMO Wireless Systems and Challenges.

Text Books:

1. MIMO-OFDM for LTE, WiFi and WiMAX Li Wang, Ming Jiang, Lajos L. Hanzo, Yosef Akhtman Weily2011
2. MIMO-OFDM Wireless Communications with MATLAB Yong Soo Cho,Jaekwon Kim, Won Young Yang, hung G. Kang John Wiley & Sons(2010)

References:

1. OFDM for Wireless Communications Systems Ramjee Prasad, Artech House Publishers(2004).
2. MIMO Wireless Communications EzioBiglieri Robert Calderbank Anthony Constantinides Andrea Goldsmith Arogya swami Paulraj H. Vincent Cambridge University Press(2007)

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C739**	**Machine Learning (PE-IV)**	**3**	**0**	**0**	**3**

Course Objectives: Learn the basic theory behind machine learning. Understand a range of machine learning algorithms along with their strengths and weaknesses; formulate machine learning techniques corresponding to various applications. Analyze the appropriate machine learning technique for a given problem.

Course Outcomes:At the end of this course the student will be able to

1. Formulate machine learning techniques corresponding to various applications.
2. Understand the concepts of Classification and regression models and their applicability
3. Learn the popular clustering algorithms and their parameters
4. Understand basic computational Learning Theory using PAC Learnability and Instance Based Learning
5. Apply machine learning algorithms for solving problems of moderate complexity using Gradient Descent Algorithm, Random Forest Algorithm for Predictive Analytics
6. Understand the Explanation based Learning and Inductive analytical approach to learning.

UNIT – I: INTRODUCTION to Learning: Forms of learning, Induction learning, Learning Decision Tree, Statistical learning methods, Learning with complex data, learning with hidden variables, Instance based learning, Reinforcement Learning, Brief Introduction to Pruning and Neural Network Concepts

UNIT II: SUPERVISED LEARNING Linear Models for Regression – Linear Basis Function Models – The Bias – Variance Decomposition – Bayesian, Linear Regression – Bayesian Model Comparison. Linear Models for Classification – Discriminant Functions – Decision Trees – Classification Trees – Regression Trees —– Feed-Forward Network Functions –BackPropagation – Regularization —– Radial Basis Function Networks – Ensemble methods – Bagging – Boosting.

UNIT III: UNSUPERVISED LEARNING Clustering – K-means – Mixtures of Gaussians –EM Algorithm in General – Model Selection for Latent Variable Models – High Dimensional Spaces – The Curse of Dimensionality – Dimensionality Reduction – Factor Analysis – Principal Component Analysis – Probabilistic PCA - Independent Components Analysis.

UNIT IV: ANALYSIS OF LEARNING TECHNIQUES Computational Learning Theory – PAC Learnability – VC Dimension – Mistake Bound model of Learning – Instance Based Learning

UNIT – V: LINEAR REGRESSION Regression Problem Analysis – Mathematical model - Gradient Descent Algorithm – Random Forest Algorithm - Machine Learning for Predictive Analytics

UNIT – VI ANALYTICAL LEARNING Learning with perfect domain theory – Explanation based Learning – Inductive analytical approach to learning – KBANN algorithm – TANGENTPROP algorithm

TEXT BOOK

1. Tom Michel, Machine Learning. Mc Graw Hill. 1997

REFERENCE BOOKS

1. Trevor Hustie, Robert Tibshirani& Jerome Friedman. The Elements of Statically Learning, Springer Verilag 2001

2. Chris Bishop, Neural Network for, Pattern Recognition, Oxford University Press. 1995

3. EthemAlpaydin, Introduction to Machine Learning", MIT Press, Prentice Hall of India, 2005

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C740**	**Microwave Integrated Circuits (PE-IV)**	**3**	**0**	**0**	**3**

UNIT- I

MIC Technology – Thick film and Thin film technology, Hybrid MICs, Monolithic MIC technology.

UNIT - II

Analysis of stripline and microstripline, Method of conformal Transformation, Characteristic parameters of strip, Microstrip lines, Microstrip Circuit Design, Impedance transformers, Filters, Lumped constant Microstrip circuits.

UNIT - III

Coupled Microstrips and Directional couplers, Even and odd mode analysis, Theory of coupled microstrip, Directional couplers, Calculations for a coupled pair of Microstrips, Branch line couplers.

UNIT - IV

Lumped Elements for MICs, Design and fabrication of lumped elements, circuits using lumped elements.

UNIT - V

Nonreciprocal components for MICs, Microstrip on Ferrimagnetic substrates, Microstrip circulators. Isolators and phase shifters, Design of microstrip circuits – high power and low power circuits.

UNIT - VI

TEXT BOOKS:

1. Gupta KC and Amarjit Singh, “Microwave Integrated circuits”, Wiley Eastern, 1974.
2. Leo Young, “Advances in Microwaves”, Academic Press.

REFERENCE BOOKS:

1. BharathiBhat,and S.K. Koul, “Strip line-like Transmission Lines for Microwave Integrated Circuits”, New Age International, 2007.

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C780**	**Internet of Things and Applications Lab**	**0**	**0**	**4**	**2**

Course objectives:

Course outcomes:

CO1:

CO2:

CO3:

CO4:

CO5:

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3
Overall		3	3	3	3				2			3	3	3	3

Sl. No.	Lab Experiment
1	Study and Configure Raspberry Pi 3 a) Installing Debian OS for Raspberry pi3 b) Flashing and Booting for the Rpi3 for the first time
2	Introduction to Linux Environment – Practice Linux commands and simple python programs on Rpi3 a) Write a Program for arithmetic operation in Python. b) Write a Program for looping statement in Python. b) Programming and Interfacing GPIOS – Blink LEDStart/Stop with Switch
3	Weather monitoring with DHT11 and data storage on cloud (ThingSpeak)
4	Write a program to store senor data in Rpi3 by creating database system.
5	Write a program to send sensor data to Cloud using Node Red service to perform Data Analytics using Rpi3

6	a) Interface and recording pictures and videos using Rpi3 b) Simple program for Colour object detector and tracker
7	Smart Home Application – Security System - Write a program to detect intruder with proximity sensor,record pictures and send alerts
8	Smart City Application – Street lighting System - Write a program to control street lights based on the ambience lighting
9	a) Writing python Code to implement of MQTT protocol on Rpi3 – Publisher b) Writing python Code to implement of MQTT protocol on Rpi3 – Subscriber
10	Writing python Code to implement of MQTT protocol on Rpi3 with multiple Publisher and Subscriber
Internet of Things Students Lab Projects	

IoT Lab Kit Content

• Raspberry Pi 3 model B (Wireless, Bluetooth)
• Micro SD memory card 8 GB • SD memory card adapter
• DHT 11 Sensor • Resistor,
• LED • Switch • Breadboard • Connecting wires
• HDMI to VGA Cable • Power Adapter and Micro USB cable

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C781**	**Advanced Communications and Networks Lab**	**0**	**0**	**4**	**2**

The objectives of this course are

- To Design and analyze.
- To Design and analyze.

Course Outcomes: After studying this course, the students will be able to

- To explore.
- To
- To understand
- To design

Mapping of Course Outcomes with Program Outcomes andProgram specific outcomes

	i	ii	Iii	iii	iv	v	vi	vii	viii	ix	x	xi	xii	PSO1	PSO2	PSO3
CO1	3	2	2	2	2								2	3	2	
CO2	3	2	2	2	2								2	3	2	
CO3	3	2	2	2	2								2	3	2	
CO4	3	2	2	2	2								2	3	2	

Syllabus Content

Syllabus Content

1. FSK Modulation and Demodulation technique
2. MSK –Modulation and Demodulation technique
3. DPSK -Modulation and Demodulation technique
4. QPSK Modulation and Demodulation technique
5. DQPSK Modulation and Demodulation technique
6. 8QAM- Modulation and Demodulation technique
7. OFDM - Modulation and Demodulation technique
8. Convolution Encoding and Decoding technique
9. Study of CDMA-DSSS Communication System with BER Measurement
10. BER performance of AWGN wireless systemusing MAT LAB software
11. Simulation of RAKE Receiver for CDMA communication using MAT LAB software.

12. Simulate and test various types of PN codes, chip rate, spreading factor and processing gain on performance of DSSS in CDMA using MAT LAB software.

13. Simulation of OFDM system using MATLAB software.

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C782**	**Microwave and Optical Communications Lab**	**0**	**0**	**4**	**2**

Prerequisites: *MWOC*

Course Objectives:

The objective of this course is to provide the students an in-depth knowledge and practice about the microwave and optical components and in analyzing the microwave and optical equipments.

Course Objectives*: After studying this course, the students will be able to*

CO1	*Analyze the characteristics of RKO and GUNN diode*
CO2	*Understand the principles governing attenuation and working of DC*
CO3	*Measure the K, S, Z and f at microwave frequencies.*
CO4	*Analyse the design principles of circulator and magic Tee*
CO5	*Understand the basic characteristics of LED and LASER*
CO6	*Measure the DR,NA and Losses for Digital and Analog Links*

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3
CO6		3	3	3	3				2			2	3	3	3
Overall		3	3	3	3				2			3	3	3	3

Part – A (Any 8 Experiments)

1. Reflex Klystron Characteristics.
2. Gunn Diode Characteristics.
3. Attenuation Measurement.
4. Directional Coupler Characteristics.
5. VSWR Measurement.
6. Impedance and Frequency Measurement.
7. Waveguide parameters measurement.
8. Scattering parameters of Circulator.
9. Scattering parameters of Magic Tee.

Part-B

1. Characterization of LED.
2. Characterization of Laser Diode.
3. Intensity modulation of Laser output through an optical fiber.
4. Measurement of NA

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C793**	**Summer Break – Internship – II**	**0**	**0**	**1**	**1**

Course Objective:

The students undergo industrial training so that he/she become industry-ready.

Course Outcomes:

At the end of the training, the student is able to

1. Select the real-time problem in the industry.
2. Analyze the requirements with respect to the problem statement
3. Design the optimal solution for the problem.
4. Implement the solution using the appropriate modern tools.
5. Present and submit the report

Mapping of Course Outcomes with Program Outcomes

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3							3	3	3	3	2		3
CO2	3	3		3					3	3	3	3	3		3
CO3	3	3	3	3					3	3	3	3	3		3
CO4	3	3			3				3	3	3	3	3	3	3
CO5									3	3	3	3			3
Overall		3	1	1	1				3	3	3	3	3	1	3

Student shall carryout the project in industry during summer vacation for 3-6 weeks. There is internal and external Evaluation. Internal Evaluation carries 30 marks and external Evaluation carries 70 marks, Total 100 marks.

IV–II

Syllabus for B. Tech (E.C.E.) IV Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - II	**8C841**	**Low power VLSI design (PE-V)**	**3**	**0**	**0**	**3**

Pre-Requisites:

Course Objectives:

Course Outcomes:

By the end of the course, students will be able to

CO1. understand the
CO2. Learn
CO3. confidently apply
CO4. Differentiate

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
Overall		3	3	3	3				2			3	3	3	3

UNIT I

Introduction, Low-Power design an overview, Low-Voltage, Low-Power design limitations: Power supply voltage, Threshold voltage, Scaling and Interconnect wires.

UNIT II

BiCMOS Processes: BiCMOS process using N-Well Process, BICMOS process using P-Well Process and BICMOS process using Twin-Well Process.

BiCMOS manufacturing and Integration considerations: Process considerations for CMOS device structures, Process considerations for Bipolar Transistors.

UNIT III

Isolation in BiCMOS: Isolation in Bipolar transistors-Junction isolation in the SBC process, Collector diffusion isolation; Isolation in MOS transistors-Local oxidation of Silicon, Deep trench isolation.

UNIT IV

Low-Voltage, Low-Power Logic Circuits-I: Conventional CMOS logic gates-Power dissipation in CMOS inverter, Basic NAND and NOR gates, Conventional BiCMOS logic gates-BiCMOS inverter, Basic driver configurations. Full swing with shunting devices.

UNIT V

Low-Voltage, Low-Power Logic Circuits-II: Full swing complementary MOS/Bipolar logic circuit, Full swing complementary MOS/Bipolar logic circuit with feedback, Merged BiCMOS digital circuit, Complementary BiCMOS circuits.

UNIT VI

Low-Power Latches and Flip-Flops: Introduction, Evolution of Latches and Flip-Flops.

TEXT BOOKS

1. CMOS/BiCMOS ULSI low voltage, low power by Yeo Rofail/ Goh(3 Authors)-Pearson Education Asia 1 st Indian reprint,2002

REFERENCES

1. Digital Integrated circuits ,J.Rabaey PH. N.J 1996
2. CMOS Digital ICs , Sung-moKang and Yusuf Leblebici 3 rd edition TMH 2003 (chapter 11)
3. VLSI DSP systems ,Parhi, John Wiley & sons, 2003 (chapter 17)
4. IEEE Trans Electron Devices, IEEE J.Solid State Circuits, and other National and International Conferences and Symposia

Syllabus for B. Tech (E.C.E.) IV Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - II	**8C842**	**System on Chip Architecture (PE-V)**	**3**	**0**	**0**	**3**

OBJECTIVES

After going through this course the student will be able to

- Understand the System Architecture and Processor Architecture, approach for a SOC Design.
- Learn the, Basic concepts in Processor Micro Architecture, and Learn Different Types of Processors like VLIW Processors, Superscalar Processors etc.
- Learn about SOC external memory, Scratchpads and Cache memory and Multilevel Caches.
- Learn the SOC Design approach, Design and evaluation, Applications Like Image compression etc

After studying this course, the students will be able to

1. Know basics of System Architecture
2. Understand the various types of Processors like VLIW Processors, Superscalar Processors.
3. Distinguish Cache memory and Multilevel Caches, SOC external memory.
4. Know the Concept of Inter Connect Architectures, SOC Standard Buses and Reconfiguration Technologies.
5. Know the concepts and issues related to Interconnect Configuration.
6. Explore the SOC Design approach and develop its applications.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3
CO6		3	3	3	3				2			2	3	3	3
Overall		3	3	3	3				2			3	3	3	3

UNIT-I: Introduction

Introduction to the System Approach: System Architecture, Components of the system, Hardware & Software, Processor Architectures, Memory and Addressing. System level interconnection, an approach for SOC Design, System Architecture and Complexity.

UNIT-II: Processors :

Introduction , Processor Selection for SOC, Basic concepts in Processor Architecture, Micro Architecture, Basic elements in Instruction handling. Buffers: minimizing Pipeline Delays, Branches, More Robust

Processors, Vector Processors and Vector Instructions extensions, VLIW Processors, Superscalar Processors.

UNIT-III: Memory Design for SOC:
Overview of SOC external memory, Internal Memory, Size, Scratchpads and Cache memory, Cache Organization, Cache data, Write Policies, Strategies for line replacement at miss time, Types of Cache, Split – I, and D – Caches, Multilevel Caches, Virtual to real translation , SOC Memory System, Models of Simple Processor – memory interaction.

UNIT-IV: Interconnect Customization and Configuration:
Inter Connect Architectures, Bus: Basic Architectures, SOC Standard Buses, Analytic Bus Models, Using the Bus model, Effects of Bus transactions and contention time. SOC Customization: An overview, Customizing Instruction Processor.

UNIT-V: Interconnect Configuration:
Reconfiguration Technologies, Mapping design onto Reconfigurable devices, Instance- Specific design, Customizable Soft Processor, Reconfiguration – overhead analysis and trade-off analysis on reconfigurable Parallelism.

UNIT-VI: Application Studies / Case Studies:
SOC Design approach, AES algorithms, Design and evaluation, Image compression – JPEG compression.

Text Books

- Computer System Design System-on-Chip – Michael J. Flynn and Wayne Luk, Wiely India Pvt. Ltd.
- Design of System on a Chip: Devices and Components – Ricardo Reis, 1st Ed., 2004, Springer

Reference Books

- ARM System on Chip Architecture – Steve Furber –2nd Ed., 2000, Addison Wesley Professional.
- System on Chip Verification – Methodologies and Techniques – Prakash Rashinkar, Peter Paterson and Leena Singh L, 2001, Kluwer Academic Publishers.

Syllabus for B. Tech (E.C.E.) IV Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - II	**8C843**	**Radar Signal Processing (PE-V)**	**3**	**0**	**0**	**3**

Course Objectives:

Course Outcomes:

CO1:

CO2:

CO3:

CO4:

UNIT I

BASICS OF RADAR AND RADAR SIGNAL POCESSING

Nature of Radar, Maximum Range, Radar Equation. Block Diagram. RadarFrequencies and Applications. Prediction of Range Performance.. Rx Noise.Modified Range Equation.Basic Radar Signal Processing, , Signal Models, components of a RadarSignal, Amplitude Models, clutter, Noise Model and Signal -to –NoiseRatio, Jamming,Frequency Models

UNIT-II

CW AND FMCW RADAR

Doppler Effect. CW Radar, Block diagram, Applications of CW Radar. Rxbandwidth requirements. FM CW Radar, Block diagram and characteristics.FM- CW Altimeter. The Doppler Shift, Spatial Models, Spectral Model

UNIT-III

MTI and Tracking RADAR

Block diagram of MTI Radar with Power Amplifier and Power Oscillators. NonCoherent MTI Radar. Delay line Cancellers. Double Cancellation. BlindSpeeds. Filter Characteristics. MTI vs Pulse Doppler Radar. Staggered PRF,Range gated Doppler Filters.

TRACKING RADARS

Tracking Radars: Sequential lobing. Conical Scan. Mono Pulse trackingRadars. Phase Comparison Mono Pulse.

UNIT-V

Sampling and Quantization of Pulsed Radar Signals, Domains andCriteria for Sampling, Radar Signals, Sampling in the Fast TimeDimension, Sampling in Slow Time – Selecting the Pulse

RepetitionInterval, Sampling the Doppler Spectrum, Sampling in the Spatial andAngle Dimensions, Quantization, I/Q Imbalance and Digital I/Q

UNIT-VI

Doppler Processing, Alternate Forms of the Doppler Spectrum, MovingTarget Indication (MTI), Pulse Doppler Processing, Pulse PairProcessing, Additional Doppler Processing Issues, Clutter Mapping andthe Moving Target Detector, MTI for moving plat forms

Text Books

1. Merrill I. Skolnik, Introduction to Radar Systems, McGraw-Hill, 2 nd Edition,1981.
2. Mark A. Richards, “Fundamentals of Radar Signal Processing”, McGraw Hill
3. Fred E. Nathanson, “Radar Design Principles: Signal Processing and TheEnvironment”,2ndEdition, 1999, PHI.

References

1. Merrill I.Skolnik,Introduction to Radar systems,McGraw-Hill,3 rd Edition,2001.
2. Byron Edde, Radar Principles,Technology,Applications. PearsonEdition,2004.
3. Peyton Z. Peebles, Jr., “Radar Principles”, 2004, John Wiley.
4. R. Nitzberg, “Radar Signal Processing and Adaptive Systems”, 1999, ArtechHouse.
5. F.E. Nathanson, “Radar Design Principles”, 1st Edition, 1969, McGraw Hill.

Syllabus for B. Tech (E.C.E.) IV Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - II	**8C844**	**5G Communications (PE-V)**	**3**	**0**	**0**	**3**

Pre-requisites:

Probability & Stochastic process, Cellular mobile Communications

Course Objectives:

This course is intended to impart to the students the principlesof

- The fundamental concepts and design principles in "Multiple-Input Multiple-Output" (MIMO) wireless communications –channel capacity, antenna diversity, space-time coding.
- The fundamental concepts in "Orthogonal Frequency-Division Multiplexing" (OFDM) communications – transmission, synchronization, peak-to-average power ratio (PAPR) reduction.
- This fundamental concepts of massive MIMO will present a comprehensive analytical development of the various concepts in massive MIMO and mmWave MIMO technologies for 5G together with practical insights and problem solving.

Course Outcome: After Learning this course, the student will be able to gain knowledge and understanding of:-

CO1	Learn 5G Technology advances and their benefits
CO2	Learn the key RF, PHY, MAC and air interface changes required to support 5G, OFDM's transceiverarchitecture
CO3	MIMO Capacity, space-timecoding
CO4	The problem of PAPR and how to reduce thePAPR. To understand how the OFDM receiver performssynchronization
CO5	Implementation options for 5G. Channel modeling and propagation
CO6	Learn Device to device communication and millimeter wave communication. Massive MIMO and mmWave MIMO technologies for 5G.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3
Overall		3	3	3	3				2			3	3	3	3

UNIT 1:

Overview of 5G Broadband Wireless Communications: Evaluation of mobile technologies 1G to 4G (LTE, LTEA, LTEA Pro), An Overview of 5G requirements, Regulations for 5G, Spectrum Analysis and Sharing for 5G. Introduction to Massive MIMO Wireless Systems, Generalized Spatial Modulation,mmWave MIMO Wireless Systems and Challenges.

UNIT 2:

Introduction to OFDM Effect- Multicarrier Modulation and Cyclic Prefix- Channel model and SNR performance- OFDM Issues of PAPR- Frequency and Timing Offset Issues. Fast Fading Wireless Channel Modeling, Rayleigh/Ricean Fading Channels, BER Performance in Fading Channels, Diversity modeling for Wireless Communications, BER Performance Improvement with diversity.
BER Analysis for Space Time Coding, Transmit Beam forming, Receiver Selection Combining, Receiver Equal Combining, Receiver Maximal Ratio Combining.

UNIT 3: Introduction to MIMO, Beam forming Antennas, Diversity: Receive- antenna diversity; Transmit-antenna diversity, MIMO Diversity and applications, MIMO Channel Capacity of ZF, LMMSE, MMSE. MIMO Channel Capacity-SVD and Eigen modes of the MIMO Channel-MIMO Spatial Multiplexing – BLAST-MIMO Diversity – Alamouti, OSTBC, MRT-MIMO - OFDM.

UNIT 4: Millimeter-wave Communications – spectrum regulations, deployment scenarios, beam-forming, physical layer techniques, interference and mobility management, Massive MIMO propagation channel models, Channel Estimation in Massive MIMO, Massive MIMO with Imperfect CSI, Multi-Cell Massive MIMO, Pilot Contamination, Spatial Modulation (SM)

UNIT 5: Transmission and Design Techniques for 5G: Basic requirements of transmission over 5G, Modulation Techniques – Orthogonal frequency division multiplexing (OFDM), generalized frequency division multiplexing (GFDM), filter bank multi-carriers (FBMC) and universal filtered multi-carrier (UFMC), Multiple Accesses Techniques – orthogonal frequency division multiple accesses (OFDMA), generalized frequency division multiple accesses (GFDMA), non-orthogonal multiple accesses (NOMA).

UNIT 6: The 5G wireless Propagation Channels: Channel modeling requirements, propagation scenarios and challenges in the 5G modeling, Channel Models for mmWave MIMO Systems.
Device-to-device (D2D) and machine-to-machine (M2M) type communications – Extension of 4G D2D standardization to 5G, radio resource management for mobile broadband D2D, multi-hop and multi-operator D2D communications.

Text Books:

1. Principles of Modern Wireless Communication Systems – Aditya K Jagannatham
2. MIMO-OFDM for LTE, WiFi and WiMAX Li Wang, Ming Jiang, Lajos L. Hanzo, YosefAkhtmanWeily2011
3. MIMO-OFDM Wireless Communications with MATLAB Yong Soo Cho,Jaekwon Kim, Won YoungYang, hung G. Kang John Wiley & Sons(2010)
4. Martin Sauter “From GSM From GSM to LTE–Advanced Pro and 5G: An Introduction to Mobile Networks and Mobile Broadband”, Wiley-Blackwell.
5. AfifOsseiran, Jose.F.Monserrat, Patrick Marsch, “Fundamentals of 5G Mobile Networks” , Cambridge University Press.
6. Athanasios G.Kanatos, Konstantina S.Nikita, Panagiotis Mathiopoulos, “New Directions in Wireless Communication Systems from Mobile to 5G”, CRC Press.
7. Theodore S.Rappaport, Robert W.Heath, Robert C.Danials, James N.Murdock “Millimeter Wave Wireless Communications”, Prentice Hall Communications.

References**:**

2. OFDM for Wireless Communications Systems Ramjee Prasad, Artech House Publishers(2004).

3. MIMO Wireless Communications EzioBiglieri Robert Calderbank Anthony Constantinides Andrea Goldsmith ArogyaswamiPaulraj H. Vincent Cambridge University Press(2007).
4. Jonathan Rodriguez, “Fundamentals of 5G Mobile Networks”, John Wiley & Sons.
5. Amitabha Ghosh and RapeepatRatasuk “Essentials of LTE and LTE-A”, Cambridge University Press.

Syllabus for B. Tech (E.C.E.) IV Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - II	**8C845**	**Deep Learning (PE-V)**	**3**	**0**	**0**	**3**

Pre-Requisites: Signals & Systems, Basics of Probability Theory, Linear Algebra & Calculus, Statistics and Machine Learning

Course Objectives:

The objective of this course is to provide the learners with a comprehensive understanding of Deep Learning Methods, Recurrent Neural Netwok and their applications.

Course Outcomes:

By the end of the course, students will be able to

CO1. understand the basics and complexity of Deep Learning algorithms and their limitations

CO2. Learn modern notions in data analysis oriented computing

CO3. confidently apply common Deep Learning algorithms in practice and implementing their own and

CO4. Differentiate various algorithms for sequence of data

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
Overall		3	3	3	3				2			3	3	3	3

Syllabus

UNIT – I Basics to Deep Learning

Introduction, History, Perceptron, MLP, review of Neural Network- Feedforward Neural Networks and Back Propagation- Gradient Decent and varients, Batch-normalization.

Activation Functions : Sigmoid,ReLU, Hyperbolic Tangent Functions, Softmax

UNIT – II Introduction to TensorFlow (Python will be used for understanding)

Computational Graph, Creating a Graph, Regression example, Handwritten digit classification using TensorFlow, TensorBoard, Keras Library

UNIT – III Deep Learning

Deep Feed Forward network, Training Deep Neural Networks using Back Propagation-Setup and initialization issues, vanishing and exploding Gradientproblems, Gradient- Descent Strategies, Overfitting and Generalizaton, Cross Validation, Feature Selection,Regularizations, Dropouts, Hyperparameters.

UNIT – IV :CNN (Convolutional Neural Networks)

Basic structure of Convolutional Network, Shortcomings of Feature Selection - Full Description of the Convolutional Layer - Max Pooling-Full Architectural Description of Convolution Networks, Backpropagation in CNNs, Evolution of CNN Architectures for Image Classification, Fine tuning in CNN.

UNIT – III Auto-encoders

Auto-encoders Neural Networks, Training, Undercomplete and Overcompleteautoencoders, Convolutional auto-encoders, De-convolution layer, Transposed convolution, Sparsely Regulated auto-encoders, Denoisingauto-encoders, Stacked auto-encoders, Variational auto-encoders.

UNIT – VI Recurrent Neural Networks

Introduction to RNN, Unfolding Computational Graph, Recurrent hidden units and Training Loss, Recurrence through output only, Forward Propagation, Teacher Forcing, Seq2Seq RNN, LSTM, GRU – Comparison of LSTM and GRUs, RNN applications.

BOOKS

1. Nikhil Buduma, Nicholas Locascio, "Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms", O'Reilly Media, 2017.
2. Ian Goodfellow, YoshuaBengio, Aaron Courville, "Deep Learning (Adaptive omputation and Machine Learning series", MIT Press, 2017.
3. CharuC.Aggarwal "Neural Networks and Deep learning" Springer International Publishing, 2018

Reference Books

1. Bishop, C. ,M., Pattern Recognition and Machine Learning, Springer, 2006.
2. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
3. Golub, G.,H., and Van Loan,C.,F., Matrix Computations, JHU Press,2013.
4. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Educatio2004.

Syllabus for B. Tech (E.C.E.) IV Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - II	**8C846**	**EMI/EMC (PE-V)**	**3**	**0**	**0**	**3**

UNIT - I

Introduction, Natural and Nuclear Sources of EMI / EMC: Electromagnetic environment, History, Concepts, Practical experiences and concerns, frequency spectrum conservations, An overview of EMI / EMC, Natural and Nuclear sources of EMI.

UNIT - II

EMI from Apparatus, Circuits and Open Area Test Sites: Electromagnetic emissions, Noise from relays and switches, Non-linearity in circuits, passive intermodulation, Cross talk in transmission lines, Transients in power supply lines, Electromagnetic interference (EMI), Open area test sites and measurements.

UNIT - III

Radiated and Conducted Interference Measurements: Anechoic chamber, TEM cell, GH TEM Cell, Characterization of conduction currents / voltages, Conducted EM noise on power lines, Conducted EMI from equipment, Immunity to conducted EMI detectors and measurements, ESD,

UNIT - IV

ESD, Electrical fast transients / bursts, Electrical surges.

UNIT - V

Grounding, Shielding, Bonding, and EMI filters: Principles and types of grounding, Shielding, and bonding, Characterization of filters, Power lines filter design.

UNIT - VI

Cables, Connectors, Components and EMC Standards: EMI suppression cables, EMC connectors, EMC gaskets, Isolation transformers, optoisolators, National / International EMC standards.

TEXT BOOKS:

1. Dr. V.P. Kodali, IEEE Publication, “Engineering Electromagnetic Compatibility”, Printed in India by S. Chand & Co. Ltd., New Delhi, 2000.
3. IIT – Delhi, “Electromagnetic Interference and Compatibility IMPACT series”, Modules 1 – 9.

REFERENCE BOOK:

1. C.R. Pal., “Introduction to Electromagnetic Compatibility”, Ny John Wiley, 1992.

Syllabus for B. Tech (E.C.E.) IV Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - II	**8C894**	**Major Project**	**0**	**0**	**10**	**5**

Prerequisite : All Courses till this semester

Course Objectives: To enhance the knowledge on selecting a project, learn related tools and enhance programming and communication skills for employability.

Course Outcomes:

At the end of this course the student will be able to

1. Develop plans with relevant people to achieve the project's goals
2. Break work down into tasks and determine handover procedures
3. Identify links and dependencies, and schedule to achieve deliverables
4. Estimate the human and physical resources required, and make plans to obtain the necessary resources
5. Allocate roles with clear lines of responsibility and accountability with team spirit.
6. Design and develop the software or prototype to meet societal needs

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		3	3	3		2				3	2	2
CO2		3	3	3		2				3	2	2
CO3		3	3	3		2				3	2	2
CO4		3	3	3		2				3	2	2
CO5		3	3	3		2				3	2	2
CO6	2	3	3	3		2				3	2	2
Overall	2	3	3	3		2				3	2	2

A project shall be carried out by a group of students consisting of 2 to 3 in number in fourth year second semester. This work shall be carried out under the guidance of the faculty assigned as internal guide and shall involve design, fabrication, software development or any other significant activity. This can be of interdisciplinary nature also.

Out of total 100 marks for project work (in the final year second semester), 30 marks shall be for Internal Evaluation and 70 marks for the External Evaluation at the end of the Semester.

External Evaluation of the project (viva-voce) shall be conducted by a committee appointed by the Chief Superintendent. The committee consists of an external examiner, HOD, a Senior Faculty Member, Project Coordinator and Internal Guide.

Division of marks for internal assessment – 30 marks

Sl.No	Description	Marks
1	Progress of Project work and the corresponding interim report as evaluated by Project Review Committee at the end of 6 weeks	5 marks
2	Seminar at the end of 6 weeks	5 marks
3	Progress of Project work as evaluated by Project Review Committee at the end of 11 weeks	5 marks
4	Seminar at the end of 11 weeks	5 marks
5	Evaluation by Project Review Committee at the end of 15 weeks and Final Project Report	5 marks
6	Final presentation and defence of project	5 marks
	Total	**30 marks**

Division of Marks for External Evaluation – 70 Marks

Sl.No	Description	Marks
1	Final Project Report	10 marks
2	Presentation	20 marks
3	Demonstration / Defense of Project	40 marks
4	**TOTAL**	**70 marks**

ECE Stream
Open Electives

Syllabus for B. Tech (E.C.E.) III Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - I	**8CC51**	**Electronics and Instrumentation(OE-I)**	**2**	**0**	**0**	**2**

Prerequisite: Fundamental concepts of Network Theory and Electronic Circuits.

Course Objectives:

This course aims to:

1. Explain basic concepts, definitions and error analysis in measurement.
2. Identify the details of instrumentation and devices intended for a particular application.
3. Elaborate discussion about the importance of signal display devices and analyzers in measurement and

describe the various bridge configurations and their applications.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Define the characteristics and analyze the errors of measurement systems.
2. Select the appropriate passive or active transducers for measurement of physical phenomenon.
3. Relate and apply the appropriate measuring techniques to real time applications.
4. Interpret the usage of DVM, Spectrum Analyzer and DSO instruments for appropriate measurements.
5. Develop an understanding of construction and working of different AC and DC bridges and their applications.

UNIT– I

Error - Absolute error, Relative error and Accuracy, Precision - conformity and significant figures, limiting errors, Propagation of errors, Errors in measurement-gross, systematic and random errors,

UNIT – II

Loading effect, Statistical analysis ofmeasurement data and probable error, Resolution, Sensitivity, Calibration. Classification of transducers, Strain gauges - gauge factor, bonded, un-bonded and semiconductor stain gauges

UNIT – III

LVDT - principle, construction and displacement measurement, Capacitive transducer - principle andthicknessmeasurement, Piezo-electric transducer and different modes of operation, Photo-electric transducers.

UNIT – IV

Characteristics, pressure, power and intensity levels of sound, Microphones, Temperature measurement - resistance wire thermometers, semiconductor thermometers and thermocouples.

UNIT – V

DVMs- ramp, dual-slope integration, integrating and successive-approximation types, digit, resolution, sensitivity and general specifications, Spectrum analyzers, Digital storage oscilloscope, Introduction to Virtual Instrumentation

UNIT – VI

Introduction to Bridges, DC Bridges - Wheatstone's bridge, Kelvin's bridge, AC bridges - introduction, general balance equation for four arm bridge, capacitance comparison bridge, inductance comparison bridge, Maxwell's bridge, Wien'sbridge, Wagner's earth connection.

Text Books:

1. Albert D. Helfric, and William D. Cooper, "Modern Electronic Instrumentation and Measurement
Techniques", PHI, 2010.
2. D V S Murthy, "Transducers and Instrumentation", 2nd Edition, PHI, 2013.
3. Nakra B.C, and Chaudhry K.K., "Instrumentation, Measurement and Analysis", 3rdEdition, TMH, 2013.

Reference Books:

1. David A. Bell, "Electronic Instrumentation and Measurements", 2nd Edition, PHI, 2003.
2. H S Kalsi, "Electronic Instrumentation", 3rdEdition, TMH, 2011.
3. A.K.Sawhney, "Electrical & Electronic Measurement and Instruments", DhanpatRai& Co. Publications, 2005.

Year/Sem	Sub. Code	Subject Name	L	T	P/D	C
III-II	**8CC52**	**Fundamentals of digital circuits & Microprocessors**	**2**	**0**	**0**	**2**

Course objectives: To develop the skills for understanding the design of digital circuits, learn programming skills for 8086 Microprocessor and interfacing peripherals to it.

Course outcomes*:*

1. *To understand number systems and apply the rules of Boolean algebra to simplify Boolean expressions using theorems and K-maps.*
2. *To design combinational circuits such as full adders, multiplexers, decoders, encoders. Code converters etc.*
3. *To design basic memory units (latches and flip-flops) and sequential circuits*
4. *To understand Architecture of 8086 and analyzing in single mode and in multi processor mode.*
5. *To understand instructions of 8086 and to write Assembly Language Programs*
6. *To interface I/0 devices with 8086.*

CO	**Fundamentals of digital circuits & Microprocessors(7CC37)**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	*To understand number systems and apply the rules of Boolean algebra to simplify Boolean expressions using theorems and K-maps.*	3	2	2	2	2								2	2	
CO2	*To design combinational circuits such as full adders, multiplexers, decoders, encoders.*	3	2	2	2	2								2	2	

	Code converters etc															
CO3	*To design basic memory units (latches and flip-flops) and sequential circuits*	3	2	2	2	2							2	2		
CO4	*To understand Architecture of 8086 and analyzing in single mode and in multi processor mode.*	3	2	2	2	2							2	2		
CO5	*To understand instructions of 8086 and to write Assembly Language Programs .*	3	2	2	2	2							2	2		
CO6	*To understand instructions of 8086 and to write Assembly Language Programs*	3	2	2	2	2							2	2		
CO	Overall	3	2	2	2	2							2	2		

UNIT – I

Number System and Boolean Algebra: Binary, decimal, octal, hexa decimal, weighted and un-weighted codes. Axiomatic definition of Boolean algebra, Binary operators, postulates of and theorems. Boolean

addition, subtraction, 1's complement, 2's complement. Switching functions, Canonical forms and Standard forms, Simplification of switching functions using theorems. K-map representation, simplification of logic functions using K-map.

UNIT - II

Combinational Logic Design: Single output and multiple output combinational logic circuit design, Binary adders/subtractors, Encoder, Decoder, Multiplexer, Demultiplexer, Parity bit generator, Code-converters.

UNIT - III

Sequential circuits: Classification of sequential circuits, the clocked SR flip flop, J- K, T and D-types flip flops, triggering mechanism of flip-flops, flip-flop conversion, introduction to counters and registers

UNIT - IV

Architecture of 8086 Microprocessor: Memory segmentation, BIU and E.U General Purpose registers, 8086 flag register and function of 8086 Flags, Pin diagram of 8086-Minimum mode and maximum mode of operation.

UNIT – V

Instruction set of 8086: Addressing modes of 8086, Assembly directives, Simple programs. Assembly language programs: involving logical, Branch & Call instructions, sorting.

UNIT - VI

Interfacing with 8086: Interfacing with RAM, ROM, 8255 PPI – Interfacing with key board, ADC and DAC Stepper Motor.

Text Books:

2. Morris Mano-,Digital design –PHI, 2nd Edition.
3. ZviKohavi and Niraj K Jha -Switching & Finite Automata theory – Cambridge, 3rd Edition.
4. Microprocessors and interfacing – Douglas V. Hall, TMH, 2nd Edition, 1999.
5. Advanced microprocessor & Peripherals - A.K.Ray & K.M.Bhurchandi, TMH, 2000.

References:

1. Fletcher -An Engineering Approach to Digital Design – PHI.
2. Fundamentals of Logic Design, Roth, Kenny, Seventh Edition, Cengage Learning
3. R.P.Jain-Switching Theory and Logic Design- TMH Edition,2003.
4. CVS Rao -Switching Theory and Logic Design –Pearson Education, 2005
5. Micro computer systems, The 8086/8088 Family Architecture, Programming and Design – Y.Liu and G.A. Gibson, PHI, 2nd Edition.

Syllabus for B. Tech (E.C.E.) III Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - II	**8CC53**	**Fundamentals of Communication(OE-II)**	**2**	**0**	**0**	**2**

Course Objectives:
The objective of this subject is to:
1.Introduce the students to communication systems, frequency spectrum ,need for modulation , antenna and measurable parameters.
2. Introduce to various analog and digital modulation schemes.
3. Introduce Radio system, Antenna and Wave propagation.
4. Knowledge in telecommunication systems and Networking
5. Knowledge of satellite communication and Optical communication
6. Cellular and mobile communication, knowledge in wireless technologies.

Course Outcomes: By completing this subject, the student can
- Work on various types of modulations.
- Should be able to use these communication modules in implementation.
- Will have a basic understanding of various wireless and cellular, mobile and telephone communication systems.

UNIT - I
Introduction: Need for Modulation, Frequency translation, Electromagnetic spectrum, Gain, Attenuation and decibels. Fundamentals of antenna and wave propogation.

UNIT - II
Simple description on Modulation: Analog Modulation-AM, FM, Pulse Modulation-PAM, PWM, PCM, Digital Modulation Techniques-ASK, FSK, PSK, QPSK modulation and demodulation schemes.

UNIT - III
Radio System:
Transmitter fundamentals, Power amplifier, and Typical transmitter circuit.
Super heterodyne receiver, Typical receiver circuit and Noise.
Antenna and Wave Propagation :
Antenna fundamentals, commonly usedantenna ,wave propagation and transmission line.

UNIT - IV
Telecommunication Systems: Telephones Telephone system, Paging systems, Internet Telephony.
Networking and Local Area Networks: Network fundamentals, LAN hardware, Ethernet LANs, Token Ring LAN.

UNIT - V
Satellite Communication: Satellite Orbits, satellite communication systems, satellite subsystems, Ground Stations Satellite Applications, Global Positioning systems.
Optical Communication: Optical Principles, Optical Communication Systems, Fiber –Optic

Cables, Optical Transmitters & Receivers, Wavelength Division Multiplexing.

UNIT - VI

Cellular and Mobile Communications: Cellular telephone systems, AMPS, GSM, CDMA, and WCDMA.

Wireless Technologies: Wireless LAN, PANs and Bluetooth, Zig Bee and Mesh Wireless networks, Wimax and MANs, Infrared wireless, RFID communication, UWB.

Text Books:

1. Principles of Electronic Communication Systems, Louis E. Frenzel, 3e, McGraw Hill publications,4th edition, 2016.
2. Electronic Communications systems, Kennedy, Davis 4e, MC GRAW HILL EDUCATION, 1999

Reference Books:

1. Theodore Rapp port, Wireless Communications - Principles and practice, Prentice Hall, 2002.
2. Roger L. Freeman, Fundamentals of Telecommunications, 2e, Wiley publications.
3. Introduction to data communications and networking, Wayne Tomasi, Pearson Education, 2005.

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8CC54**	**Electronic Circuit Design and Analysis (OE-III)**	**2**	**0**	**0**	**2**

Course outcomes:After studying this course, the students will be able to

1. understand the concept of feedback and analyze its effect in input and output impedances of feedback amplifiers
2. Distinguish between small and large signal amplifier and able to compare the conversion efficiency levels
3. able to design linear and non-linear wave shaping circuits
4. Demonstrate the concepts of Differential Amplifier and Operational Amplifier and their characteristics anddesign of the basic circuits using IC741.
5. Explore, design and analysis of Filters, 555 Timers and data converters.
6. Classify and characterize the various Logic Families.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	3		2			2				3	2	
CO2	2	3	3	3		2			2				3	2	
CO3	2	3	3	3		2			2				3	2	
CO4	2	3	3	3		2			2				3	2	
CO5	2	3	3	3		2			2				3	2	
CO6	2	3	3	3		2			2				3	2	
Overall	2	3	3	3		2			2				3	2	

Unit-I

FEED BACK AMPLIFIERS

Fundamentals of feedback-classification- Characteristics of feedback Amplifier, effect of feedback in voltage series, voltage shunt, current series and current shunt amplifiers.

Unit-II

POWER AMPLIFIERS

Classification of Power Amplifiers - Class A, B, AB & C power amplifiers –push pull configuration, complementary symmetry circuits, Distortion in Amplifiers, Harmonic distortion and Crossover Distortion in Power Amplifiers– Conversion efficiency and relative performance.

Unit-III

WAVE SHAPING – Linear and Non-linear

RC high pass, low pass circuit response for sinusoidal, step, pulse, square, ramp inputs-Differentiator –Integrator.

Diode clippers- Transistor clipper- clipping at two independent levels – Emitter coupled clipper Clamping operation – clamping with source, diode resistances- clamping circuits theorem.

Unit-IV

OPAMP CHARACTERISTICS and Applications

Differential Amplifiers and its Characteristics. Op-Amp Block Diagram, Ideal OP-AMP Characteristics,DC and AC Characteristics. 741 Op-Amp and its Features and Characteristics. Op-amp asAdder/Subtractor, Difference Amplifier, Instrumentation Amplifier, Differentiator, Integrator,Comparators.

Unit-V

FILTERs, TIMERs

Filters: Introduction, Butterworth Filters- First and Second Order Active Filters- LPF, HPF, BPF, BRF.Introduction to 555 Timer, Functional Block, 555 timers as Monostable and AstableMultivibrators andApplications, Introduction to A/D and D/A converters, R-2R ladder type DAC, Successive ApproximationRegister type ADC.

Unit-VI

LOGIC FAMILIES

Classification of IC Logic Families. Standard TTL NAND & NOR Gate-Analysis, CMOS Logic family-NAND & NOR Gate-Analysis , ECL family. Comparison of Various Logic Families.

Text Books -

D. Roy Chowdhary, Linear Integrated Circuits , New Age Publications (P) Ltd, 2nd Edition, 2003

John F. Wakerly, Digital Design Principles & Practices, PHI/ Pearson Education Asia, 3rd Ed., 2005.

References -

Ramakanth A. Gayakwad, Op-Amps & Linear ICs, PHI,1987.