

III Year – I SEMESTER**T P C**
3+1 0 3**PULSE AND DIGITAL CIRCUITS****OBJECTIVES**

The student will be made

- To understand the concept of wave shaping circuits, Switching Characteristics of diode and transistor.
- To analyze different types of Multi vibrators and their design procedures.
- To Introduce to Time-base Generators and Principles of Synchronization and Frequency division.
- To Understand Sampling Gates and to Design NAND and NOR gates using various logic families.

UNIT I

LINEAR WAVE SHAPING: High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square and ramp inputs. RC network as differentiator and integrator, attenuators, its applications in CRO probe, RL and RLC circuits and their response for step input, Ringing circuit.

UNIT II

NON-LINEAR WAVE SHAPING : Diode clippers, Transistor clippers, clipping at two independent levels, Transfer characteristics of clippers, Emitter coupled clipper, Comparators, applications of voltage comparators, clamping operation, clamping circuits using diode with different inputs, Clamping circuit theorem, practical clamping circuits, effect of diode characteristics on clamping voltage, Transfer characteristics of clampers.

UNIT III

SWITCHING CHARACTERISTICS OF DEVICES : Diode as a switch, piecewise linear diode characteristics, Transistor as a switch, Break down voltage consideration of transistor, saturation parameters of Transistor and their variation with temperature, Design of transistor switch, transistor-switching times.

Digital Logic gate circuits: Realization of Logic Gates using DTL, TTL, ECL and CMOS logic circuits, Comparison of logic families.

UNIT IV**MULTIVIBRATORS :**

Bistable Multi Vibrator: Analysis and Design of Fixed Bias, Self Bias Bistable Multi Vibrator, Collector catching Diodes, Commutating Capacitors,

Methods of Triggering using RC network & Diode, Emitter Coupled Bistable Multi Vibrator (Schmitt trigger).

Monostable Multi Vibrator: Analysis and Design of Collector Coupled Monostable Multi Vibrator, Triggering method of a Monostable Multi Vibrator, Application of Monostable Multi Vibrator as a Voltage to Time Converter.

Astable Multi Vibrator: Analysis and Design of Collector Coupled Astable Multi vibrator , Application of Astable Multi Vibrator as a Voltage to Frequency Converter. All circuits are transistor version.

UNIT V

VOLTAGE TIME BASE GENERATORS : General features of a time base signal, methods of generating time base waveform, Miller and Bootstrap time base generators – basic principles, Transistor miller time base generator, Transistor Bootstrap time base generator.

UNIT VI

SYNCHRONIZATION AND FREQUENCY DIVISION & SAMPLING GATES : Principles of Synchronization, Frequency division in sweep circuit, Astable relaxation circuits, Monostable relaxation circuits, Synchronization of a sweep circuit with symmetrical signals.

Basic operating principles of sampling gates, Unidirectional and Bi-directional sampling gates, Reduction of pedestal in gate circuits, Applications of sampling gates.

TEXT BOOKS :

1. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, McGraw-Hill, 1991.
2. Solid State Pulse circuits - David A. Bell, PHI, 4th Edn., 2002 .

REFERENCES :

1. Pulse and Digital Circuits – A. Anand Kumar, PHI, 2005.
2. Wave Generation and Shaping - L. Strauss.
3. Pulse, Digital Circuits and Computer Fundamentals - R.Venkataraman.

OUTCOMES

After going through this course the student will be able to

- Design linear and non-linear wave shaping circuits.
- Apply the fundamental concepts of wave shaping for various switching and signal generating circuits.
- Design different multivibrators and time base generators.

III Year – I SEMESTER

T	P	C
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LINEAR IC APPLICATIONS**OBJECTIVES**

The student will

- Study characteristics, realize circuits, design for signal analysis using Op-amp ICs.
- Study the linear and non-linear applications of operational amplifiers.
- Study IC 555 timer, PLL and VCO with their applications.
- Study and understand different types of ADCs and DACs
- Acquire skills required for designing and testing integrated circuits

UNIT I

INTEGRATED CIRCUITS: Differential Amplifier- DC and AC analysis of Dual input Balanced output Configuration, Properties of other differential amplifier configuration (Dual Input Unbalanced Output, Single Ended Input – Balanced/ Unbalanced Output), DC Coupling and Cascade Differential Amplifier Stages, Level translator.

UNIT II

Characteristics of OP-Amps, Integrated circuits-Types, Classification, Package Types and Temperature ranges, Power supplies, Op-amp Block Diagram, ideal and practical Op-amp Specifications, DC and AC characteristics, 741 op-amp & its features, FET input. Op-Amps, Op-Amp parameters & Measurement, Input & Out put Off set voltages & currents, slew rates, CMRR, PSRR, drift, Frequency Compensation technique.

UNIT III

LINEAR and NON-LINEAR APPLICATIONS OF OP- AMPS: Inverting and Non-inverting amplifier, Integrator and differentiator, Difference amplifier, Instrumentation amplifier, AC amplifier, V to I, I to V converters, Buffers. Non- Linear function generation, Comparators, Multivibrators, Triangular and Square wave generators, Log and Anti log Amplifiers, Precision rectifiers.

UNIT IV

ACTIVE FILTERS, ANALOG MULTIPLIERS AND MODULATORS: Introduction, Butter worth filters – 1st order, 2nd order LPF, HPF filters. Band pass, Band reject and All pass filters.

Four Quadrant multiplier, balanced modulator, IC1496, Applications of analog switches and Multiplexers, Sample & Hold amplifiers.

UNIT V

TIMERS & PHASE LOCKED LOOPS: Introduction to 555 timer, functional diagram, Monostable and Astable operations and applications, Schmitt Trigger. PLL - introduction, block schematic, principles and description of individual blocks, 565 PLL, Applications of PLL – frequency multiplication, frequency translation, AM, FM & FSK demodulators. Applications of VCO (566).

UNIT VI

DIGITAL TO ANALOG AND ANALOG TO DIGITAL CONVERTERS : Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, Different types of ADCs – parallel Comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC. DAC and ADC Specifications, Specifications AD 574 (12 bit ADC).

TEXT BOOKS :

1. Linear Integrated Circuits – D. Roy Chowdhury, New Age International (p) Ltd, 2nd Edition, 2003.
2. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI, 1987.

REFERENCES :

1. Design with Operational Amplifiers & Analog Integrated Circuits - Sergio Franco, McGraw Hill, 1988.
2. OP AMPS and Linear Integrated Circuits concepts and Applications, James M Fiore, Cengage Learning India Ltd.
3. Operational Amplifiers & Linear Integrated Circuits–R.F.Coughlin & Fredrick Driscoll, PHI, 6th Edition.
4. Operational Amplifiers – C.G. Clayton, Butterworth & Company Publ.Ltd./ Elsevier, 1971.
5. Operational Amplifiers & Linear ICs – David A Bell, Oxford Uni. Press, 3rd Edition.

OUTCOMES

After going through this course the student will be able to

- Design circuits using operational amplifiers for various applications.
- Analyze and design amplifiers and active filters using Op-amp.
- Acquire skills required for designing and testing integrated circuits
- Understand the gain-bandwidth concept and frequency response of the three basic amplifiers. Understand thoroughly the operational amplifiers with linear integrated circuits.
- Design combinational logic circuits for different applications.

III Year – I SEMESTER**T P C**
3+1 0 3**CONTROL SYSTEMS****OBJECTIVES**

The student will

- Learn the fundamental concepts of Control systems and mathematical modelling of the system.
- Study the concepts of time response and frequency response of the system.
- Understand the basics of stability analysis of the system.

UNIT I**INTRODUCTION**

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

UNIT II**TRANSFER FUNCTION REPRESENTATION**

Transfer Function of DC Servo motor - AC Servo motor- 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 III**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.

UNIT IV**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 V

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.

STABILITY ANALYSIS IN FREQUENCY DOMAIN:

Polar Plots, Nyquist Plots Stability Analysis.

UNIT VI

CLASSICAL CONTROL DESIGN TECHNIQUES

Compensation techniques – Lag, Lead, Lead-Lag Controllers design in frequency Domain, PID Controllers. 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 – Concepts of Controllability and Observability.

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Modern Control Engineering – by Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd., 3rd edition, 1998.
2. Control Systems by N.K.Sinha, New Age International (P) Limited Publishers, 3rd Edition, 1998.

OUTCOMES

After going through this course the student will be able to

- Represent the mathematical model of a system.
- Determine the response of different order systems for various step inputs.
- Analyse the stability of the system.

III Year – I SEMESTER

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DIGITAL SYSTEM DESIGN & DIGITAL IC APPLICATIONS**OBJECTIVES**

The student will be introduced to

- The electrical behavior of CMOS both in static and dynamic conditions and before that study the diode/transistor-transistor logic and Emitter coupled logic.
- In this course, students can study Integrated circuits for all digital operational designs like adder, subtractor, multipliers, multiplexers, registers, counters, flip flops, encoders, decoders and memory elements like RAM and ROM.
- Design and to develop the internal circuits for different digital operations and simulate them using hardware languages using integrated circuits.
- Understand the concepts of SSI Latches and Flip-Flops and Design of Counters using Digital ICs, modeling of sequential logic integrated circuits using VHDL.

Unit-I:

Digital Design Using HDL: Design flow, program structure, History of VHDL, VHDL requirements, Levels of Abstraction, Elements of VHDL, Concurrent and Sequential Statements, Packages, Libraries and Bindings, Objects and Classes, Subprograms, Comparison of VHDL and Verilog HDL.

Unit-II:

VHDL Modelling : Simulation, Logic Synthesis, Inside a logic Synthesizer, Constraints, Technology Libraries, VHDL and Logic Synthesis, Functional Gate-Level verification, Place and Route, Post Layout Timing Simulation, Static Timing, Major Netlist formats for design representation, VHDL Synthesis-Programming Approach.

Unit-III:

Programmable Logic Devices (PLDs) & Memories: Programmable Read Only Memory, Programmable Logic Array, Programmable Array Logic Devices, ROM: Internal structure, 2D-Decoding, Commercial ROM types, timing and applications,. Static RAM: Internal structure, SRAM timing, standard, synchronous SRAMS, Dynamic RAM: Internal structure, timing, synchronous DRAMS. Design considerations of PLDs with relevant Digital ICs.

Unit-IV:

Digital Logic Families and Interfacing: Introduction to logic families, CMOS logic, CMOS steady state and dynamic electrical behavior, CMOS

logic families. bipolar logic, transistor-transistor logic, TTL families, CMOS/TTL interfacing, low voltage CMOS logic and interfacing, Emitter coupled logic.

Unit-V:

Combinational Logic Design: Adders & Subtractors, Ripple Adder, Look Ahead Carry Generator, Binary Parallel Adder, Binary Adder-Subtractor, ALU, Decoders, encoders, three state devices, multiplexers and demultiplexers, Code Converters, parity circuits, comparators, multipliers, Barrel Shifter, Simple Floating-Point Encoder, Cascading Comparators, Dual Priority Encoder, Design considerations with relevant Digital ICs, modeling of Circuits by using VHDL.

Unit-VI:

Sequential Logic Design: SSI Latches and Flip-Flops, Counters, Design of Counters using Digital ICs, Ring Counter, Johnson Counter, Modulus N Synchronous Counters, MSI Registers, Shift Registers, Modes of Operation of Shift Registers, Universal Shift Registers, MSI Shift Registers, Design considerations with relevant Digital ICs, modeling of circuits by using VHDL.

TEXT BOOKS:

1. Digital Design Principles & Practices – John F.Wakerly, PHI/ Pearson Education Asia, 3rd Edition, 2005.
2. Designing with TTL Integrated Circuits: Robert L. / John R. Morris & Miller.

REFERENCES:

1. "Fundamentals of Digital logic design with VHDL". Stephen Brown & Zvonko Vranesic, Tata McGraw Hill, 2nd edition.
2. VHDL Primer – J. Bhasker, Pearson Education/ PHI, 3rd Edition.

OUTCOMES:

After going through this course the student will be able to

- Understand the concepts of different logics and implementations using Integrated circuits.
- Design and analyze any Digital design in real time applications.
- Extend the digital operations to any width by connecting the ICs and can also design, simulate their results using hardware description language.
- Understand the concepts of MSI Registers and Modes of Operation of Shift Registers, Universal Shift Registers.

III Year – I SEMESTER

T	P	C
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ANTENNAS AND WAVE PROPAGATION**OBJECTIVES**

The student will be able to

- understand the applications of the electromagnetic waves in free space.
- introduce the working principles of various types of antennas
- discuss the major applications of antennas with an emphasis on how antennas are employed to meet electronic system requirements.
- understand the concepts of radio wave propagation in the atmosphere.

UNIT I

ANTENNA FUNDAMENTALS: Introduction, Radiation Mechanism – single wire, 2 wire, dipoles, Current Distribution on a thin wire antenna. Antenna Parameters - Radiation Patterns, Patterns in Principal Planes, Main Lobe and Side Lobes, Beamwidths, Polarization, Beam Area, Radiation Intensity, Beam Efficiency, Directivity, Gain and Resolution, Antenna Apertures, Aperture Efficiency, Effective Height, illustrated Problems.

UNIT II

THIN LINEAR WIRE ANTENNAS: Retarded Potentials, Radiation from Small Electric Dipole, Quarter wave Monopole and Half wave Dipole – Current Distributions, Evaluation of Field Components, Power Radiated, Radiation Resistance, Beamwidths, Directivity, Effective Area and Effective Height. Natural current distributions, fields and patterns of Thin Linear Center-fed Antennas of different lengths, Radiation Resistance at a point which is not current maximum. Antenna Theorems – Applicability and Proofs for equivalence of directional characteristics, Loop Antennas: Small Loops - Field Components, Comparison of far fields of small loop and short dipole, Concept of short magnetic dipole, D and R_r relations for small loops.

UNIT III

ANTENNA ARRAYS : 2 element arrays – different cases, Principle of Pattern Multiplication, N element Uniform Linear Arrays – Broadside, End-fire Arrays, EFA with Increased Directivity, Derivation of their characteristics and comparison; Concept of Scanning Arrays. Directivity

Relations (no derivations). Related Problems. Binomial Arrays, Effects of Uniform and Non-uniform Amplitude Distributions, Design Relations. Arrays with Parasitic Elements, Yagi-Uda Arrays, Folded Dipoles and their characteristics.

UNIT IV

NON-RESONANT RADIATORS : Introduction, Traveling wave radiators – basic concepts, Long wire antennas – field strength calculations and patterns, Microstrip Antennas-Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas –Geometry and Parameters, Impact of different parameters on characteristics. Broadband Antennas: Helical Antennas – Significance, Geometry, basic properties; Design considerations for monofilar helical antennas in Axial Mode and Normal Modes (Qualitative Treatment).

UNIT V

VHF, UHF AND MICROWAVE ANTENNAS : Reflector Antennas : Flat Sheet and Corner Reflectors. Paraboloidal Reflectors – Geometry, characteristics, types of feeds, F/D Ratio, Spill Over, Back Lobes, Aperture Blocking, Off-set Feeds, Cassegrain Feeds.

Horn Antennas – Types, Optimum Horns, Design Characteristics of Pyramidal Horns; Lens Antennas – Geometry, Features, Dielectric Lenses and Zoning, Applications, Antenna Measurements – Patterns Required, Set Up, Distance Criterion, Directivity and Gain Measurements (Comparison, Absolute and 3-Antenna Methods).

UNIT VI

WAVE PROPAGATION : Concepts of Propagation – frequency ranges and types of propagations. Ground Wave Propagation–Characteristics, Parameters, Wave Tilt, Flat and Spherical Earth Considerations. Sky Wave Propagation – Formation of Ionospheric Layers and their Characteristics, Mechanism of Reflection and Refraction, Critical Frequency, MUF and Skip Distance – Calculations for flat and spherical earth cases, Optimum Frequency, LUHF, Virtual Height, Ionospheric Abnormalities, Ionospheric Absorption.

Fundamental Equation for Free-Space Propagation, Basic Transmission Loss Calculations. Space Wave Propagation – Mechanism, LOS and Radio Horizon. Tropospheric Wave Propagation – Radius of Curvature of path, Effective Earth's Radius, Effect of Earth's Curvature, Field Strength Calculations, M-curves and Duct Propagation, Tropospheric Scattering.

TEXT BOOKS

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

REFERENCES

1. Antenna Theory - C.A. Balanis, John Wiley and Sons, 2nd Edition, 2001.
2. Antennas and Wave Propagation – K.D. Prasad, Satya Prakashan, Tech India Publications, New Delhi, 2001.
3. Transmission and Propagation – E.V.D. Glazier and H.R.L. Lamont, The Services Text Book of Radio, vol. 5, Standard Publishers Distributors, Delhi.
4. Electronic and Radio Engineering – F.E. Terman, McGraw-Hill, 4th Edition, 1955.
5. Antennas – John D. Kraus, McGraw-Hill, 2nd Edition, 1988.

OUTCOMES

After going through this course the student will be able to

- Identify basic antenna parameters.
- Design and analyze wire antennas, loop antennas, reflector antennas, lens antennas, horn antennas and microstrip antennas
- Quantify the fields radiated by various types of antennas
- Design and analyze antenna arrays
- Analyze antenna measurements to assess antenna's performance
- Identify the characteristics of radio wave propagation

III Year – I SEMESTER**T P C**
0 3 2**Pulse & Digital Circuits Lab**

1. Linear wave shaping.
2. Non Linear wave shaping – Clippers.
3. Non Linear wave shaping – Clampers.
4. Transistor as a switch.
5. Study of Logic Gates & Some applications.
6. Study of Flip-Flops & some applications.
7. Sampling Gates.
8. Astable Multivibrator.
9. Monostable Multivibrator.
10. Bistable Multivibrator.
11. Schmitt Trigger.
12. UJT Relaxation Oscillator.
13. Bootstrap sweep circuit.

EQUIPMENT REQUIRED FOR LABORATORY:

1. RPS - 0 – 30 V
2. CRO - 0 – 20 M Hz.
3. Function Generators - 0 – 1 M Hz
4. Components
5. Multi Meters

III Year – I SEMESTER**T P C**
0 3 2**LIC APPLICATIONS LAB****Minimum Twelve Experiments to be conducted :**

1. Study of ICs – IC 741, IC 555, IC 565, IC 566, IC 1496 – functioning, parameters and Specifications.
2. OP AMP Applications – Adder, Subtractor, Comparator Circuits.
3. Integrator and Differentiator Circuits using IC 741.
4. Active Filter Applications – LPF, HPF (first order)
5. Active Filter Applications – BPF, Band Reject (Wideband) and Notch Filters.
6. IC 741 Oscillator Circuits – Phase Shift and Wien Bridge Oscillators.
7. Function Generator using OP AMPs.
8. IC 555 Timer – Monostable Operation Circuit.
9. IC 555 Timer – Astable Operation Circuit.
10. Schmitt Trigger Circuits – using IC 741 and IC 555.
11. IC 565 – PLL Applications.
12. IC 566 – VCO Applications.
13. Voltage Regulator using IC 723.
14. Three Terminal Voltage Regulators – 7805, 7809, 7912.
15. 4 bit DAC using OP AMP.

EQUIPMENT REQUIRED FOR LABORATORIES:

1. RPS
2. CRO
3. Function Generator
4. Multi Meters
5. IC Trainer Kits (Optional)
6. Bread Boards
7. Components:- IC741, IC555, IC565, IC1496, IC723, 7805, 7809, 7912 and other essential components.
8. Analog IC Tester

III Year – I SEMESTER**T P C**
0 3 2**Digital System Design & DICA Laboratory**

The students are required to design and draw the internal structure of the following Digital Integrated Circuits and to develop VHDL source code, perform simulation using relevant simulator and analyze the obtained simulation results using necessary synthesizer. Further, it is required to verify the logic with necessary hardware.

List of Experiments:

1. Realization of Logic Gates
2. 3 to 8 Decoder- 74138
3. 8*1 Multiplexer-74151 and 2*1 De-multiplexer-74155
4. 4-Bit Comparator-7485.
5. D Flip-Flop- 7474
6. Decade Counter- 7490
7. 4 Bit Counter-7493
8. Shift Register-7495
9. Universal shift register-74194/195
10. Ram (16*4)-74189 (read and write operations)
11. ALU

Equipment Required:

1. Xilinx ISE software-latest version
2. Personal computer with necessary peripherals
3. Hardware kits- Various FPGA families.

III Year – I SEMESTER**T P C**
3 0 2**INTELLECTUAL PROPERTY RIGHTS AND PATENTS****Unit I**

Introduction to Intellectual Property Law – Evolutionary past – Intellectual Property Law Basics - Types of Intellectual Property - Innovations and Inventions of Trade related Intellectual Property Rights – Agencies Responsible for Intellectual Property Registration – Infringement - Regulatory – Over use or Misuse of Intellectual Property Rights - Compliance and Liability Issues.

Unit II

Introduction to Copyrights – Principles of Copyright – Subject Matters of Copyright – Rights Afforded by Copyright Law –Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of performers – Copyright Formalities and Registration – Limitations – Infringement of Copyright – International Copyright Law- Semiconductor Chip Protection Act.

Unit III

Introduction to Patent Law – Rights and Limitations – Rights under Patent Law – Patent Requirements – Ownership and Transfer – Patent Application Process and Granting of Patent – Patent Infringement and Litigation – International Patent Law – Double Patenting – Patent Searching – Patent Cooperation Treaty – New developments in Patent Law- Invention Developers and Promoters.

Unit IV

Introduction to Trade Mark – Trade Mark Registration Process – Post registration procedures – Trade Mark maintenance – Transfer of rights – Inter parties Proceedings – Infringement – Dilution of Ownership of Trade Mark – Likelihood of confusion – Trade Mark claims – Trade Marks Litigation – International Trade Mark Law

Unit V

Introduction to Trade Secrets – Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreement –

Trade Secret Law – Unfair Competition – Trade Secret Litigation – Breach of Contract – Applying State Law.

Unit VI

Introduction to Cyber Law – Information Technology Act - Cyber Crime and E-commerce – Data Security – Confidentiality – Privacy - International aspects of Computer and Online Crime.

REFERENCE BOOKS:

1. Deborah E. Bouchoux: "Intellectual Property". Cengage learning , New Delhi
2. Kompal Bansal & Parishit Bansal "Fundamentals of IPR for Engineers", BS Publications (Press)
3. Cyber Law. Texts & Cases, South-Western's Special Topics Collections
4. Prabhuddha Ganguli: ' Intellectual Property Rights" Tata Mc-Graw – Hill, New Delhi
5. Richard Stim: "Intellectual Property", Cengage Learning, New Delhi.
6. R. Radha Krishnan, S. Balasubramanian: "Intellectual Property Rights", Excel Books. New Delhi.
7. M. Ashok Kumar and Mohd. Iqbal Ali: "Intellectual Property Right" Serials Pub.

III Year – II SEMESTER

T	P	C
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MICRO PROCESSORS AND MICRO CONTROLLERS

OBJECTIVES : The student will

- learn concepts of microprocessor, different addressing modes and programming of 8086.
- understand interfacing of 8086, with memory and other peripherals.
- learn concept of DMA, USART RS-232 and PIC controller.
- study the features of advanced processors and Pentium processors.
- study the features of 8051 Microcontroller, its instruction set and also other controllers.

UNIT-I: 8086/8088 MICROPROCESSORS

Register organization of 8086, Architecture, signal description of 8086, physical memory organization, general bus operation, I/O addressing capability, special purpose activities, Minimum mode, maximum mode of 8086 system and timings, the processor 8088, machine language instruction formats, addressing mode of 8086, instruction set of 8086, assembler directives and operators.

UNIT-II: PROGRAMMING WITH 8086 MICROPROCESSOR

Machine level programs, programming with an assembler, Assembly language programs, introduction to stack, stack structure of 8086/8088, interrupts and interrupt service routines, interrupt cycle of 8086, non-maskable interrupt and maskable interrupts, interrupt programming.

UNIT-III: BASIC AND SPECIAL PURPOSE PROGRAMMABLE PERIPHERALS AND THEIR INTERFACING WITH 8086/88

Semiconductor memory interfacing, dynamic RAM interfacing, interfacing I/O ports, PIO 8255 modes of operation of 8255, interfacing to D/A and A/D converters, stepper motor interfacing, control of high power devices using 8255. Programmable interrupt controller 8259A, the keyboard/display controller 8279, programmable communication interface 8251 USART, DMA Controller 8257.

UNIT-IV: ADVANCED MICRO PROCESSORS

Salient features of 80386DX, architecture and signal description of 80386, register organization of 80386 and addressing modes, data types of 80386,

real address mode of 80386, protected mode of 80386, segmentation and Paging, virtual 8086 mode and enhanced mode. Instruction set of 80386. The coprocessor 80387.

UNIT-V: 8051 MICROCONTROLLER

Introduction to microcontrollers, 8051 Microcontrollers, 8051 pin description, connections, I/O ports and memory organization, MCS51 addressing modes and instructions, assembly language programming tools.

UNIT-VI: PIC MICROCONTROLLERS AND ARM 32-BIT MICROCONTROLLER

Overview and features, PIC16Cx/7X instructions, interrupts in PIC 16C61/71, PIC 16F8XX Flash controllers, I/O ports and timers. Introduction to 16/32 Bit processors, ARM architecture and organization, ARM / Thumb programming model, ARM / Thumb instruction set.

TEXT BOOKS:

1. A.K.Ray, K.M.Bhurchandi, "Advanced Microprocessors and Peripherals", Tata McGraw Hill Publications, 2000.
2. N.Sentil Kumar, M.Saravanan, S.Jeevananthan, "Microprocessors and Microcontrollers", Oxford University Press, 2010.

REFERENCES:

1. Ajay V Deshmukh, "Microcontrollers", TATA McGraw Hill publications, 2012.
2. Krishna Kant, "Microprocessors and Microcontrollers", PHI Publications, 2010.

OUTCOMES

After going through this course the student will be able to

- develop programs for different addressing modes.
- perform 8086 interfacing with different peripherals and implement programs.
- describe the key features of serial and parallel communication and able to
- Design a microcontroller for simple applications.

III Year – II SEMESTER**T P C**
3+1 0 3**DIGITAL SIGNAL PROCESSING****OBJECTIVES**

The student will be able to

- Define and use Discrete Fourier Transforms (DFTs)
- Use Z - transforms and discrete time Fourier transforms to analyze a digital system.
- Understand simple finite impulse response filters
- Learn the design procedures used for filter bank
- Learn to program a DSP processor to filter signals

UNIT I

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

UNIT II

DISCRETE FOURIER SERIES & FOURIER TRANSFORMS: Properties of discrete Fourier series, DFS representation of periodic sequences, Discrete Fourier transforms: Properties of DFT, linear convolution of sequences using DFT, Computation of DFT, Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT.

UNIT III

REALIZATION OF DIGITAL FILTERS: Review of Z-transforms, Applications of Z – transforms, solution of difference equations - digital filters, Block diagram representation of linear constant-coefficient difference equations, Basic structures of IIR systems, Transposed forms, Basic structures of FIR systems, System function,

UNIT IV

IIR & FIR DIGITAL FILTERS: Analog filter approximations – Butter worth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples: Analog-Digital transformations Characteristics of FIR Digital Filters, frequency response. Design of FIR Digital Filters using Window Techniques, Frequency Sampling technique, Comparison of IIR & FIR filters.

UNIT V

MULTIRATE DIGITAL SIGNAL PROCESSING: Decimation, interpolation, sampling rate conversion, Implementation of sampling rate conversion.

UNIT VI

INTRODUCTION TO DSP PROCESSORS: Introduction to programmable DSPs: Multiplier and Multiplier Accumulator (MAC), Modified Bus Structures and Memory Access schemes in DSPs Multiple access memory, multiport memory, VLSI architecture, Pipelining, Special addressing modes, On-Chip Peripherals. Architecture of TMS 320C5X- Introduction, Bus Structure, Central Arithmetic Logic Unit, Auxiliary Register, Index Register, Block Move Address Register, Parallel Logic Unit, Memory mapped registers, program controller, Some flags in the status registers, On- chip registers, On-chip peripherals.

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.
3. Digital Signal Processors – Architecture, Programming and Applications,, B.Venkataramani, M.Bhaskar, TATA McGraw Hill, 2002.
4. Digital Signal Processing – K Raja Rajeswari, I.K. International Publishing House.

Reference Books:

1. Digital Signal Processing: Andreas Antoniou, TATA McGraw Hill , 2006
2. Digital Signal Processing: MH Hayes, Schaum's Outlines, TATA McGraw 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. Digital Signal Processing – Alan V. Oppenheim, Ronald W. Schafer, PHI Ed., 2006

OUTCOMES

After going through this course the student will be able to

- Estimate the spectra of signals that are to be processed by a discrete time filter, and to verify the performance of a variety of modern and classical spectrum estimation techniques.
- Design and simulate a digital filter
- Design new digital signal processing systems.
- Design and realize FIR, IIR filters
- Program a DSP processor to filter signals

III Year – II SEMESTER

T	P	C
3+1	0	3

DIGITAL COMMUNICATIONS**OBJECTIVES**

The student will be able to

- understand pulse digital modulation systems such as PCM, DPCM and DM.
- understand various digital modulation techniques and able to analyze various systems for their performance in terms of probability of error.
- study the concept of entropy and need for source coding.
- study Block codes, cyclic codes and convolution codes.

UNIT I

PULSE DIGITAL MODULATION: Elements of digital communication systems, advantages of digital communication systems, Elements of PCM: Sampling, Quantization & Coding, Quantization error, Companding in PCM systems. Differential PCM systems (DPCM). Delta modulation, its drawbacks, adaptive delta modulation, comparison of PCM and DM systems, noise in PCM and DM systems.

UNIT II

DIGITAL MODULATION TECHNIQUES: Introduction, ASK, FSK, PSK, DPSK, DEPSK, QPSK, M-ary PSK, ASK, FSK, similarity of BFSK and BPSK.

UNIT III

DATA TRANSMISSION : Base band signal receiver, probability of error, the optimum filter, matched filter, probability of error using matched filter, coherent reception, non-coherent detection of FSK, calculation of error probability of ASK, BPSK, BFSK, QPSK.

UNIT IV

INFORMATION THEORY: Discrete messages, concept of amount of information and its properties. Average information, Entropy and its properties. Information rate, Mutual information and its properties.

UNIT V

SOURCE CODING: Introductions, Advantages, Shannon's theorem, Shanon-Fano coding, Huffman coding, efficiency calculations, channel capacity of discrete and analog Channels, capacity of a Gaussian channel, bandwidth –S/N trade off.

UNIT VI

LINEAR BLOCK CODES: Introduction, Matrix description of Linear Block codes, Error detection and error correction capabilities of Linear block codes, Hamming codes, Binary cyclic codes, Algebraic structure, encoding, syndrome calculation, BCH Codes.

CONVOLUTION CODES: Introduction, encoding of convolution codes, time domain approach, transform domain approach. Graphical approach: state, tree and trellis diagram decoding using Viterbi algorithm.

TEXT BOOKS:

1. Digital communications - Simon Haykin, John Wiley, 2005
2. Principles of Communication Systems – H. Taub and D. Schilling, TMH, 2003

REFERENCES:

1. Digital and Analog Communication Systems - Sam Shanmugam, John Wiley, 2005.
2. Digital Communications – John Proakis, TMH, 1983. Communication Systems Analog & Digital – Singh & Sapre, TMH, 2004.
3. Modern Analog and Digital Communication – B.P.Lathi, Oxford reprint, 3rd edition, 2004.

OUTCOMES

After going through this course the student will be able to

- analyze the performance of a Digital Communication System for probability of error and are able to design a digital communication system.
- analyze various source coding techniques
- Compute and analyze Block codes, cyclic codes and convolution codes.
- Design a coded communication system.

III Year – II SEMESTER

T	P	C
3+1	0	3

MICROWAVE ENGINEERING**OBJECTIVES**

The student will

- Understand fundamental electrical characteristics of waveguides and transmission lines through electromagnetic field analysis.
- Understand the basic properties of Polarization and Ferrite materials composition in the case of waveguide components.
- Understand the multiport junction concept for splitting the microwave energy in a desired direction.
- Understand the function, design, and integration of the major microwave components like oscillator, modulator, power amplifier, filter, and mixer in building a Microwave test bench setup for measurements.

UNIT I

MICROWAVE TRANSMISSION LINES: Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguides – TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Filter Characteristics, Dominant and Degenerate Modes, Sketches of TE and TM mode fields in the cross-section, Mode Characteristics – Phase and Group Velocities, Wavelengths and Impedance Relations; Power Transmission and Power Losses in Rectangular Guide, Impossibility of TEM mode. Related Problems.

UNIT II

CIRCULAR WAVEGUIDES: Introduction, Nature of Fields, Characteristic Equation, Dominant and Degenerate Modes. Microstrip Lines– Introduction, Zo Relations, Effective Dielectric Constant, Losses, Q factor.

Cavity Resonators– Introduction, Rectangular and Cylindrical Cavities, Dominant Modes and Resonant Frequencies, Q factor and Coupling Coefficients, Excitation techniques- waveguides and cavities, Related Problems.

UNIT III

WAVEGUIDE COMPONENTS AND APPLICATIONS - I :Coupling Mechanisms – Probe, Loop, Aperture types. Waveguide Discontinuities –

Waveguide irises, Tuning Screws and Posts, Matched Loads. Waveguide Attenuators – Resistive Card, Rotary Vane types; Waveguide Phase Shifters – Dielectric, Rotary Vane types. Scattering Matrix– Significance, Formulation and Properties. S-Matrix Calculations for – 2 port Junction, E-plane and H-plane Tees, Magic Tee, Hybrid Ring; Directional Couplers – 2Hole, Bethe Hole types, Ferrite Components– Faraday Rotation, S-Matrix Calculations for Gyrator, Isolator, Circulator, Related Problems.

UNIT - IV

MICROWAVE TUBES :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 and Small Signal Theory – Expressions for o/p Power and Efficiency. Reflex Klystrons – Structure, Applegate Diagram and Principle of working, Mathematical Theory of Bunching, Power Output, Efficiency, Electronic Admittance; Oscillating Modes and o/p Characteristics, Electronic and Mechanical Tuning, Related Problems.

UNIT V

HELIX TWTS: Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT and Suppression of Oscillations, Nature of the four Propagation Constants.

M-type Tubes

Introduction, Cross-field effects, Magnetrons – Different Types, 8-Cavity Cylindrical Travelling Wave.

Magnetron – Hull Cut-off and Hartree Conditions, Modes of Resonance and PI-Mode Operation, Separation of PI-Mode, o/p characteristics.

UNIT VI

MICROWAVE SOLID STATE DEVICES: Introduction, Classification, Applications. TEDs – Introduction, Gunn Diode – Principle, RWH Theory, Characteristics, Basic Modes of Operation, Oscillation Modes. Avalanche Transit Time Devices – Introduction, IMPATT and TRAPATT Diodes – Principle of Operation and Characteristics.

MICROWAVE MEASUREMENTS: Description of Microwave Bench – Different Blocks and their Features, Precautions; Microwave Power Measurement – Bolometer Method. Measurement of Attenuation, Frequency, VSWR, Cavity Q. Impedance Measurements.

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.

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 Passive Circuits – Peter A. Rizzi, PHI, 1999.
4. Microwave Engineering – G S N Raju , I K International
5. Microwave and Radar Engineering – G Sasibhushana Rao Pearson
6. Electronic and Radio Engineering – F.E. Terman, McGraw-Hill, 4th ed., 1955.

OUTCOMES : After going through this course the student will

- Gain knowledge of transmissionlines and waveguide structures and how they are used as elements in impedance matching and filter circuits.
- Apply analysis methods to determine circuit properties of passive or active microwave devices.
- Gain knowledge and understanding of microwave analysis methods.
- Distinguish between M-type and O-type tubes
- Analyze and measure various microwave parameters using a Microwave test bench

III Year – II SEMESTER

T	P	C
3+1	0	3

Open Elective**Open Electives:**

1. Bio Medical Engineering
2. Fuzzy & Neural Networks
3. Image Processing (not for ECE Students)
4. Principles of Signals, Systems and Communications (Not for ECE Students)
5. Electronic Instrumentation (Not for ECE Students)

Note: ECE Students can also Choose the OPEN ELECTIVES Offered by any Other Department.

BIO-MEDICAL ENGINEERING
(OPEN ELECTIVE)

UNIT-I:

INTRODUCTION TO BIOMEDICAL INSTRUMENTATION: Age of Biomedical Engineering, Development of Biomedical Instrumentation, Man Instrumentation System, Components of the Man-Instrument System, Physiological System of the Body, Problems Encountered in Measuring a Living System, Sources of Bioelectric Potentials, Muscle, Bioelectric Potentials, Sources of Bioelectric Potentials, Resting and Action Potentials, Propagation of Action Potential, Bioelectric Potentials-ECG, EEG and EMG, Evoked Responses.

UNIT-II:

ELECTRODES AND TRANSDUCERS: Introduction, Electrode Theory, Biopotential Electrodes, Examples of Electrodes, Basic Transducer Principles, Biochemical Transducers, The Transducer and Transduction Principles, Active Transducers, Passive Transducers, Transducers for Biomedical Applications, Pulse Sensors, Respiration Sensor, Transducers with Digital Output.

UNIT-III:

CARDIOVASCULAR SYSTEM AND MEASUREMENTS: The Heart and Cardiovascular System, Electro Cardiography, Blood Pressure Measurement, Measurement of Blood Flow and Cardiac Output, Measurement of Heart Sound, Plethysmography.

MEASUREMENTS IN THE RESPIRATORY SYSTEM: The Physiology of The Respiratory System, Tests and Instrumentation for The Mechanics of Breathing, Respiratory Therapy Equipment.

UNIT-IV:

PATIENT CARE AND MONITORING: Elements of Intensive-Care Monitoring, Patient Monitoring Displays, Diagnosis, Calibration and Repair ability of Patient-Monitoring Equipment, Other Instrumentation for Monitoring Patients, Organization of the Hospital for Patient-Care Monitoring, Pacemakers, Defibrillators, Radio Frequency Applications of Therapeutic use.

THERAPEUTIC AND PROSTHETIC DEVICES: Audiometers and Hearing Aids.

Myoelectric Arm, Laparoscope, Ophthalmology Instruments, Anatomy of Vision,.

Electrophysiological Tests, Ophthalmoscope, Tonometer for Eye Pressure Measurement.

Diathermy, Clinical Laboratory Instruments, Biomaterials, Stimulators.

UNIT-V:

DIAGNOSTIC TECHNIQUES AND BIO-TELEMTRY: Principles of Ultrasonic Measurement, Ultrasonic Imaging, Ultrasonic Applications of Therapeutic Uses, Ultrasonic Diagnosis, X-Ray and Radio-Isotope Instrumentations, CAT Scan, Emission Computerized Tomography, MRI, Introduction to Biotelemetry, Physiological Parameters Adaptable to Biotelemetry, The Components of Biotelemetry System, Implantable Units, Telemetry for ECG Measurements during Exercise, Telemetry for Emergency Patient Monitoring.

UNIT-VI:

MONITORS, RECORDERS AND SHOCK HAZARDS: Biopotential Amplifiers, Monitors, Recorders, Shock Hazards and Prevention,

Physiological Effects and Electrical Current, Shock Hazards from Electrical Equipment, Methods of Accident Prevention, Isolated Power Distribution System.

Text Books:

1. “Bio-Medical Electronics and Instrumentation”, Onkar N. Pandey, Rakesh Kumar, Katson Books.
2. “Bio-Medical Instrumentation”, Cromewell , Wiebell, Pfeiffer

References:

1. “Introduction to Bio-Medical Equipment Technology”, 4th Edition, Joseph J. Carr, John M. Brown, Pearson Publications.
2. “Hand Book of Bio-Medical Instrumentation”, Khandapur. McGrawHill

Image Processing (OPEN ELECTIVE)

Unit: 1

Introduction to Image Processing:

Overview of Image Processing, Nature of Image Processing, Image Processing Computer Graphics, Signal Processing, Machine Vision, video Processing, Optics, Statistics, Digital Image Representation, Types of Images, Digital Image Processing Operations, Fundamental steps in Image Processing, Image Processing Applications.

Digital Imaging System

Digital Imaging System:

Physical Aspects of Imaging Acquisition, Biological Aspects of Image Acquisition, Properties of Human Visual System, Review of Digital Camera, Sampling and Quantization, Image Quality – *Optical Resolution, Image Display Device and Device Resolution*, Digital Halftone Process – *Random Dithering, Ordered Dithering, Non-Periodic Dithering*, Image Storage and File Formats – Need for File Format

Types of File Formats – *GIF, JPEG, PNG, DICOM, SVG Structure of TIFF File Format*.

Unit: 2

Digital Image Processing Operations: Basic Relationship and Distance Metrics, Classification of Image Processing Operations, Arithmetic and Logical Operations, Geometric Operations, Image Interpolation Techniques, Set Operations, Statistical Operations, Convolution and Correlation Operations, Data Structures and Image Processing Applications Development – Relational Structures, Hierarchical Data Structures, Pyramids, Quadrees, Application Development.

Digital Image Transforms: Need for Image Transforms, Spatial Frequencies in Image Processing, Introduction to Fourier Transform, Discrete Fourier Transform, Fast Fourier Transform and its algorithm, Properties of Fourier transform – *Sampling Theorem, Parseval's Theorem*, Discrete Cosine Transform, Discrete Sine Transform, Walsh Transform, Hadamard Transform, Haar Transform, Slant Transform, SVD and KL Transforms *or* *Hotelling Transform*.

Unit: 3

Image Enhancement: Image Quality and Need for Image Enhancement, Image Quality Metrics, Image Enhancement Point Operations Linear and

Non-linear Functions, Piecewise Linear Functions, Histogram-based Techniques, Spatial Filtering Concepts, Image Smoothing Spatial Filters and its design, Image Sharpening Spatial Filters Frequency Domain Filtering

Image Restoration: Image Degradation (Restoration) Model, Categories of Image Degradations, Noise Modeling, Blur and Distortions, Image Restoration in the Presence of Noise Only, Mean Filters, Order-statistics Filters, Image Restoration Techniques, Constrained and Unconstrained Methods, Geometrical Transforms for Image Restoration.

Unit: 4

Image Compression:

Image Compression Model, Compression Algorithm and its types – *Entropy Coding, Predictive Coding, Transform Coding, Layered Coding*, Types of Redundancy – *Coding Redundancy, Inter-pixel Redundancy, Psychovisual Redundancy, Chromatic Redundancy*.

Lossless Compression Algorithms, Run-length Coding, Huffman Coding , Shannon–Fano Coding, Bit-plane Coding, Arithmetic Coding, Lossless Predictive Coding, Lossy Compression Algorithms, Block Transform Coding, Image and Video Compression standards, JPEG, Video Compression – MPEG.

Unit: 5

Image Segmentation:

Introduction – Classification of Image Segmentation Algorithms, Detection of Discontinuities, Edge Detection – Staged in Edge Detection – Types of Edge Detectors, First-order Edge Detection Operators – Second-order Derivative Filters, Edge Operator Performance, Edge Linking Algorithms, Principle of Thresholding - Effect of Noise over Threshold Process and Peakiness Test - Parametric Methods, Non-parametric Methods, Principle of Region- growing –Dynamic Segmentation approaches , Validation of Segmentation Algorithms.

Unit: 6

Colour Image Processing:

Introduction – Colour Fundamentals, Devices for Colour Imaging, Colour Image Storage and Processing – Colour Models – RGB Colour Model, HIS Colour Model, HSV Colour Model, HLS Colour Model, TV Colour Model–

YUV Model, YIQ Model, $Y C_b C_r$ Colour Model, Printing Colour Models- CMK and CMYK Models.

Colour Quantization – Popularity Algorithm, Median-cut Algorithm, Octree-based Algorithm, Pseudo Colour Image Processing.

Full Colour Processing – Colour Transformation – Image Filters for Colour Images – Noise in Colour Images, Colour Image Segmentation– Thresholding, K-means Clustering Technique, RGB Colour Space Segmentation, Colour Features.

Text Books:

1. S.Sridhar, “Digital Image Processing” Oxford Publishers, 2011
2. S.Jayaraman, S.Esakkirajan, T.Veerakumar, “Digital Image Processing” Mc Graw Hill Publishers, 2009

Reference Books:

1. Rafael C.Gonzalez and Richard E. Woods, “Digital Image Processing” Pearson Education, 2011.
2. B.Chanda and D. Dutta Majumder, “Digital Image Processing and Analysis” Prentice Hall of India, 2011/2012 (Print).
3. Anil K. Jain, “Fundamentals of Digital Image Processing,” Prentice Hall of India, 2012.
4. Milan Sonka, Hlavac & Boyle “Digital Image Processing and Computer Vision,” Cengage Learning Publishers, 2010 (Reprinted).

Principles of Signals, Systems and Communications (OPEN ELECTIVE)

Unit – I

Signal Analysis: Introduction, Fourier Series - Trigonometric Fourier Series, Complex Exponential Fourier Series; Complex Fourier Spectrum – Time Domain and Frequency Domain Representation of a Signal; Fourier Transform - Analysis of a Non Periodic Function over entire interval; Fourier Transform Involving Impulse Function; Properties of Fourier Transform and Significance- Convolution Integral, Fourier Transform of Periodic Functions.

Unit – II

Linear Systems: Introduction; System Function – Representation of a function $f(t)$ and its response $r(t)$, Definition of System Function; Distortionless Transmission – Band width of a system, Rise Time and System Band Width; Energy Signals and Power Signals, Energy and Power Spectral Densities; Correlation – Cross and Auto Correlation and their properties.

Unit – III

Amplitude Modulation: Introduction to Communication System, Need for Modulation, Types of Amplitude Modulations, AM-SC- DSB-SC & SSB-SC, AM- DSB, SSB & VSB, Power and BW requirements, Generation of AM, DSB-SC, SSB-SC; Demodulation of AM-: Diode detectors.

Unit – IV

Angle Modulation: Frequency & Phase Modulations, Advantages of FM over AM, Bandwidth consideration, Narrow band and Wide band FM, Comparison of FM & PM, FM Modulators – Direct Method and Indirect or Armstrong method of generations; FM Demodulators- Slope Detection, Balanced Slope, Foster Seeley and Ratio Detectors.

Unit – V

Pulse Modulations: Sampling Theorem – Nyquist Interval, Aliasing, Signal recovery from its sampled version; Flat Top and Natural Sampling, PAM-PAM Modulation and Demodulation, PWM and PPM, Time Division

Multiplexing, Frequency Division Multiplexing and Comparison between TDM and FDM.

Unit – VI

Pulse Code Modulations: Digital Representation of Analog Signal-Quantization of Signals, Quantization Error, Pulse Code Modulation- PCM System, Line Codes and their properties, Delta Modulation, Adaptive DM and comparisons.

Digital Modulation: ASK, FSK, PSK and DPSK, QPSK demodulation, Coherent and Non-coherent Reception, Comparison of Binary and Quaternary Modulation Schemes, M-ary modulation techniques.

TEXT BOOKS:

1. Communication Systems Analog and Digital – R.P. Singh and SD Sapre, TMH, 2nd Edition, 2008
2. Principles of Communication Systems- H. Taub and D. Schilling, TMH, 2003.

REFERENCE BOOKS:

1. Modern Digital and Analog Communication Systems – B.P. Lathi, Oxford 3rd Edition.
2. Communication Systems – Simon Haykin, John Wiley, 3rd Edition
3. Digital and Analog Communication Systems – K Sam Shanmugam, WSE, 2006.
4. Electronic & Communication Systems – Kennedy and Davis, TMH, 4th Edition, 2004.

III Year – II SEMESTER

T	P	C
0	3	2

MICROPROCESSORS AND MICROCONTROLLERS LAB

The students are required to develop the necessary Algorithm, Flowchart and Assembly Language Program Source Code for executing the following functions using MASM/TASM software and to verify the results with necessary Hardware Kits.

PART-I: MICROPROCESSOR 8086

1. Introduction to MASM/TASM.
2. Arithmetic operation- Multi byte Addition and Subtraction, Multiplication and Division- Signed and unsigned Arithmetic operation, ASCII- Arithmetic operation.
3. Logic operations-Shift and rotate- Converting packed BCD to unpacked BCD, BCD to ASCII conversion.
4. By using string operation and Instruction prefix: Move Block, Reverse string, Sorting, Inserting, Deleting, Length of the string, String comparison.
5. DOS/BIOS programming : Reading keyboard (Buffered with and without echo) - Display characters, Strings.

PART-II: INTERFACING WITH MICROPROCESSOR

1. 8259 – Interrupt Controller-Generate an interrupt using 8259 timer.
2. 8279 – Keyboard Display- Write a program to display a string of characters.
3. 8255 – PPI-Write ALP to generate sinusoidal wave using PPI.
4. 8251 – USART-Write a program in ALP to establish Communication between two processors.

PART-III: MICROCONTROLLER 8051

1. Reading and Writing on a parallel port.
2. Timer in different modes.
3. Serial communication implementation.

PART-IV: INTERFACING WITH MICROCONTROLLER

Write C programs to interface 8051 chip to Interfacing modules to Develop single chip solutions.

1. Simple Calculator using 6 digit seven segment display and Hex Keyboard interface to 8051.
2. Alphanumeric LCD panel and Hex keypad input interface to 8051.
3. External ADC and Temperature control interface to 8051.
4. Generate different waveforms Sine, Square, Triangular, and Ramp etc. using DAC interface to 8051; change the frequency and Amplitude.

EQUIPMENT REQUIRED FOR LABORATORY

1. MASM/TASM software Kits
2. 8086 Microprocessor Kits
1. 8051 Micro Controller kits
2. Interfaces/peripheral subsystems
 - i) 8259 PIC
 - ii) 8279-KB/Display
 - iii) 8255 PPI
 - iv) 8251 USART
5. A/D and D/AC Interface

III Year – II SEMESTER

T	P	C
0	3	2

DIGITAL COMMUNICATIONS LAB

1. Time division multiplexing.
2. Pulse code modulation.
3. Differential pulse code modulation.
4. Delta modulation.
5. Frequency shift keying.
6. Phase shift keying .
7. Differential phase shift keying.
8. Companding
9. Source Encoder and Decoder
10. Linear Block Code-Encoder and Decoder
11. Binary Cyclic Code - Encoder and Decoder
12. Convolution Code - Encoder and Decoder

Equipment required for Laboratories:

1. RPS - 0 – 30 V
2. CRO - 0 – 20 M Hz.
3. Function Generators - 0 – 1 M Hz
4. RF Generators - 0 – 1000 M Hz./0 – 100 M Hz.
5. Multimeters
6. Lab Experimental kits for Digital Communication
7. Components
8. Radio Receiver/TV Receiver Demo kits or Trainees.

III Year – II SEMESTER**T P C**
0 3 2**DIGITAL SIGNAL PROCESSING LAB****LIST OF EXPERIMENTS:**

1. To study the architecture of DSP chips – TMS 320C 5X/6X Instructions.
2. To verify linear convolution.
3. To verify the circular convolution.
4. To design FIR filter (LP/HP) using windowing technique
 - a) Using rectangular window
 - b) Using triangular window
 - c) Using Kaiser window
5. To Implement IIR filter (LP/HP) on DSP Processors
6. N-point FFT algorithm.
7. MATLAB program to generate sum of sinusoidal signals.
8. MATLAB program to find frequency response of analog LP/HP filters.
9. To compute power density spectrum of a sequence.
10. To find the FFT of given 1-D signal and plot.

III Year – II SEMESTER**T P C**
0 2 1**Seminar**