TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous)

ELECTRONICS AND COMMUNICATION ENGINEERING COURSE STRUCTURE & SYLLABUS (R18)

B.Tech. V Semester

S. No.	Course Code	Course Title	L	T	P	Credits
1	**B45PC1**	Electromagnetic Theory And Transmission Lines	3	1	0	3
2	**B45PC2**	VLSI Design	4	1	0	4
3	**B45PC3**	Digital Signal Processing	4	1	0	4
4	**B45PC4**	Digital Communications	3	1	0	3
		Open Elective – I	3	1	0	3
5	**B45PC6**	VLSI & ECAD Lab – I	0	0	3	1.5
6	**B45PC7**	Digital Communications Lab	0	0	3	1.5
7	**B45PC8**	Digital Signal Processing Lab	0	0	2	1.0
		TOTAL CREDITS				**21**

Semester VI

S. No.	Course Code	Course Title	L	T	P	Credits
1	**B46PC1**	Antennas and Wave Propagation	3	1	0	3
2	**B46PC2**	Microprocessors and Microcontrollers	4	1	0	4
3	**B46PE3**	**Program Elective – I** **B46PE3-I:** Cellular and Mobile Communications **B46PE3-II:** MEMS **B46PE3-III:** Information Theory and Coding	4	1	0	4
4	**B46PE4**	**Program Elective – II** **B46PE4-I :** Wireless Communications and Networks **B46PE4-II:** Image Processing and Pattern Recognition **B46PE4-III:** Power Electronics	3	1	0	3
		Open Elective – II	3	1	0	3
5	**B46PC6**	VLSI & ECAD Lab – II	0	0	2	1
6	**B46PC7**	Microprocessors and Microcontrollers Lab	0	0	3	1.5
7	**B46HS8**	Advanced English Communication Skills Lab	0	0	3	1.5
		TOTAL CREDITS				**21**

TKR COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING – R18

ELECTROMAGNETIC THEORY AND TRANSMISSION LINES - B45PC1

B.Tech. V Semester **L/T/P/C**
3/1/0/3

COURSE OBJECTIVES:
This is a structured foundation course, dealing with concepts, formulations and applications of Electromagnetic Theory and Transmission Lines, and is the basic primer for all electronics and communication engineering subjects. The main objectives of the course are:

1. To explain the basics of electrostatic and magneto static concepts and show the time varying electromagnetic fields as applied to high frequency circuit design.
2. To interpret the electromagnetic wave characteristics at interface of different boundaries.
3. To illustrate the importance of transmission line theory and applications of it to circuit design with the help of Smith chart.
4. To understand the basic concepts of guided waves.

COURSE OUTCOMES:
Having gone through this foundation course, the students would be able to

1. Analyze the electric fields due to different charge distributions and analyze the electric fields in different mediums.
2. Distinguish between the static and time-varying fields, establish the corresponding sets of Maxwell's Equations and Boundary Conditions, and use them for solving engineering problems.
3. Analyze the EM wave propagation and attenuation in various media and analyze the importance of pointing theorem.
4. Determine the Transmission Line parameters for different lines characterize the distortions and estimate the characteristics for different lines.
5. Choose smith chart to design transmission lines, to find the reflection coefficient for given impedance and vice versa.

UNIT – I:
Electrostatics: Introduction to coordinate systems and Vector analysis. Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Maxwell's Two Equations for Electrostatic Fields, Energy Density. Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations; Capacitance – Parallel Plate, Coaxial, Spherical Capacitors, Illustrative Problems.

UNIT – II:
Magnetostatics: Biot-Savart's Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magneto static Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law.

Maxwell's Equations (Time Varying Fields): Faraday's Law and Transformer EMF,Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in

Different Final Forms
and Word Statements, Conditions at a Boundary Surface Dielectric-Dielectric and Dielectric-Conductor Interfaces.

UNIT – III:

EM Wave Characteristics - I: Wave Equations for Conducting and Perfect DielectricMedia, Uniform Plane Waves – Definition, All Relations Between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics– Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Polarization.

EM Wave Characteristics – II: Reflection and Refraction of Plane Waves – Normal andOblique Incidences for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector andPoynting Theorem – Application.

UNIT – IV:

Transmission Lines - I: Types, Parameters, Transmission Line Equations, Primary &Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Losslessness/Low Loss Characterization, Distortion – Condition for Distortionlessness and Minimum Attenuation, Loading - Types of Loading.

UNIT – V:

Transmission Lines – II: Input Impedance Relations, SC and OC Lines, ReflectionCoefficient, VSWR. UHF Lines as Circuit Elements; λ/4, λ/2, λ/8 Lines – Impedance Transformations, Significance of Z_{min} and Z_{max}, Smith Chart – Configuration and Applications, Single Matching.

Guided waves: Propagation of TE, TM and TEM waves between Parallel planes.

TEXT BOOKS

1. Principles of Electromagnetics – Matthew N.O. sadiku and S.V. Kulkarni, 4th Ed., Oxford University Press, Aisan Edition, 2015.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, 2nd Ed. 2000, PHI.
3. Transmission Lines and Networks – UmeshSinha, SatyaPrakashan, 2001, (Tech. India Publications), New Delhi.

REFERENCE BOOKS

1. Engineering Electromagnetics – Nathan Ida, 2nd Ed., 2005, Springer (India) Pvt. Ltd., New Delhi.
2. Networks, Lines and Fields – John D. Ryder, 2nd Ed., 1999, PHI.
3. Engineering Electromagnetics – William H. Hayt Jr. and John A. Buck, 7th Ed., 2006,Mc Graw Hill Education.

TKR COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

VLSI DESIGN - B45PC2

B.Tech. V Semester **L/T/P/C**

4/1/0/ 4

COURSE OBJECTIVES:

The objectives of the course are to:

1. Give exposure to different steps involved in the fabrication of ICs using MOS transistor, CMOS/ BICMOS transistors, and passive components.
2. Explain electrical properties of MOS and BiCMOS devices to analyze the behavior of inverters designed with various loads.
3. Give exposure to the design rules to be followed to draw the layout of any logic circuit.
4. Provide concept to design different types of logic gates using CMOS inverter and analyze their transfer characteristics.
5. Provide design concepts to design building blocks of data path of any system using gates.

COURSE OUTCOMES:

Upon successfully completing the course, the student should be able to:

1. Acquire qualitative knowledge about the fabrication process of integrated circuit using MOS transistors.
2. Choose an appropriate inverter depending on specifications required for a circuit
3. Draw the layout of any logic circuit which helps to understand and estimate parasitic of any logic circuit
4. Design different types of logic gates using CMOS inverter and analyze their transfer characteristics
5. Provide design concepts required to design building blocks of data path using gates.
6. Extra hardware to improve testability of system.

UNIT – I:

Introduction: Introduction to IC Technology – MOS, PMOS, NMOS, CMOS & BiCMOS.

Basic Electrical Properties: Basic Electrical Properties of MOS and BiCMOS Circuits: I_{ds}- V_{ds} relationships, MOS transistor threshold Voltage, g_m, g_{ds}, Figure of merit ωo; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

UNIT – II:

VLSI Circuit Design Processes: VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, 2 μm CMOS Design rules for wires, Contacts and Transistors Layout. Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits.

UNIT – III:

Gate Level Design: Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Time delays, Driving large capacitive loads, Wiring capacitance, Fan – in, Fan – out, Choice of layers.

UNIT – IV:

Data Path Subsystems: Subsystem Design, Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Zero/One Detectors, Counters.

Array Subsystems: SRAM, DRAM, ROM, Serial Access Memories.

UNIT – V:

Programmable Logic Devices: PALs, PLAs, FPGAs, CPLDs, Standard Cells, Programmable Array Logic, Design Approach, Parameters influencing low power design.

CMOS Testing: CMOS Testing, Need for testing, Test Principles, Design Strategies for test, Chip level Test Techniques.

TEXT BOOKS

1. Essentials of VLSI circuits and systems – Kamran Eshraghian, Eshraghian Dougles and A.Pucknell, PHI Edition, 2005.
2. CMOS VLSI Design – A Circuits and Systems Perspective, Neil H. E Weste, David Harris, Ayan Banerjee, 3rd Ed, Pearson, 2009.

REFERENCE BOOKS

1. CMOS logic circuit Design - John .P. Uyemura, Springer, 2007.
2. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition.

TKR COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

DIGITAL SIGNAL PROCESSING - B45PC3

B.Tech. V Semester **L/T/P/C**
4/1/0/4

COURSE OBJECTIVES:

1. To provide background and fundamental material for the analysis and processing of Digital signals.
2. To familiarize the relationships between continuous-time and discrete time signals and systems.
3. To study fundamentals of time, frequency and Z-plane analysis and to discuss the Inter-relationships of this analytic method.
4. To study the designs and structures of digital (IIR and FIR) filters from analysis to synthesis for a given specifications.
5. The impetus is to introduce a few real-world signal processing applications.
6. To acquaint in FFT algorithms, Multi-rate signal processing techniques and finite word length effects.

COURSE OUTCOMES:

Completion of the course, the student will be able to:

1. Perform time, frequency, and Z -transform analysis on signals and systems.
2. Understand the inter-relationship between DFT and various transforms.
3. Understand the significance of various filter structures and effects of round off errors.
4. Design a digital filter for a given specification.
5. Understand the fast computation of DFT and appreciate the FFT processing.

UNIT – I:

Introduction: Introduction to Digital Signal Processing: Discrete Time Signals & Sequences, Conversion of continuous to discrete signal, Normalized Frequency**,** Linear Shift Invariant Systems, Stability, and Causality, linear differential equation to difference equation**,** Linear Constant Coefficient Difference Equations, Frequency Domain Representation of Discrete Time Signals and Systems.

Realization of Digital Filters: Applications of Z – Transforms, Solution of Difference Equations of Digital Filters, System Function, Stability Criterion, Frequency Response of Stable Systems, Realization of Digital Filters – Direct, Canonic, Cascade and Parallel Forms.

UNIT – II:

Discrete Fourier Transforms: Properties of DFT, Linear Convolution of Sequences using DFT, Computation of DFT: Over-Lap Add Method, Over-Lap Save Method, Relation between DTFT, DFS, DFT and Z-Transform.

Fast Fourier Transforms: Fast Fourier Transforms (FFT) - Radix-2 Decimation-in-Time and Decimation-in-Frequency FFT Algorithms, Inverse FFT, and FFT with General Radix-N.

UNIT – III:

IIR Digital Filters: Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital Filters from Analog Filters, Step and Impulse Invariant Techniques, Bilinear Transformation Method, Spectral Transformations.

UNIT – IV:

FIR Digital Filters: Characteristics of FIR Digital Filters, Frequency Response, Design of FIR Filters: Fourier Method, Digital Filters using Window Techniques, Frequency Sampling Technique, Comparison of IIR & FIR filters.

UNIT – V:

Multirate Digital Signal Processing: Introduction, Down Sampling, Decimation, Upsampling, Interpolation, Sampling Rate Conversion, Conversion of Band Pass Signals, Concept of Resampling, Applications of Multi Rate Signal Processing.

Finite Word Length Effects: Limit cycles, Overflow Oscillations, Round-off Noise in IIR Digital Filters, Computational Output Round off Noise, Methods to Prevent Overflow, Trade-off between Round Off and Overflow Noise, Measurement of Coefficient Quantization Effects through Pole-Zero Movement, Dead Band Effects.

TEXT BOOKS

1. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education / PHI, 2007.
2. Discrete Time Signal Processing – A. V. Oppenheim and R.W. Schaffer, PHI, 2009.
3. Fundamentals of Digital Signal Processing – Loney Ludeman, John Wiley, 2009.

REFERENCES

1. Digital Signal Processing – Fundamentals and Applications – Li Tan, Elsevier, 2008.
2. Fundamentals of Digital Signal Processing using MATLAB – Robert J. Schilling, Sandra L. Harris, Thomson, 2007.
3. Digital Signal Processing - A Practical approach, Emmanuel C. Ifeachor and Barrie, W.Jervis, 2nd Edition, Pearson Education, 2009.

TKR COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

DIGITAL COMMUNICATIONS - B45PC4

B.Tech. V Semester **L/T/P/ C**
3/1/0/ 3

COURSE OBJECTIVES:

1. To understand the functional block diagram of Digital Communication system.
2. To understand the various digital modulation techniques.
3. To understand a mathematical model of Digital Communication system for bit error rate analysis of different Digital Communication systems.
4. To study various source and channel coding techniques.
5. To study the performance of spread spectrum modulation.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to:

1. Analyze the basic digital modulation techniques such as PCM, DM etc., and understand the concepts of sampling.
2. Understand the concepts of different Shift Keying techniques.
3. Understand the basics of information theory and analyze the error performance, design optimum receivers for digital modulation techniques.
4. Understand about different error detection and correcting codes like block codes, cyclic codes and convolutional codes.
5. Analyze the performance of Spread Spectrum and Noise.

UNIT –I:

ELEMENTS OF DIGITAL COMMUNICATION SYSTEMS: Model of digital communication systems, Digital representation of Analog signal, certain issues in Digital transmission, Advantages of digital communication systems, Sampling Theorem, Types of sampling- impulsesampling, natural sampling, flat-top sampling, Introduction to Base band sampling.

WAVEFORM CODING TECHNIQUES: PCM generation and reconstruction, Quantization noise, Non uniform quantization and companding, DPCM, Adaptive DPCM, DM and Adaptive DM, Noise in PCM and DM.

UNIT –II:

DIGITAL MODULATION TECHNIQUES: Introduction, ASK, ASK modulator, Coherent ASK detector, Non-coherent ASK detector, FSK, Bandwidth and Frequency spectrum of FSK, Non coherent FSK detector, Coherent FSK detector, FSK detection using PLL, BPSK, Coherent PSK Detection, QPSK, 8-PSK,16-PSK,Differential PSK,QAM.

UNIT –III:

INFORMATION THEORY: Information and Entropy, Conditional Entropy and Redundancy, Shannon-Fano coding, mutual information, Information loss due to noise, source coding-Huffman code, Variable length coding, Lempel-Ziv coding, source coding to increase average information per bit, Lossy source coding, Bandwidth-S/N tradeoff, Hartley Shannon Law.

BASEBAND PULSE TRANSMISSION: Introduction, Matched filter, Error rate due to noise, Inter symbol interference, Nyquist's criterion for distortion less baseband binary transmission, eye patterns.

DIGITAL PASSBAND TRANSMISSION: Pass band transmission model, probability of error, correlation receiver.

UNIT- IV:

ERROR CONTROL CODES: LINEAR BLOCK CODES: Matrix description of linear block codes, Error detection and correction capabilities of linear block codes.

CYCLIC CODES: Algebraic structure, Encoding, syndrome calculation, Decoding.

CONVOLUTION CODES: Encoding, Decoding using state, Tree, Trellis diagrams, Decoding using Viterbi algorithm.

UNIT –V:

SPREAD SPECTRUM MODULATION: Use of spread spectrum, direct sequence spread spectrum (DSSS), Code division Multiple Access, Ranging using DSSS, Frequency hopping spread spectrum, PN-sequences: Generation and characteristics, Synchronization in spread spectrum systems.

TEXT BOOKS

1. Digital communication—Simon Haykin, John Wiley, 4 th edition, 2009.
2. Digital and analog communication systems-Sam Shanmugam, John Wiley, 2005.
3. Digital communications- Bernard sklar and Pabitra Kumar Ray-Pearson,2nd edition ,2009.

REFERENCES

1. Principles of Communication Systems-Herbert Taub, Donald L schilling, Goutham Saha, 3rd Edition, McGraw Hill, 2008.
2. Electronic Communication systems, Wayne tomasi, 5th Edition, Pearson.
3. Communication Systems-Analog and Digital, R.P.Singh, S.Sapre, McGraw Hill Education, 2012.
4. Digital Communications-John G.Proakis, Masoud Salehi-5th edition, McGraw-hill, 2008.

TKR COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

VLSI & E-CAD LAB – I (B45PC6)

B.Tech. V Semester **L/T/P/ C**

0/0/3/ 1.5

COURSE OBJECTIVES:

1. To study the HDL programming language.
2. To learn the simulation of basic gates using the HDL.
3. To learn the simulation of combinational circuits using HDL.
4. To learn the synthesis and layouts of analog and digital CMOScircuits.
5. To develop an ability to simulate and synthesize various digital circuits.

COURSE OUTCOMES:

At the end of the course, students will be able to:

1. Simulate various digital circuits.
2. Simulate and synthesize various CMOS circuits.
3. Understand the layout design rules for both static CMOS and dynamic clocked CMOS Circuits.
4. Develop an ability of designing of analog and digital CMOS circuits.
5. Design of Digital VLSI Circuits, stick diagram of circuits.
6. Design Entry & simulation of combinational circuits with test bench & functional verification.
7. Generation of configuration/fuse files for combinational circuits & implementation of the hardware using FPGA.
8. Design a schematic and simple layout for CMOS circuits, parasitic extraction.
9. Be able to complete a significant VLSI design project having a set of objective criteria and design constraints

LIST OF EXPERIMENTS

Design and implementation of the following CMOS digital/analog circuits using **Cadence / Mentor Graphics / Synopsys /Equivalent** CAD tools. The design shall include Gate-level design, Transistor-level design, Hierarchical design, Verilog HDL/VHDL design, Logic synthesis, Simulation and verification, Scaling of CMOS Inverter for different technologies, study of secondary effects (temperature, power supply and process corners), Circuit optimization with respect to area, performance and/or power, Layout, Extraction of parasitic and back annotation, modifications in circuit parameters and layout consumption, DC/transient analysis, Verification of layouts (DRC, LVS)

PART- A (E-CAD programs)

Programming can be done using any complier. Down load the programs on FPGA/CPLD boards and performance testing may be done using pattern generator (32 channels) and logic analyzer apart from verification by simulation with any of the front end tools.

1. HDL code to realize all the logic gates
2. Design of half adder and half Subtractor
3. Design of Full adder using 3 modeling styles
4. Design of 2-to-4 decoder.
5. Design of 3-to-8 decoder using 2-to-4 decoder.
6. Design of 8-to-3 encoder (without and with priority).

7. Design of 8-to-1 multiplexer and 1-to-8 Demultiplexers.
8. Design of 4 bit binary to gray code converter.

PART- B (VLSI CIRCUIT DESIGN)

Introduction to layout design rules. Layout, physical verification, placement & route for Complex design, static timing analysis, IR drop analysis and crosstalk analysis of the following:

1. Design of CMOS inverter (DC & Transient analysis)
2. Design of Universal Gates Using Static CMOS Logic.
3. CMOS OR/ AND gates.
4. CMOS XOR and XNOR gates.
5. Design any Dynamic logic gate.
6. AOI or OAI gates.
7. Design A Logic Gate Using Pass Transistors.
8. Design of CMOS Transmission Gate.

Note: *Any* ***SIX of*** *the above experiments from each part are to be conducted (Total 12)*

TKR COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

DIGITAL COMMUNICATION LAB - B45PC7

B.Tech. V Semester **L/T/P/ C**

0/0/3/ 1.5

COURSE OBJECTIVE:

1. This course gives students deep knowledge in digital communication systems at the practical level.
2. This lab focuses the fundamental concepts on TDM, Pulse modulation Techniques.
3. To analyze various digital modulation techniques like ASK, FSK, PSK, DPSK and QPSK.
4. To understand the concept of ISI & OFDM.

COURSE OUTCOMES:

On completion of this lab course the students will be able to

1. Understand basic theories of Digital communication system in practical.
2. Design and implement different Pulse modulation and demodulation techniques.
3. Analyze digital modulation techniques.
4. Identify and describe different techniques in modern digital communications, in particular source coding techniques.
5. Perform different multiplexing techniques

Note:

1. Perform any twelve experiments.
2. All these experiments are to be simulated using MATLAB or any other simulation package and then to be realized in hardware.

List of Experiments:

1. PCM Generation and Detection
2. Differential Pulse Code Modulation
3. Delta Modulation
4. Adaptive Delta modulation
5. Time Division Multiplexing of 2 Band Limited Signals
6. Frequency Shift Keying: Generation and Detection
7. Phase Shift Keying: Generation and Detection
8. Amplitude Shift Keying: Generation and Detection
9. Study of the spectral characteristics ofPAM
10. Study of the spectral characteristics ofPWM
11. Study of the spectral characteristics ofQAM.
12. DPSK :Generation and Detection
13. QPSK : Generation and Detection
14. OFDM: Generation and Detection

TKR COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

DIGITAL SIGNAL PROCESSING LAB - B45PC8

B.Tech. V Semester **L/T/P/ C**
0/0/2/ 1.0

Note:

1. The Programs shall be implemented in Software (Using MATLAB / Lab View / C Programming / Equivalent) and Hardware (Using TI / Analog Devices / Motorola / Equivalent DSP processors).
2. Minimum of 12 experiments to be conducted.

List of Experiments

1. Generation of Sinusoidal Waveform / Signal based on Recursive Difference Equations.
2. Histogram of White Gaussian Noise and Uniformly Distributed Noise.
3. To find DFT / IDFT of given DT Signal.
4. To find Frequency Response of a given System given in Transfer Function/ Differential equation form.
5. Obtain Fourier series coefficients by formula and using FET and compare for half sine wave.
6. Implementation of FFT of given Sequence.
7. Determination of Power Spectrum of a given Signal(s).
8. Implementation of LP FIR Filter for a given Sequence/Signal.
9. Implementation of HP IIR Filter for a given Sequence/Signal
10. Generation of Narrow Band Signal through Filtering
11. Generation of DTMF Signals
12. Implementation of Decimation Process
13. Implementation of Interpolation Process
14. Implementation of I/D Sampling Rate Converters
15. Impulse Response of First order and Second Order Systems.

TKR COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
ANTENNAS AND WAVE PROPAGATION - B46PC1

B.Tech. VI Semester **L/T/P/ C**
3/1/0/ 3

COURSE OBJECTIVES:

This can be termed a middle level course in the electronic communication engineering domain. The course deals with antenna basics, different types of antennas, some design features, antenna measurements and wave propagation, and has the following main objectives:

1. To understand the concept of radiation, antenna definitions and significance of antenna parameters, to derive and analyze the radiation characteristics of thin wire dipole antennas and solve numerical problems.
2. To distinguish between UHF, VHF and Microwave Antennas, their requirements, specifications, characteristics and design relations.
3. To analyze the characteristics of Yagi-Uda antennas, helical antennas, pyramidal horns, micro strip patch antennas and parabolic reflectors and identify the requirements to facilitate their design.
4. To identify the antenna array requirements and understand the set-up requirements for microwave measurements.
5. To define and distinguish between different phenomenon of wave propagation.

COURSE OUTCOMES:

Having gone through this course on Antenna Theory and Wave Propagation, the students would be able to:

1. Explain the mechanism of radiation, distinguish between different antenna characteristic parameters, establish their mathematical relations, and estimate them for different practical cases.
2. Establish the radiation patterns of folded dipole, Yagi-Uda Antenna, Helical Antennas, Horn Antennas, and to acquire the knowledge of their analysis, design and development.
3. Analyze a micro strip rectangular patch antenna and a parabolic reflector antenna.
4. Carry out the Linear Array Analysis, Binomial Arrays and Planar arrays and specify the requirements for microwave measurements.
5. Classify the different wave propagation mechanisms.

UNIT – I:

Antenna Basics: Introduction, Basic Antenna Parameters – Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity-Gain-Resolution, Antenna Apertures, Effective Height, Friis transmission equation, Illustrative Problems.

Fields from Oscillating Dipole, Field Zones, Front - to-back Ratio, Antenna Theorems, Radiation, Retarded Potentials – Helmholtz Theorem

Thin Linear Wire Antennas – Radiation from Small Electric Dipole, Quarter Wave Monopole and Half Wave Dipole – Current Distributions, Field Components, Radiated Power, Radiation Resistance, Beam Width, Directivity, Effective Area and Effective Height, Natural Current Distributions, Far Fields and Patterns of Thin Linear Centre-fed Antennas of Different Lengths, Illustrative Problems. Loop Antennas - Introduction, Small Loop, Comparison of Far Fields of Small

Loop and Short Dipole, Radiation Resistances and Directivities of Small Loops (Qualitative Treatment).

UNIT – II:

VHF, UHF and Microwave Antennas - I : Arrays with Parasitic Elements, Yagi-Uda Array, Folded Dipoles and their Characteristics, Helical Antennas – Helical Geometry, Helix Modes, Practical Design Considerations for Mono filar Helical Antenna in Axial and Normal Modes, Horn Antennas – Types, Fermat's Principle, Optimum Horns, Design Considerations of Pyramidal Horns, Illustrative Problems.

UNIT – III:

VHF, UHF and Microwave Antennas - II: Microstrip Antennas – Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas – Geometry and Parameters, Characteristics of Microstrip Antennas. Reflector Antennas – Introduction, Flar Sheet and Corner Reflectors, Paraboloidal Reflectors – Geometry, Pattern Characteristics, Feed Methods, Reflector Types – Related Features, Illustrative Problems.

UNIT – IV:

Antenna Arrays: Point Sources – Definition, Patterns**,** arrays of 2 Isotropic Sources - Different Cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, End fire Arrays, EFA with Increased Directivity, Derivation of their Characteristics and Comparison, BSAs with Non-uniform Amplitude Distributions – General Considerations and Binomial Arrays, Planar arrays (Qualitative treatment), Illustrative Problems.

Antenna Measurements: Introduction, Concepts - Reciprocity, Near and Far Fields, Coordinate System, Sources of Errors. Patterns to be Measured, Directivity Measurement, Gain Measurements (by Comparison, Absolute and 3-Antenna Methods)

UNIT – V:

Wave Propagation – I: Introduction, Definitions, Categorizations and General Classifications, Different Modes of Wave Propagation, Ray/Mode Concepts, Ground Wave Propagation (Qualitative Treatment) – Introduction, Plane Earth Reflections, Space and Surface Waves, Wave Tilt, Curved Earth Reflections. Space Wave Propagation – Introduction, Field Strength Variation with Distance and Height, Effect of Earth's Curvature, Absorption, Super Refraction, M-Curves and Duct Propagation, Scattering Phenomena, Troposphere Propagation.

Wave Propagation – II: Sky Wave Propagation – Introduction, Structure of Ionosphere, Refraction and Reflection of Sky Waves by Ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation between MUF and Skip Distance, Multi-hop Propagation.

TEXT BOOKS

1. Antennas and Wave Propagation – J.D. Kraus, R.J. Marhefka and Ahmad S. Khan, MC GRAW HILL EDUCATION, New Delhi, 4th ed., (Special Indian Edition), 2010.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd ed., 2000.

REFERENCE BOOKS

1. Antenna Theory - C.A. Balanis, John Wiley & Sons, 3rd Ed., 2005.
2. Antennas and Wave Propagation – K.D. Prasad, Satya Prakashan, Tech India Publications, New Delhi, 2001.

TKR COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
MICROPROCESSORS AND MICROCONTROLLERS - B46PC2

B.Tech. VI SEMESTER **L/T/P/ C**
4/1/0/ 4

COURSE OBJECTIVES:
To develop an understanding of the operations of microprocessors and micro controllers; machine language programming and interfacing techniques.

COURSE OUTCOMES:
Upon completion of this course the student will be able to:
1. Acquire the knowledge of internal architecture, organization of 8086 and can develop assembly language programming.
2. Acquire the knowledge of internal architecture, organization of 8051 and can develop assembly language programming.
3. Acquire the knowledge of interfacing techniques to 8086 and 8051 and can develop assembly language programming to design microprocessors/microcontroller based systems.
4. Acquire the knowledge of stands the internal architecture and organization of ARM processors/controllers and can develop assembly language programming.
5. Acquire the knowledge of internal architecture and organization of Advanced ARM Processors.

UNIT – I:
8086 Architecture: 8086 Architecture-Functional diagram, Register Organization, Memory Segmentation, Programming Model, Memory addresses, Physical Memory Organization, Architecture of 8086, Signal descriptions of 8086, interrupts of 8086.

Instruction Set and Assembly Language Programming of 8086: Instruction formats, Addressing modes, Instruction Set, Assembler Directives, Macros, and Simple Programs involving Logical, Branch and Call Instructions, Sorting, String Manipulations.

UNIT – II:
Introduction to Microcontrollers: Overview of 8051 Microcontroller, Architecture, I/O Ports, Memory Organization, Addressing Modes and Instruction set of 8051.

8051 Real Time Control: Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Programming 8051 Timers and Counters.

UNIT – III:
I/O And Memory Interface: LCD, Keyboard, External Memory RAM, ROM Interface, ADC, DAC Interface to 8051.

Serial Communication and Bus Interface: Serial Communication Standards, Serial Data Transfer Scheme, On board Communication Interfaces-I2C Bus, SPI Bus, UART; External Communication Interfaces-RS232,USB.

UNIT – IV:

ARM Architecture: ARM Processor fundamentals, ARM Architecture – Register, CPSR, Pipeline, exceptions and interrupts interrupt vector table, ARM instruction set – Data processing, Branch instructions, load store instructions, Software interrupt instructions, Program status register instructions, loading constants, Conditional execution, Introduction to Thumb instructions.

UNIT – V:

Advanced ARM Processors: Introduction to CORTEX Processor and its architecture, OMAP Processor and its Architecture.

TEXT BOOKS

1. Advanced Microprocessors and Peripherals – A. K. Ray and K.M. Bhurchandani, MHE, 2nd Edition, 2006.
2. The 8051 Microcontroller, Kenneth. J. Ayala, Cengage Learning, 3rd Edition, ARM System Developers guide, Andrew N SLOSS, Dominic SYMES, Chris WRIGHT, Elsevier, 2012.

REFERENCE BOOKS

1. Microprocessors and Interfacing, D. V. Hall, MGH, 2nd Edition 2006.
2. Introduction to Embedded Systems, Shibu K.V, MHE, 2009
3. The 8051Microcontrollers, Architecture and Programming and Applications - K.Uma Rao, Andhe Pallavi, Pearson, 2009.

TKR COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CELLULAR AND MOBILE COMMUNICATIONS - B46PE3

B.Tech. VI SEMESTER **L/T/P/ C**
4/1/0/ 4

COURSE OBJECTIVES:
The course objectives are:
1. To provide the student with an understanding of the Cellular concept, Frequency reuse, Hand-off strategies.
2. To enable the student to analyze and understand wireless and mobile cellular communication systems over a stochastic fading channel.
3. To provide the student with an understanding of Co-channel and Non Co-channel interferences.
4. To give the student an understanding of cell coverage for signal and traffic, diversity techniques and mobile antennas.
5. To give the student an understanding of frequency management, Channel assignment and types of handoff.

COURSE OUTCOMES:
By the end of the course,
1. The student will be able to analyze and design wireless and mobile cellularsystems.
2. The student will be able to understand impairments due to multipath fadingchannel.
3. The student will be able understand the fundamental techniques to overcome the different fading effects.
4. The student will be able to understand Co-channel and Non Co-channel interferences
5. The student will be able to familiar with cell coverage for signal and traffic, diversity techniques and mobile antennas.
6. The student will have an understanding of frequency management, Channel assignment, and types of handoff.

UNIT – I:
Introduction to Cellular Mobile Radio Systems: Limitations of Conventional Mobile Telephone Systems, Basic Cellular Mobile System, First, Second, Third and Fourth Generation Cellular Wireless Systems, Performance Criteria, Uniqueness of Mobile Radio Environment- Fading - Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Operation Of Cellular Systems & Hexagonal Shaped Cells.

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 Systems- Cell Splitting, Sectoring, Microcell Zone Concept, Umbrella Cell Approach.

UNIT – II:
Co-Channel Interference: Introduction to Co-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, Time Diversit

y. **Non-Co-Channel Interference:** Adjacent Channel Interference, Near End Far End Interference, Cross Talk, Effects on Coverage and Interference by Power Decrease, Antenna Height Decrease, Effects of Cell Site Components.

UNIT – III:

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.

Cell Site and Mobile Antennas: Omni Directional and Directional Antennas, Space Diversity Antennas, Umbrella Pattern Antennas, Minimum Separation of Cell Site Antennas, Mobile Antennas, High Gain Antennas.

UNIT – IV:

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.

UNIT – V:

Handoffs and Dropped Calls: Handoff Initiation, Types of Handoff, Delaying Handoff, Advantages of Handoff, Power Difference Handoff, Forced Handoff, Mobile Assisted and Soft Handoff, Intersystem Handoff, Introduction to Dropped Call Rates and their Evaluation.

TEXT BOOKS

1. Mobile Cellular Telecommunications – W.C.Y. Lee, Mc Graw Hill, 2nd Edn., 1989.
2. Wireless Communications - Theodore. S. Rapport, Pearson Education, 2nd Edn., 2002.
3. wireless communication and networks - Dalal, oxford university press.

REFERENCE BOOKS

1. Principles of Mobile Communications – Gordon L. Stuber, Springer International, 2nd Edn., 2001.
2. Modern Wireless Communications - Simon Haykin, Michael Moher, Pearson Education, 2005.
3. Wireless Communications Theory and Techniques, Asrar U. H .Sheikh, Springer, 2004.
4. Wireless Communications and Networking, Vijay Garg, Elsevier Publications, 2007.
5. Wireless Communications – Andrea Goldsmith, Cambridge University Press, 2005.

TKR COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

MEMS - B46PE3

B.Tech. VI Semester **L/T/P/C**
4/1/0/4

COURSE OBJECTIVES:

1. To learn basics of Micro Electro Mechanical Systems (MEMS).
2. To learn about various sensors and actuators used in MEMS.
3. To learn the principle and various devices of MOEMS, Fluidic, bio and chemical systems.

COURSE OUTCOMES:

Upon successful completion of this course the student shall be able to

1. Know the importance and various devices of MEMS and their applications.

UNIT – I:

INTRODUCTION: Definition of MEMS, MEMS history and development, micro machining, lithography principles & methods, structural and sacrificial materials, thin film deposition, impurity doping, etching, surface micro machining, wafer bonding, LIGA.

MECHANICAL SENSORS AND ACTUATORS: Principles of sensing and actuation: beam and cantilever, capacitive, piezo electric, strain, pressure, flow, pressure measurement by micro phone, MEMS gyroscopes, shear mode piezo actuator, gripping piezo actuator, Inchworm technology.

THERMAL SENSORS AND ACTUATORS: Thermal energy basics and heat transfer processes, thermisters, thermo devices, thermo couple, micro machined thermo couple probe, peltier effect heat pumps, thermal flow sensors, micro hot plate gas sensors, MEMS thermo vessels, pyro electricity, shape memory alloys (SMA), U-shaped horizontal and vertical electro thermal actuator, thermally activated MEMS relay, micro spring thermal actuator, data storage cantilever.

UNIT – II:

MICRO-OPTO-ELECTRO MECHANICAL SYSTEMS: Principle of MOEMS technology, properties of light, light modulators, beam splitter, micro lens, micro mirrors, digital micro mirror device (DMD), light detectors, grating light valve (GLV), optical switch, wave guide and tuning, shear stress measurement.

UNIT – III:

MAGNETIC SENSORS AND ACTUATORS: Magnetic materials for MEMS and properties, magnetic sensing and detection, magneto resistive sensor, more on hall effect, magneto diodes, magneto transistor, MEMS magnetic sensor, pressure sensor utilizing MOKE, mag MEMS actuators, by directional micro actuator, feedback circuit integrated magnetic actuator, large force reluctance actuator, magnetic probe based storage device.

UNIT – IV:

MICRO FLUIDIC SYSTEMS: Applications, considerations on micro scale fluid, fluid actuation methods, dielectrophoresis (DEP), electro wetting, electro thermal flow, thermo capillary effect, electro osmosis flow, opto electro wetting (OEW), tuning using micro fluidics, typical micro fluidic channel, microfluid dispenser, micro needle, molecular gate, micro pumps.

RADIO FREQUENCY (RF) MEMS: RF – based communication systems, RF MEMS, MEMS inductors, varactors, tuner/filter, resonator, clarification of tuner, filter, resonator, MEMS switches, phase shifter.

UNIT – V:

CHEMICAL AND BIO MEDICAL MICRO SYSTEMS: Sensing mechanism & principle, membrane-transducer materials, chem.-lab-on-a-chip (CLOC) chemoresistors, chemocapacitors, chemotransistors, electronic nose (E-nose), mass sensitive chemosensors, fluroscence detection, calorimetric spectroscopy.

TEXT BOOK

1. MEMS, Nitaigour Premchand Mahalik, TMH Publishing co.

REFERENCE BOOKS

1. Foundation of MEMS, Chang Liu, Prentice Hall Ltd.
2. MEMS and NEMS, Sergey EdwrdLyshevski, CRC Press, Indian Edition.
3. MEMS and Micro Systems: Design and Manufacture, Tai-Ran Hsu, TMH Publishers.
4. Introductory MEMS, Thomas M Adams, Richard A Layton, Springer International Publishers.

TKR COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

INFORMATION THEORY AND CODING - B46PE3

B.Tech. VI Semester **L/T/P/C**
4/1/0/4

COURSE OUTCOMES:

At the end of the course, students will demonstrate the ability to:

1. Understand the concept of information and entropy
2. Understand Shannon's theorem for coding
3. Calculation of channel capacity
4. Apply coding techniques

UNIT I:

Information Theory: Basics of information, entropy, conditional entropy, entropy for discrete ensembles, discrete memory less channel, bounds discrete channels, channel capacity, mutual information.

UNIT II:

Source Coding: Source coding theorem-code efficiency, redundancy, variance; shannon's noisy coding theorem, shannon's noise less coding theorem, shannon's Hartley theorem application to continuous channel, shannon'sfano coding, huffman coding.

UNIT III:

Techniques Of Coding And Decoding: Linear block codes: principle of block coding, matrix description of linear block codes, hamming codes, error detection and correction capabilities of hamming codes.

UNIT IV:

Cyclic Codes: Algebric structure, syndrome calculation, error correction using syndrome vector, syndrome decoder for (n,k) block code, error correction capability, advantages and dis advantages of cyclic codes.

UNIT V :

Convolution Codes: Analysis of convolution encoders, Markov sources-code tree, trellis, state diagram for convolution encoder, uniquely detectable codes, Viterbi algorithm, advantages and disadvantages of convolution codes.

TEXT BOOKS:

1. N. Abramson, Information and Coding, McGraw Hill, 1963.
2. M. Mansurpur, Introduction to Information Theory, McGraw Hill, 1987.
3. R.B. Ash, Information Theory, Prentice Hall, 1970.
4. Shu Lin and D.J. Costello Jr., Error Control Coding, Prentice Hall, 1983.

REFERENCE BOOKS:

1. Principles of Communication Systems-Herbert Taub, Donald L schilling, GouthamSaha, 3rd Edition, McGraw Hill, 2008.
2. Digital and analog communication systems-Sam Shanmugam, John Wiley, 2005.

TKR COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

WIRELESS COMMUNICATIONS AND NETWORKS - B46PE4

B.Tech. VI Semester **L/T/P/ C**
3/1/0/ 3

COURSE OBJECTIVES:

The course objectives are:

1. To provide the students with the fundamental treatment about many practical and theoretical concepts that forms basic of wireless communications.
2. To equip the students with various kinds of wireless networks and its operations.
3. To prepare students to understand the concept of frequency reuse, and be able to apply it in the design of mobile cellular system.
4. To prepare students to understand various modulation schemes and multiple access techniques that are used in wireless communications,
5. To provide an analytical perspective on the design and analysis of the traditional and emerging wireless networks, and to discuss the nature of, and solution methods to, the fundamental problems in wireless networking.
6. To train students to understand the architecture and operation of various wireless wide area networks such as GSM, IS-95, GPRS and SMS.
7. To train students to understand wireless LAN architectures and operation.
8. To prepare students to understand the emerging technique OFDM and its importance in the wireless communications.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to:

1. Understand the principles of wireless communications.
2. Understand fundamentals of wireless networking
3. Understand cellular system design concepts.
4. Analyze various multiple access schemes used in wireless communication.
5. Understand wireless wide area networks and their performance analysis.
6. Demonstrate wireless local area networks and their specifications.
7. Familiar with some of the existing and emerging wireless standards.
8. Understand the concept of orthogonal frequency division multiplexing.

UNIT – I:

The Cellular Concept-System Design Fundamentals

Introduction, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies- Prioritizing Handoffs, Practical Handoff Considerations, Interference and system capacity – Co channel Interference and system capacity, Channel planning for Wireless Systems, Adjacent Channel interference , Power Control for Reducing interference, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular Systems- Cell Splitting, Sectoring .

UNIT – II:

Mobile Radio Propagation: Large-Scale Path Loss

Introduction to Radio Wave Propagation, Free Space Propagation Model, Relating Power to

Electric Field, The Three Basic Propagation Mechanisms, Reflection-Reflection from Dielectrics, Brewster Angle, Reflection from prefect conductors, Ground Reflection (Two- Ray) Model, Diffraction- Fresnel Zone Geometry, Knife-edge Diffraction Model, Multiple knife-edge.Diffraction, Scattering, Outdoor Propagation Models- Longley-Ryce Model, Okumura Model, Hata Model, PCS Extension to Hata Model, Walfisch and Bertoni Model, Wideband PCS Microcell Model, Indoor Propagation Models-Partition losses (Same Floor), Partition losses between Floors, Log-distance path loss model, Ericsson Multiple Breakpoint Model, Attenuation Factor Model, Signal penetration into buildings, Ray Tracing and Site Specific Modeling.

UNIT – III:

Mobile Radio Propagation: Small –Scale Fading and Multipath

Small Scale Multipath propagation-Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel- Relationship between Bandwidth and Received power, Small-Scale Multipath Measurements-Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels Sounding, Parameters of Mobile Multipath Channels-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Types of Small-Scale Fading-Fading effects Due to Multipath Time Delay Spread, Flat fading, Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading, slow fading, Statistical Models for multipath Fading Channels-Clarke's model for flat fading, spectral shape due to Doppler spread in Clarke's model, Simulation of Clarke and Gans Fading Model, Level crossing and fading statistics, Two-ray Rayleigh Fading Model.

UNIT – IV:

Equalization and Diversity

Introduction, Fundamentals of Equalization, Training A Generic Adaptive Equalizer, Equalizers in a communication Receiver, Linear Equalizers, Non linear Equalization- Decision Feedback Equalization (DFE), Maximum Likelihood Sequence Estimation (MLSE) Equalizer, Algorithms for adaptive equalization-Zero Forcing Algorithm, Least Mean Square Algorithm, Recursive least squares algorithm. Diversity Techniques-Derivation of selection Diversity improvement, Derivation of Maximal Ratio Combining improvement, Practical Space Diversity Consideration-Selection Diversity, Feedback or Scanning Diversity, Maximal Ratio Combining, Equal Gain Combining, Polarization Diversity, Frequency Diversity, Time Diversity, RAKE Receiver.

UNIT – V:

Wireless Networks

Introduction to wireless Networks, Advantages and disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN Standard IEEE 802.11,IEEE 802.11 Medium Access Control, Comparison of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements, Wireless PANs, HiperLan, WLL.

TEXT BOOKS

1. Wireless Communications, Principles, Practice – Theodore, S. Rappaport, 2nd Ed., 2002, PHI.
2. Wireless Communications-Andrea Goldsmith, 2005 Cambridge University Press.
3. Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy, 2002, PE

REFERENCEBOOKS

1. Wireless Communication and Networking – William Stallings, 2003, PHI.

TKR COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IMAGE PROCESSING AND PATTERN RECOGNITION – B46PE4

B.Tech.VI Semester **L/T/P/ C**
3/1/0/ 3

COURSE OBJECTIVES:

1. Adequate background knowledge about image processing and pattern recognition
2. Practical knowledge and skills about image processing and pattern recognition tools
3. Necessary knowledge to design and implement a prototype of an image processing and pattern recognition application.

COURSE OUTCOMES:

1. Ability to apply computer algorithms to practical problems.
2. Ability to image segmentation, reconstruction and restoration.
3. Ability to perform the classification of patterns.

UNIT – I:

Fundamental steps of image processing, components of an image processing of system. The image model and image acquisition, sampling and quantization, relationship between pixels, distance functions, scanner.

Statistical and spatial operations, Intensity functions transformations, histogram processing, smoothing & sharpening – spatial filters Frequency domain filters, homomorphic filtering, image filtering & restoration. Inverse and weiner filtering, FIR weiner filter, Filtering using image transforms, smoothing splines and interpolation.

UNIT – II:

Morphological and other area operations, basic morphological operations, opening and closing operations, dilation erosion, Hit or Miss transform, morphological algorithms, extension to grey scale images.

Segmentation and Edge detection region operations, basic edge detection, second order detection, crack edge detection, gradient operators, compass and Laplace operators, edge linking and boundary detection, thresholding, region based segmentation, segmentation by morphological watersheds.

UNIT – III:

Image compression: Types and requirements, statistical compression, spatial compression, contour coding, quantizing compression, image data compression-predictive technique, pixel coding, transfer coding theory, lossy and lossless predictive type coding, Digital Image Water marking.

UNIT – IV:

Representation and Description: Chain codes, Polygonal approximation, Signature Boundary Segments, Skeltons, Boundary Descriptors, Regional Descriptors, Relational Descriptors, Principal components for Description, Relational Descriptors.

UNIT – V:

Pattern Recognition Fundamentals: Basic Concepts of pattern recognition, Fundamental problems in pattern recognition system, design concepts and methodologies, example of automatic pattern recognition systems, a simple automatic pattern recognition model

Pattern classification: Pattern classification by distance function: Measures of similarity, Clustering criteria, K-means algorithm, Pattern classification by likelihood function: Pattern classification as a Statistical decision problem, Bayes classifier for normal patterns.

TEXT BOOKS

1. Digital Image Processing Third edition, Pearson Education, Rafael C. Gonzalez, Richard E. Woods.
2. Pattern recognition Principles: Julus T. Tou, and Rafel C. Gonzalez, Addision-Wesly Publishing Company.
3. Digital Image Processing, M.Anji Reddy, Y.Hari Shankar, BS Publications.

REFERENCE BOOKS

1. Image Processing, Analysis and Machine Vision, Second Edition, Milan Sonka, Vaclav Hlavac and Roger Boyle. Thomson learning
2. Digital Image Processing – William k. Pratl –John Wiley edition.
3. Fundamentals of digital image processing – by A.K. Jain, PHI.
4. Pattern classification, Richard Duda, Hart and David strok John Wiley publishers.

TKR COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

POWER ELECTRONICS - B46PE4

B.Tech.VI Semester **L/T/P/C**
3/1/0/ 3

COURSE OBJECTIVES:

1. To Design/develop suitable power converter for efficient control or conversion of power in drive applications
2. To Design / develop suitable power converter for efficient transmission and utilization of power in power system applications.

COURSE OUTCOMES:

After completion of this course the student is able to

1. Choose the appropriate converter for various applications.
2. Design the power converters suitable for particular applications.
3. Develop the novel control methodologies for better performance.

UNIT – I:

Power Semi Conductor Devices and Commutation Circuits: Thyristors – Silicon Controlled Rectifiers (SCR's) – BJT – Power MOSFET – Power IGBT and their characteristics and other thyristors – Basic theory of operation of SCR – Static characteristics – Turn-on and Turn-off methods- Dynamic characteristics of SCR – Turn on and Turn off times -Salient points. Two transistor analogy of SCR – R, RC, UJT firing circuits – Series and parallel connections of SCRs – Snubber circuit details – Specifications and Ratings of SCR, BJT, IGBT – Numerical problems – Line Commutation and Forced Commutation circuits.

UNIT – II:

Single Phase Half Wave Controlled Converters: Phase control technique – Single phase Line commutated converters – Half wave controlled converters with Resistive, RL load and RLE load – Derivation of average load voltage and current -Active and Reactive power inputs to the converters without and with Freewheeling Diode – Numerical problems Single Phase Fully Controlled Converters: Fully controlled converters, Midpoint and Bridge connections with Resistive, RL loads and RLE load – Derivation of average load voltage and current – Line commutated inverters, semi-converters, active and Reactive power inputs to the converters, Effect of source inductance – Expressions of load voltage and current – Numerical problems. Three Phase Line Commutated Converters: Three phase converters – Three pulse and six pulse converters and bridge connections with R, RL load voltage and current with R and RL load and RLE loads – Semi Converters, Effect of Source inductance–Dual converters Waveforms – Numerical Problems

UNIT – III:

AC Voltage Controllers: AC voltage controllers – Single phase two SCR's in anti parallel with R and RL loads , modes of operation of Triac – Triac with R and RL loads – Derivation of RMS load voltage, current and power factor- wave forms , Numerical problems- Single phase and three phase cycloconverters (principle of operation only).

UNIT – IV:

Choppers: Choppers – Time ratio control and Current limit control strategies – Step down choppers- Derivation of load voltage and currents with R, RL and RLE loads- Step up Chopper – load voltage expression. Morgan's chopper – Jones chopper – Oscillation choppers (Principle of operation only) – waveforms — AC Chopper – Problems.

UNIT – V:

Inverters: Inverters – Single phase inverter – Basic series inverter, parallel Capacitor inverter, bridge inverter – Waveforms,. Simple bridge inverters, Voltage control techniques for inverters- Pulse width modulation techniques – Numerical problems.

TEXT BOOKS:

1. M. D. Singh & K. B. Kanchandhani, "Power Electronics", Tata McGraw – Hill Publishing Company, 1998.
2. "M. H. Rashid", "Power Electronics : Circuits, Devices and Applications", Prentice Hall of India, 2nd edition, 1998
3. "V. R. Murthy", "Power Electronics", Oxford University Press, 1st Edition 2005.

REFERENCE BOOKS:

1. VedamSubramanyam, "Power Electronics", New Age International (P) Limited, Publishers, 2nd Edition 2008.
2. Philip T. Krein, "Elements of Power Electronics", Oxford University Press, 1997.
3. M. S. JamilAsghar, "Power Electronics", PHI Private Limited, 2004.
4. P. C. Sen, "Power Electronics", Tata McGraw-Hill Publishing, 2001.
5. John G. Kassakian, Martin, F. Schlect, Geroge C. Verghese, "Principles of Power Electronics", Pearson Education, 1st Edition 2010.

TKR COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

VLSI & E-CAD LAB- II -B46PC6

B.Tech. VI Semester **L/T/P/ C**
0/0/2/ 1

COURSE OBJECTIVES:

1. To learn the HDL programming language.
2. To learn the simulation of basic gates using the HDL.
3. To learn the simulation of combinational and sequential circuits using HDL.
4. To learn the synthesis and layouts of analog and digital CMOScircuits.
5. To develop an ability to simulate and synthesize various digital circuits.

COURSE OUTCOMES:

At the end of the course, students will be able to:

1. Simulate various digital circuits.
2. Simulate and synthesize various CMOS circuits.
3. Understand the layout design rules for both static CMOS and dynamic clocked CMOS Circuits.
4. Develop an ability of designing of analog and digital CMOS circuits.
5. Design of Digital VLSI Circuits, stick diagram of circuits.
6. Design Entry & simulation of combinational and sequential circuits with test bench & functional verification.
7. Generation of configuration/fuse files for combinational and sequential circuits & implementation of the hardware using FPGA.
8. Design a schematic and simple layout for CMOS circuits, parasitic extraction.
9. Be able to complete a significant VLSI design project having a set of objective criteria and design constraints

List of Experiments

Design and implementation of the following CMOS digital/analog circuits using **Cadence / Mentor Graphics / Synopsys /Equivalent** CAD tools. The design shall include Gate-level design, Transistor-level design, Hierarchical design, Verilog HDL/VHDL design, Logic synthesis, Simulation and verification, Scaling of CMOS Inverter for different technologies, study of secondary effects (temperature, power supply and process corners), Circuit optimization with respect to area, performance and/or power, Layout, Extraction of parasitic and back annotation, modifications in circuit parameters and layout consumption, DC/transient analysis, Verification of layouts (DRC, LVS).

PART- A (E-CAD programs)

Programming can be done using any complier. Down load the programs on FPGA/CPLD boards and performance testing may be done using pattern generator (32 channels) and logic analyzer apart from verification by simulation with any of the front end tools.

1. Design of any combinational circuit using 3 modeling styles.
2. Design of A 4 bit comparator.
3. Design of SR, D latch or flip flops in behavioral modeling
4. Design of JK, T flip flops in behavioral modeling
5. Design D flip flop using SR flip flop.
6. Design of Shift Register using D flip flops
7. Design of 4-bit binary, BCD counters (synchronous/ asynchronous reset) or any Sequence counter

8. Finite State Machine Design.

PART- B (VLSI CIRCUIT DESIGN)

Introduction to layout design rules. Layout, physical verification, placement & route for Complex design, static timing analysis, IR drop analysis and crosstalk analysis of the following:

1. Design of Half Adder.
2. Design of symmetrical full adder.
3. Design of a 2x1 multiplexer using transmission gates.
4. Design a single bit latch/ Flip-flop.
5. A 8 – Bit shift register.
6. A 6 –T SRAM bit cell.
7. Layout Design for CMOS inverter or any Combinational Circuit
8. Analog Circuit simulation (AC analysis) – CS & CD amplifier

Note: *Any* ***SIX of*** *the above experiments from each part are to be conducted (Total 12)*

TKR COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

MICROPROCESSORS AND MICROCONTROLLERS LAB -B46PC7

B.Tech. VI Semester **L/T/P/ C**

0/0/3/ 1.5

COURSE OBJECTIVES:

To develop an understanding of the operations of microprocessors and micro controllers; machine language programming and interfacing techniques.

COURSE OUTCOMES:

Upon completion of this Lab the student will be able to:

1. Apply the fundamentals of assembly level programming for microprocessors/ microcontrollers.
2. Develop programs on a microprocessor using instruction set of 8086.
3. Develop the assembly level programming using 8051 instructionset.
4. Analyze different I/O devices which can be interfaced to microprocessor and microcontroller.
5. Develop programs using instruction set of ARM.

Note:

1. Minimum of 12 experiments to be conducted.
2. The following programs/experiments are to be written for assembler and to be executed the same with 8086 and 8051 kits.

List of Experiments:

1. Programs for 16 bit arithmetic operations 8086(using various addressing modes)
2. Programs for sorting an array for 8086.
3. Programs for searching for a number of characters in a string for 8086.
4. Programs for string manipulation for 8086.
5. Programs for digital clock design using 8086.
6. Interfacing ADC and DAC to 8086.
7. Parallel communication between two microprocessor kits using 8255.
8. Serial communication between two microprocessor kits using 8251.
9. Interfacing to 8086 and programming to control stepper motor.
10. Programming using arithmetic, logical and bit manipulation instructions of 8051.
11. Program and verify Timer/Counter in 8051.
12. Program and verify interrupt handling in 8051.
13. UART operation in 8051.
14. Communication between 8051 kit and PC
15. Interfacing LCD to 8051
16. Interfacing Matrix/Keyboard to 8051
17. Data transfer from peripheral to memory through DMA controller 8237/8257

TKR COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ADVANCED ENGLISH COMMUNICATION SKILLS (AECS) LAB – B46HS8

B.Tech. VI Semester **L/T/P/ C**
0/0/3/ 1.5

COURSE OBJECTIVES:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

1. To improve students' fluency in spoken English
2. To enable them to listen to English spoken at normal conversational speed
3. To help students develop their vocabulary
4. To read and comprehend texts in different contexts
5. To communicate their ideas relevantly and coherently in writing
6. To make students industry-ready
7. To help students acquire behavioral skills for their personal and professional life
8. To respond appropriately in different socio-cultural and professional contexts

COURSE OUTCOMES:

Students will be able to:

1. Acquire vocabulary and use it contextually
2. Listen and speak effectively
3. Develop proficiency in academic reading and writing
4. Increase possibilities of job prospects
5. Communicate confidently in formal and informal contexts

The following course activities will be conducted as part of the Advanced English Communication Skills (AECS) Lab:

1. **Inter-personal Communication and Building Vocabulary** - Starting a Conversation – Responding Appropriately and Relevantly – Using Appropriate Body Language – Role Play in Different Situations - Synonyms and Antonyms, One-word Substitutes, Prefixes and Suffixes, Idioms and Phrases and Collocations.
2. **Reading Comprehension** –General Vs Local Comprehension, Reading for Facts, Guessing Meanings from Context, Skimming, Scanning, Inferring Meaning.
3. **Writing Skills** – Structure and Presentation of Different Types of Writing – Letter Writing/Resume Writing/ e-correspondence/ Technical Report Writing.
4. **Presentation Skills** – Oral Presentations (individual or group) through JAM Sessions/Seminars/PPTs and Written Presentations through Posters/Projects/Reports/ emails/Assignments… etc.,
5. **Group Discussion and Interview Skills** – Dynamics of Group Discussion, Intervention, Summarizing, Modulation of Voice, Body Language, Relevance, Fluency and Organization of Ideas and Rubrics of Evaluation- Concept and Process, Pre-interview Planning, Opening Strategies, Answering Strategies, Interview through Tele-conference & Video-conference and Mock Interviews.

Minimum Hardware Requirement: Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:

1. Spacious room with appropriate acoustics
2. Eight round tables with five movable chairs for each table.
3. Audio-visual aids
4. LCD Projector
5. Public Address system
6. Computer with suitable configuration

Suggested Software: The software consisting of the prescribed topics elaborated above should be procured and used.

1. Oxford Advanced Learner's Compass, 8th Edition
2. DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.

REFERENCE BOOKS

1. Kumar, Sanjay and PushpLata. English for Effective Communication, Oxford University Press, 2015.
2. Konar, Nira. English Language Laboratories – A Comprehensive Manual, PHI Learning Pvt. Ltd., 2011.