KUVEMPU UNIVERSITY
Department of Studies & Research in Electronics
Jnanasahyadri –577 451

Scheme of M.Sc. Electronics Syllabus (NEW)

I Semester:

SUBJECT CODE	SUBJECT	TH/PR	IA	CREDITS	TOTAL
ELH - 1.1	Analog & Digital electronics	75	25	4	100
ELH - 1.2	Programming in C with data structures	75	25	5	100
ELH - 1.3	Computer Organization	75	25	4	100
ELH - 1.4	Signals and Systems	75	25	4	100
ELP - 1.5	Analog & Digital Lab	40	10	2	50
ELP - 1.6	Analog & Digital Lab	40	10	2	50
			TOTAL	**21**	**500**

II Semester:

SUBJECT CODE	SUBJECT	TH/PR	IA	CREDITS	TOTAL
ELH - 2.1	Microprocessors and Microcontrollers	75	25	5	100
ELH - 2.2	Digital Signal Processing	75	25	5	100
ELH - 2.3	Control System	75	25	4	100
ELS	**Soft Core Subject**	75	25	4	100
ELE - 2.5	Basic Electronics (Ele)	40	10	2	50
ELP - 2.6	Micro Controller Lab	40	10	2	50
ELP - 2.7	Digital Signal Processing Lab	40	10	2	50
			TOTAL	**24**	**550**

Soft Core Subjects:

ELS -2.4.1 EM Theory ,Microwave Devices and Radar

OR

ELS -2.4.2 Network Analysis

III Semester:

SUBJECT CODE	SUBJECT	TH/PR	IA	CREDITS	TOTAL
ELH - 3.1	Advanced Communication System	75	25	5	100
ELH - 3.2	Digital design using VHDL	75	25	4	100
ELH - 3.3	Embedded System Design	75	25	4	100
ELS	**Soft Core Subject**	75	25	4	100
ELE - 3.5	Fundamentals of Digital Electronics (Ele)	40	10	2	50
ELP - 3.6	Advanced Communication Lab	40	10	2	50
ELP - 3.7	VHDL Lab	40	10	2	50
			TOTAL	**23**	**550**

Soft Core Subjects:

ELS -3.4.1 Electronic Instrumentation and measurements **OR**
ELS -3.4.2 Power Electronics[] **OR**
ELS -3.4.3 Image Processing

IV Semester:

SUBJECT CODE	SUBJECT	TH/PR	IA	CREDITS	TOTAL
ELH- 4.1	VLSI Design	75	25	5	100
ELH- 4.2	Computer Communication Networks	75	25	4	100
ELH- 4.3	Information Theory and Coding	75	25	5	100
ELP- 4.4	Computer Networks Lab	40	10	2	50
EL- 4.5	Project Work	75	25	6	100
			TOTAL	**22**	**450**

TOTAL MARKS AND CREDITS

SL.NO	SEMESTER	CREDITS	MARKS
1	FIRST	21	500
2	SECOND	23	550
3	THIRD	24	550
4	FOURTH	22	450
GRAND TOTAL		**90**	**2050**

ELH 1.1 ANALOG AND DIGITAL ELECTRONICS

UNIT I

SEMICONDUCTOR DIODES AND APPLICATIONS: p-n junction diode, Characteristics and Parameters, Diode approximations, DC load line, Temperature dependence of p-n characteristics, AC equivalent circuits, Zener diodes, Half-wave diode rectifier, Ripple factor, Full-wave diode rectifier, Shunt capacitor - Approximate analysis of capacitor filters, Power supply performance, Zener diode as voltage regulator..

TRANSISTORS: Bipolar Junction transistor, Transistor Voltages and currents, amplification, Common Base, Common Emitter and Common Collector Characteristics, DC Load line and Bias Point.

BIASING METHODS: Base Bias, Collector to Base Bias, Voltage divider Bias, Comparison of basic bias circuits, Bias circuit design, Thermal Stability of Bias Circuits (Qualitative discussions only).
O**THER DEVICES:** Silicon Controlled Rectifier (S.C.R), SCR Control Circuits, S.C.R applications; Unijunction transistor, UJT applications, Junction Field effect Transistors, JFET Characteristics, FET Amplifications.

UNIT II

AMPLIFIERS & OSCILLATORS: Decibels and Half power points, Single Stage CE Amplifier and Capacitor coupled two stage CE amplifier(Qualitative discussions only), Series voltage negative feedback and Additional effects of Negative feed back(Qualitative discussions only), The Barkhausen Criterion for Oscillations, BJT RC phase shift oscillator, Hartley ,Colpitts and crystal oscillator (Qualitative discussions only) .

INTRODUCTION TO OPERATIONAL AMPLIFIERS: Ideal OPAMP, Saturable property of anOP AMP inverting and non inverting OPAMP circuits, need for OPAMP, Characteristics and applications - voltage follower, addition, subtraction, integration, differentiation.IC-555 and its applications.

UNIT III

COMMUNICATION SYSTEMS: Block diagram, Modulation AM FM, Superhetrodyne Receivers

DIGITAL LOGIC:, Boolean algebra, Logic gates, Half-adder, Full-adder, Parallel Binary adder.Flip-Flops: different types, Shift Registers & its applications. Counter and counter applications.
MSI Logic families: Decoders, BCD-to-7 segment decoder/driver, encoders,Multiplexers and their applications, Demultiplexers,

INTERFACING CIRCUITS: D/A converters R-2R ladder converter, weighted register DAC, switched current source DAC, switched capacitor DAC, accuracy and resolution, A/D converter-flash A/D converter, counter type A/D converter, tracking A/D converter, successive approximation A/D converter, dual slope A/D converter,

TEXTBOOKS:

1. Electronic Devices and Circuits: David. A. Bell; PHI, New Delhi,2004
2. Digital Logic and Computer Design, Morris Mano, PHI, EEE

REFERENCEBOOKS:

1. Electronic Devices and Circuits: Jacob Millman, Christos C. Halkias TMH, 1991 Reprint 2001
2. Electronic Communication Systems, George Kennedy, TMH 4th Edition

ELH 1.2 PROGRAMMING IN 'C' WITH DATA STRUCTURE

UNIT - I

Review of structures and pointers, storage classes, Command line parameters, Macros, Processor statements, Dynamic Memory Allocation, File handling

The Stack: Definition and examples, representation of stacks in C, Evaluation of postfix expression, Conversion from Infix to Postfix.
Recursion: Recursive definition and Processes, Recursion in C, Writing recursive programmes, Efficiency of Recursion, GCD, Fibonacci, Tower of Hanoi Problems

UNIT - II

Queues and Linked Lists: The Queue and its sequential representation linked lists, lists in C and other list structures

Trees: Binary trees, Binary tree representations, Trees and their applications

UNIT - III

Sorting: selection sort, bubble sort, Quick sort, Binary tree sorts, Heap sort, Insertion sorts, simple insertion, Radix sort
Searching: Basic search techniques, Algorithmic notation, sequential searching, searching in ordered table, binary search, interpolation search, Tree searching-binary search, tree insertion and deletions, introduction to Hashing

TEXT BOOKS:

1. **Yedidyah Langsam, Moshe J Augenstein & Aaron M Tanenbaum**, Data Structures using C and C++, 2nd edition, PHI, 1997
2. **E. Balaguruswamy,** Programming in ANSI C, 2nd edition, Tata Mc Graw Hill, 1998

REFERENCE BOOKS:

1. **Robert L Kruse**, Data Structures and Programme design using C, PHI
2. **Trembly and Sorenson**, Data structures, Tata Mc Graw Hill.

ELH 1.3 COMPUTER ORGANIZATION

UNIT I

Basic Structure of Computer Hardware and Software: Functional Units, Basic Operational Concepts, Bus Structures, Software, Performance

Addressing Methods: Basic Concepts, Memory Locations, Addresses and Encoding of Information, Main Memory Operation, Instructions and Instruction Sequencing, Addressing Modes, Assembly Language

The Processing Unit: Fundamental Concepts, Execution of a complete Instruction, Hardwired Control, Performance Considerations.
Microprogrammed control: Microinstructions, Grouping of control signals, Microprogram sequencing, Microinstruction with next address field, Prefetching Microinstructions, Emulation.

UNIT II

Input/Output Organization: Accessing I/O Devices, Interrupts, Direct Memory Access, I/O Hardware, Standard I/O Interfaces.

The Memory: Basic Concepts, Semiconductor RAM Memories, ROM, Cache Memory, Performance Considerations, Virtual Memories, Memory Management Requirements

Arithmetic: Number Representation, Addition of Positive Numbers, Design of Fast Adders, Signed Addition and Subtraction, Arithmetic and Branching Conditions, Multiplication of Positive Numbers, Fast Multiplication, Integer Division, Floating Point Numbers and Operations.

UNIT III

Pipelining: Basic Concepts, Instruction Queue, Branching, Data Dependency, Influence of Pipelining on Instruction Set Design, Multiple Execution Unit, Performance Considerations.

Computer Peripherals: ON line Storage Systems- Magnetic Disk, Magnetic Tape, CD-ROM, System Performance Consideration, Direct Access and Communication Line Considerations, RISC processors, multiprocessors.

TEXT BOOK :

1. **Carl Hamacher, Zvonko G Vranesic and Safwat G. Zaky**, *Computer Organization*: McGraw,Hill, 4th Edition, 1996.

REFERENCE BOOK:

1. **M. Morris Mano,** *Computer System Architecture*, PHI, 3rd Edn, 1997.

ELH 1.4 SIGNALS AND SYSTEMS

UNIT I

Introduction: Definition of signals and systems, overview of specific systems, classification of signals, basic operation of signals, elementary signals, systems viewed as interconnections of operations, properties of systems.

Time domain representations for Linear Time Invariant (LTI) systems: Introduction, convolution, impulse response representation for LTI systems, properties of impulse r esponse representation for LTI systems, differential and difference equations, representation of LTI systems, block diagram representations

UNIT II

Fourier representation of signals: Discrete time periodic signals, Discrete Time Fourier Series (DTFS), continuous time periodic signals, Fourier series, discrete time non periodic signals, Fourier transforms, properties of Fourier representations

Application of Fourier representations: Fourier transform representations for periodic signals, convolution and modulations Fourier transform representation for discrete time signals, sampling, reconstruction of continuous time signals

UNIT III

Z, Transforms: Introduction, Z-transform, properties of Region of Convergence (ROC), Properties of Z - transforms, inversion of Z- transforms, transform analysis of LTI systems, unilateral Z, transforms

TEXT BOOKS:

1. **Simon Haykin, Barry Van Veen**, “Signals and Systems”, John Wiley & Sons (Asia) Pvt. Ltd. 2002.

REFERENCE BOOKS:

1. **John G Proakis and Dinitris G Manolakis**, Digital Signal Processing, Principles Algorithms and Applications, PHI, 3rd edn. 1997

2. **A P Oppenheim and Wilsky**, Signal Systems, Prentice Hall India, 1992

ELP - 1. 5 ANALOG AND DIGITAL ELECTRONICS LAB

1. Simplification, realization of Boolean expressions using logic gates/Universal gates.
2. Realization of Half/Full adder and Half/Full Subtractors using logic gates.
3. (i) Realization of parallel adder/Subtractors using 7483 chip

   (ii) BCD to Excess-3 code conversion and vice versa.
4. Realization of Binary to Gray code conversion and vice versa
5. MUX/DEMUX – use of 74153, 74139 for arithmetic circuits and code converter.
6. Realization of One/Two bit comparator and study of 7485 magnitude comparator.
7. Use of a) Decoder chip to drive LED display and b) Priority encoder.
8. Truth table verification of Flip-Flops: (i) JK Master slave (ii) T type and (iii) D type.
9. Realization of 3 bit counters as a sequential circuit and MOD – N counter design (7476, 7490, 74192, 74193).
10. Shift left; Shift right, SIPO, SISO, PISO, PIPO operations using 74S95
11. Diode VI Characteristics: PN Diode, Zener Diode and Varactor Diode
12. Transistor Characteristics: PNP and NPN
13. FET Characteristics
14. Transistor Amplifier.

ELP 1.6 Programming in C and Data Structures Lab

List of programs

1. Programs on structures and pointers
2. File handling – opening, closing, copying etc
3. Array implementation of stack, Queue,
4. Recursion programs
5. Programs to convert prefix to postfix, evaluation of postfix.
6. Insertion, deletion and display of elements in stack ,Queue.
7. Inserting and deletion of nodes in linked list and tree.
8. Searching sorting techniques

ELH 2.1 MICROPROCESSORS AND MICROCONTROLLERS

UNIT I

Introduction: Microprocessors and microcontroller. Introduction, Microprocessors and Microcontrollers, A Microprocessors survey. RISC & CISC CPU Architectures, Harvard & Von-Neumann CPU architecture

Architecture of the 8088 and 8086 Microprocessors: Internal Architecture, Software model, Memory Address Space and Data organization, Data types, Segment Registers and Memory Segmentation, Instruction Pointer, Data Registers, Pointer and Index Registers, Generating a Memory Address, The Stack, Input/Output Address Space, Addressing modes.
Programming: Data Transfer, Arithmetic, Logic-Shift-Rotate, Flag Control, Compare, Jump, Subroutine and Subroutine-Handling, Loop and Loop-Handling, String and String-Handling Instructions.

The 8051 Architecture: Introduction, 8051 Microcontroller Hardware, Input / Output Pins, Ports and Circuits External Memory, Counter and Timers, Serial Data Input / Output, Interrupts

UNIT II

Addressing Modes and Operations: Introduction, Addressing modes, External data Moves, Code Memory, Read Only Data Moves / Indexed Addressing mode, PUSH and POP Opcodes, Data exchanges, Example Programs; Byte level logical Operations, Bit level Logical Operations, Rotate and Swap Operations, Example Programs. Arithmetic Operations: Flags, Incrementing and Decrementing, Addition, Subtraction, Multiplication and Division, Decimal Arithmetic, Example Programs.

Jump and Call Instructions: The JUMP and CALL Program range, Jumps, calls and Subroutines, Interrupts and Returns, More Detail on Interrupts, Example Problems

UNIT III

Timer / Counter Programming in 8051: Programming 8051 Timers, Counter Programming,

8051 Serial Communication: Basics of Serial Communication, 8051 connections to RS-232, 8051 Serial communication Programming, Programming the second serial port,

Interrupts Programming: 8051 Interrupts, Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Interrupt Priority in the 8051/52, Interrupt programming in C 10 Hrs

8051 Interfacing and Applications: Interfacing 8051 to LCD, Keyboard, parallel and serial ADC, DAC, Stepper motor interfacing, DC motor interfacing and PWM 6Hrs

TEXT BOOKS:

1. "The 8051 Microcontroller Architecture, Programming & Applications", 2e Kenneth J. Ayala ;, Penram International, 1996 / Thomson Learning 2005

2. "The 8051 Microcontroller and Embedded Systems – using assembly and C "-, Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; PHI, 2006 / Pearson, 2006

REFERENCE BOOKS:

1. "Programming and Customizing the 8051 Microcontroller" Predko ;–, TMH

ELH 2.2 DIGITAL SIGNAL PROCESSING

UNIT I

Discrete Time Signals In Frequency domain: Discrete Time Fourier Transform (DTFT**) Discrete Fourier transform (DFT):** Introduction, Definition of DFT: Linearity, Circular shift of a sequence, Symmetry properties, Circular convolution, Linear convolution using DFT. **Computation DFT:** Introduction to FFT, Decimation-in-time FFT algorithm and in-place computations, and Decimation-in-frequency FFT algorithm and in-place computations,
LTI DTS in Frequency domain, transfer function, frequency response

UNIT II

Digital Filters: simple digital filters, All pass functions, complimentary transfer functions, digital two pairs, Sampling and reconstruction.
Analog Filter Design: The filter problem, maximally flat low-pass filter approximation, Chebyshev Filter approximation, Frequency transformation.
Digital Filter Structures: Direct, parallel, cascade, ladder and lattice for IIR, Possible realizations for FIR, including pollyphase, all pass structures, tunable filters

UNIT III

Digital Filter Design:
IIR Filter Design: using Impulse invariance and Bi Linear transformations,Spectral transformations,
FIR Filter Design:using winnowing ,frequency sampling and computer aids. Difference between IIR and FIR

Text books:

1) “Digital Signal Processing”, Rabiner and Gold, Prentice Hall of India Ltd.
2) “Network Analysis and Synthesis”, F.F. Kuo, John Wiley & Sons, 7th Edition.

Reference books:
1) “Digital Signal Processing”, Proakis, Prentice Hall of India Ltd.
2) “Digital Signal Processing”, Sanjit. K. Mitra, Tata-McGraw Hill.

ELH 2.3 CONTROL SYSTEM

UNIT I

Modeling of Systems: The control system, Mathematical models of physical systems – Introduction, Differential equations of physical systems – Mechanical systems, Friction, Translational systems (Mechanical accelerometer, Levered systems excluded), Rotational systems, Gear trains, Electrical systems, Analogous systems

Block diagrams and signal flow graphs: Transfer functions, Block diagram algebra, Signal Flow graphs (State variable formulation excluded),

Time Response of feed back control systems: Standard test signals, Unit step response of First and second order systems, Time response specifications, Time response specifications of second order systems, steady – state errors and error constants.

UNIT II

Stability analysis: Concepts of stability, Necessary conditions for Stability, Routh- stability criterion, Relative stability analysis; More on the Routh stability criterion

Root–Locus Techniques: Introduction, The root locus concepts, Construction of root loci.

UNIT III

Stability in the frequency domain: Mathematical preliminaries, Nyquist Stability criterion, (Inverse polar plots excluded), Assessment of relative stability using Nyquist criterion, (Systems with transportation lag excluded).

Introduction to State variable analysis: Concepts of state, state variable and state models for electrical systems, Solution of state equations.

TEXT BOOK :

1. J. Nagarath and M.Gopal, "Control Systems Engineering", New Age International (P) Limited, Publishers, Fourth edition – 2005

REFERENCE BOOKS:

1. **"Modern Control Engineering ",** K. Ogata, Pearson Education Asia/ PHI, 4th Edition, 2002.
2. **"Concepts of Control Systems",** P. S. Satyanarayana; Dynaram publishers, B'lore, 2001
3. **"Control Systems – Principles and Design",** M. Gopal, TMH, 1999
4. **"Feedback control system analysis and synthesis",** J. J. D'Azzo and C. H. Houpis; McGraw Hill, International student Edition.

ELS 2.4.1 EM THEORY, MICROWAVE DEVICES AND RADARS

UNIT I

Magnetostatics: Biot, Savart's Law, Ampere's law, Scalar and Vector Magnetic Potentials
Maxwell's equations: Modifications of static field equations for time varying fields, continuity equations, Maxwell's equation in differential, integral and word statements forms, condition at a boundary surface using Maxwell's equations

Electromagnetic waves: Wave propagation-electric and magnetic wave equations, uniform plane wave, relation between E&H for a uniform plane wave, solution of a wave equation for a uniform plane wave, uniform plane wave in conducting medium, low loss dielectric medium, perfect dielectric medium, intrinsic impedance of dielectric and conducting mediums, derivation of propagation constant, attenuation constant, phase velocity and wave length, polarization of plane waves, linear, elliptic, circular polarization

Poynting vector and power flow: Poynting theorem and applications, instantaneous, average and complex poynting vector

UNIT II

MICROWAVE TRANSMISSION LINES: Introduction, transmission lines equations and solutions, reflection and transmission coefficients, standing waves and SWR, line impedance and line admittance. Smith chart, impedance matching using single stubs, Microwave coaxial connectors.

MICROWAVE WAVEGUIDES AND COMPONENTS: Introduction, rectangular waveguides, circular waveguides, microwave cavities, microwave hybrid circuits, directional couplers, circulators and isolators.

MICROWAVE DIODES, Transfer electron devices: Introduction, GUNN effect diodes – GaAs diode, RWH theory, Modes of operation, Avalanche transit time devices: READ diode, IMPATT diode, BARITT diode, Parametric amplifiers Other diodes: PIN diodes, Schottky barrier diodes.

UNIT III

AN INTRODUCTION TO RADAR: Basic Radar, The simple form of the Radar equation, Radar block diagram, Radar frequencies, application of Radar, the origins of Radar.

MTI AND PULSE DOPPLER RADAR: Introduction to Doppler and MTI Radar, delay line Cancellers, digital MTI processing, Moving target detector, pulse Doppler Radar.

TEXT BOOKS:

1.Microwave Devices and circuits- Liao / Pearson Education.
2.Introduction to Radar systems-Merrill I Skolnik, 3rd Ed, TMH, 2001.
3.Microwave Engineering – Annapurna Das, Sisir K Das TMH Publication, 2001.

REFERENCE BOOK:

1. **Microwave Engineering** – David M Pozar, John Wiley, 2e, 2004.
2. **J D Kraus, '***Antennas*', 2nd Edition, Tata Mc Graw Hill
3. E C Jordan, '*Electro magnetic waves radiating systems*',, Prentice Hall India,

ELS 2.4.2 NETWORK ANALYSIS

UNIT I

Introduction:

Review of Kirchoff's laws: Node voltage analysis and mesh voltage analysis, network solutions using first order differential equation, initial conditions in networks.

Practical sources, Source transformations, Network reduction using Star – Delta transformation, Loop and node analysis With linearly dependent and independent sources for DC and AC networks, Concepts of super node and super mesh

Network Topology: Graph of a network, Concept of tree and co-tree, incidence matrix, tie-set, tie-set and cut-set schedules, Formulation of equilibrium equations in matrix form, Solution of resistive networks, Principle of duality**.**

UNIT II

Network Theorems – 1: Superposition, Reciprocity and Millman's theorems

Network Theorems - II: Thevinin's and Norton's theorems; Maximum Power transfer theorem

Resonant Circuits: Series and parallel resonance, frequency-response of series and Parallel circuits, Q –factor, Bandwidth.

Transient behavior and initial conditions: Behavior of circuit elements under switching condition and their Representation, evaluation of initial and final conditions in RL, RC and RLC circuits for AC and DC excitations.

UNIT III

Laplace Transformation & Applications : Solution of networks, step, ramp and impulse responses, waveform Synthesis

Two port network parameters: Definition of z, y, h and transmission parameters, modeling with these parameters, relationship between parameters sets **16 Hrs**

Textbooks:

1. Network Analysis: Van Valkenburg, PHI, 2003
2. Networks and systems: Roy Choudhury D, New Age International, 2004

References:

1. : Joseph Edminister: Electric circuits, Schaum's series-Mc Graw Hill.

ELE 2.5 BASIC ELECTRONICS

UNIT I

SEMICONDUCTOR DIODES AND APPLICATIONS: p-n junction diode, Characteristics and Parameters, Diode approximations, DC load line, Temperature dependence of p-n characteristics, AC equivalent circuits, Zener diodes Half-wave diode rectifier, Ripple factor, Full-wave diode rectifier, Other full-wave circuits, Shunt capacitor - Approximate analysis of capacitor filters, Power supply performance, Zener diode voltage regulators,

TRANSISTORS: Bipolar Junction transistor, Transistor Voltages and currents, amplification, Common Base, Common Emitter and Common Collector Characteristics, DC Load line and Bias Point.

BIASING METHODS: Base Bias, Collector to Base Bias, Voltage divider Bias, Comparison of basic bias circuits, Bias circuit design, Thermal Stability of Bias Circuits (Qualitative discussions only).

OTHER DEVICES: Silicon Controlled Rectifier (S.C.R), SCR Control Circuits, More S.C.R applications; Unijunction transistor, UJT applications, Junction Field effect Transistors(Exclude Fabrication and Packaging), JFET Characteristics, FET Amplifications,

UNIT II

AMPLIFIERS & OSCILLATORS: Decibels and Half power points, Single Stage CE Amplifier and Capacitor coupled two stage CE amplifier(Qualitative discussions only), Series voltage negative feedback and Additional effects of Negative feed back(Qualitative discussions only), The Barkhausen Criterion for Oscillations, BJT RC phase shift oscillator, Hartley ,Colpitts and crystal oscillator (Qualitative discussions only).

INTRODUCTION TO OPERATIONAL AMPLIFIERS: Ideal OPAMP, Saturable property of an OP AMP inverting and non inverting OPAMP circuits, need for OPAMP, Characteristics and applications - voltage follower, addition, subtraction, integration, differentiation; Numerical examples as applicable Cathode Ray Oscilloscope (CRO)

TEXTBOOKS:

1. Electronic Devices and Circuits: David. A. Bell; PHI, New Delhi, 2004
2. Electrical and Electronics & Computer Engineering for Scientists and Engineers Second Edition -K.A. Krishnamurthy & M.R. Raghuveer- New Age International Publishers (Willey Eastern) 2001

REFERENCEBOOKS:

1. Electronic Devices and Circuits: Jacob Millman, Christos C. Halkias TMH, 1991 Reprint 2001

ELP 2.6 MICROCONTROLLER LAB

I. PROGRAMMING

1. Data Transfer - Block move, Exchange, Sorting, Finding largest element in an array.
2. Arithmetic Instructions - Addition/subtraction, multiplication and division, square, Cube – (16 bits Arithmetic operations – bit addressable).
3. Counters.
4. Boolean & Logical Instructions (Bit manipulations).
5. Conditional CALL & RETURN.
6. Code conversion: BCD – ASCII; ASCII – Decimal; Decimal - ASCII; HEX - Decimal and Decimal - HEX.
7. Programs to generate delay, Programs using serial port and on-Chip timer / counter.

II. INTERFACING:

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

8. Simple Calculator using 6 digit seven segment display and Hex Keyboard interface to 8051.
9. Alphanumeric LCD panel and Hex keypad input interface to 8051.
10. External ADC and Temperature control interface to 8051.
11. Generate different waveforms Sine, Square, Triangular, Ramp etc. using DAC interface to 8051; change the frequency and amplitude.
12. Stepper and DC motor control interface to 8051.
13.. Elevator interface to 8051

ELP 2.7 DSP LAB

LIST OF EXPERIMENTS USING MATLAB / SCILAB / OCTAVE / WAB

1. Verification of Sampling theorem.
2. Impulse response of a given system
3. Linear convolution of two given sequences.
4. Circular convolution of two given sequences
5. Autocorrelation of a given sequence and verification of its properties.
6. Cross correlation of given sequences and verification of its properties.
7. Solving a given difference equation.
8. Computation of N point DFT of a given sequence and to plot magnitude and phase spectrum.
9. Linear convolution of two sequences using DFT and IDFT.
10. Circular convolution of two given sequences using DFT and IDFT
11. Design and implementation of FIR filter to meet given specifications.
12. Design and implementation of IIR filter to meet given specifications.

B. LIST OF EXPERIMENTS USING DSP PROCESSOR

1. Linear convolution of two given sequences.
2. Circular convolution of two given sequences.
3. Computation of N- Point DFT of a given sequence
4. Realization of an FIR filter (any type) to meet given specifications .The input can be a signal from function generator / speech signal.
5. Audio applications such as to plot time and frequency (Spectrum) display of Microphone output plus a cosine using DSP. Read a wav file and match with their respective spectrograms
6. Noise: Add noise above 3kHz and then remove; Interference suppression using 400 Hz tone.
7. Impulse response of first order and second order system

REFERENCE BOOKS:

1. **Digital signal processing using MATLAB -** Sanjeet Mitra, TMH, 2001
2. **Digital signal processing using MATLAB** - J. G. Proakis & Ingale, MGH, 2000
3. **Digital Signal Processors**, B. Venkataramani and Bhaskar, TMH,2002

ELH 3.1 ADVANCED COMMUNICATION SYSTEM

UNIT - 1

Basic signal processing operations in digital communication. Sampling Principles: Sampling Theorem, Quadrature sampling of Band pass signal, Practical aspects of sampling and signal recovery

PAM, TDM. Waveform Coding Techniques, PCM, Quantization noise and SNR, robust quantization.

DPCM, DM, applications. Base-Band Shaping for Data Transmission, Discrete PAM signals, power spectra of discrete PAM signals.

ISI, Nyquist's criterion for distortion less base-band binary transmission, correlative coding, eye pattern, base-band M-ary PAM systems, adaptive equalization for data transmission

UNIT II

DIGITAL MODULATION TECHNIQUES: Digital Modulation formats, Coherent binary modulation techniques, Coherent quadrature modulation techniques. Non-coherent binary modulation techniques.

Detection and estimation, Model of DCS, Gram-Schmidt Orthogonalization procedure, geometric interpretation of signals, response of bank of correlators to noisy input.

OVERVIEW OF OPTICAL FIBER COMMUNICATION: Introduction, Historical development, general system, advantages, disadvantages, and applications of optical fiber communication, optical fiber waveguides, Ray theory, cylindrical fiber (no derivations in article 2.4.4), single mode fiber, cutoff wave length, mode filed diameter. Optical Fibers: fiber materials, photonic crystal, fiber optic cables specialty fibers.

TRANSMISSION CHARACTERISTICS OF OPTICAL FIBERS: Introduction, **A**ttenuation, absorption, scattering losses, bending loss, dispersion, Intra model dispersion, Inter model dispersion.

UNIT III

OPTICAL SOURCES AND DETECTORS: Introduction, LED's, LASER diodes, Photo detectors, Photo detector noise, Response time, double hetero junction structure, Photo diodes, comparison of photo detectors.

FIBER COUPLERS AND CONNECTORS: Introduction, fiber alignment and joint loss, single mode fiber joints, fiber splices, fiber connectors and fiber couplers.
OPTICAL RECEIVER: Introduction, Optical Receiver Operation.

INTRODUCTION TO SATELLITE COMMUNICATION: Definition of terms for earth orbiting satellites, orbital elements, apogee and perigee, kepler's laws, O perturbations, atmospheric drag, inclined orbits, side real time, orbital plane, geostationary orbit, antenna look angles.

SPACE SEGMENT: introduction, power supply subsystem, attitude control: spin stabilization, three axis body stabilization, state keeping, thermal control: TT&C Subsystem, transponders, wide band receiver, input demultiplexer, power amplifier, antenna subsystem.

TEXT BOOK:

1. **Digital communications**, Simon Haykin, John Wiley, 2003.

2 **Optical Fiber Communication"**, Gerd Keiser, 4th Ed., MGH, 2008.

3. Dennis roody, satellite communications, Tata M.graw Hills, 2001

REFERENCE BOOKS:

1.**Digital and analog communication systems & An introduction to Analog and Digital Communication**, K. Sam Shanmugam, John Wiley, 1996. 2.Simon Haykin, John Wiley, 2003

ELH 3.2 DIGITAL SYSTEMS DESIGN USING VHDL

UNIT I

INTRODUCTION: VHDL description of combinational networks, Modeling flip-flops using VHDL, VHDL models for a multiplexer, Compilation and simulation of VHDL code, Modeling a sequential machine, Variables, Signals and constants, Arrays, VHDL operators, VHDL functions, VHDL procedures, Packages and libraries, VHDL model for a counter.

DESIGNING WITH PROGRAMMABLE LOGIC DEVICES: Read-only memories, Programmable logic arrays (PLAs), Programmable array logic (PLAs), Other sequential programmable logic devices (PLDs), Design of a keypad scanner.

DESIGN OF NETWORKS FOR ARITHMETIC OPERATIONS: Design of a serial adder with accumulator, State graphs for control networks, Design of a binary multiplier, Multiplication of signed binary numbers, Design of a binary divider.

UNIT II

DIGITAL DESIGN WITH SM CHARTS: State machine charts, Derivation of SM charts, Realization of SM charts. Implementation of the dice game, Alternative realization for SM charts using microprogramming, Linked state machines.

DESIGNING WITH PROGRAMMABLE GATE ARRAYS AND COMPLEX PROGRAMMABLE LOGIC DEVICES: Xlinx 3000 series FPGAs, Designing with FPGAs, Xlinx 4000 series FPGAs, using a one-hot state assignment, Altera complex programmable logic devices (CPLDs), Altera FELX 10K series COLDs.

UNIT III

FLOATING - POINT ARITHMETIC: Representation of floating-point numbers, Floating-point multiplication, Other floating-point operations.

ADDITIONAL TOPICS IN VHDL: Attributes, Transport and Inertial delays, Operator overloading, Multi-valued logic and signal resolution, IEEE-1164 standard logic, Generics, Generate statements, Synthesis of VHDL code, Synthesis examples, Files and Text IO.

VHDL MODELS FOR MEMORIES AND BUSES: Static RAM, A simplified 486 bus model, interfacing memory to a microprocessor bus.

Text Book

1.**Digital Systems Design using VHDL**, Charles H. Roth. Jr:, Thomson Learning, Inc, 2006.

Reference:

1.**Fundamentals of Digital Logic Design with VHDL**, Stephen Brwon & Zvonko Vranesic, Tata McGrw-Hill, New Delhi, 2nd Ed., 2007

2.Digital System Design with VHDL, Mark Zwolinski, 2 Ed, Pearson Education., 2004

3.Digital Electronics and Design with VHDL - Volnei A Pedroni, Elsivier Science, 2009

ELH 3.3 EMBEDDED SYSTEM DESIGN

UNIT I

INTRODUCTION: Overview of embedded systems, embedded system design challenges, common design metrics and optimizing them. Survey of different embedded system design technologies, trade-offs. Custom Single-Purpose Processors, Design of custom single purpose processors.

SINGLE-PURPOSE PROCESSORS: Hardware, Combinational Logic, Sequential Logic, RT level Combinational and Sequential Components, Optimizing single-purpose processors. Single-Purpose Processors: Software, Basic Architecture, Operation, Programmer's View, Development Environment, ASIPS.

Standard Single-Purpose Peripherals, Timers, Counters, UART, PWM, LCD Controllers, Keypad controllers, Stepper Motor Controller, A to D Converters, Examples .

UNIT II

MEMORY: Introduction, Common memory Types, Compulsory memory, Memory Hierarchy and Cache, Advanced RAM. Interfacing, Communication Basics, Microprocessor Interfacing, Arbitration, Advanced Communication Principles, Protocolos - Serial, Parallel and Wireless.

INTERRUPTS: Basics - Shared Data Problem - Interrupt latency. Survey of Software Architecture, Round Robin, Round Robin with Interrupts - Function Queues - scheduling - RTOS architecture.

INTRODUCTION TO RTOS: Tasks - states - Data - Semaphores and shared data. More operating systems services - Massage Queues - Mail Boxes -Timers – Events - Memory Management.

Basic Design Using RTOS, Principles- An example, Encapsulating semaphores and Queues.

Hard real-time scheduling considerations – Saving Memory space and power. Hardware software co-design aspects in embedded systems

TEXT BOOKS:

1. **Embedded System Design: A Unified Hardware/Software Introduction** - Frank Vahid, Tony Givargis, John Wiley & Sons, Inc.2002
2. **An Embedded software Primer** - David E. Simon: Pearson Education, 1999

REFERENCE BOOKS:

1. **Embedded Systems: Architecture and Programming,** Raj Kamal, TMH. 2008
2. **Embedded Systems Architecture – A Comprehensive Guide for Engineers and Programmers**, Tammy Noergaard, Elsevier Publication, 2005
3. **Embedded C programming**, Barnett, Cox & O'cull, Thomson (2005

ELS 3.4.1 ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

UNIT I

Introduction

(a) Measurement Errors: Gross errors and systematic errors, Absolute and relative errors, Accuracy, Precision, Resolution and Significant figures.

(b) Voltmeters and Multimeters Introduction, Multirange voltmeter, Extending voltmeter ranges, Loading, AC voltmeter using Rectifiers – Half wave and full wave, Peak responding and True RMS voltmeters.

Digital Instruments:Digital Voltmeters - Introduction, DVM's based on V – T, V – F and Successive approximation principles, Resolution and sensitivity, General specifications, Digital Multi-meters,Digital frequency meters, Digital measurement of time.

UNIT II

Oscilloscopes:Introduction, Basic principles, CRT features, Block diagram and working of each block, Typical CRT connections, Dual beam and dual trace CROs, Electronic switch

Special Oscilloscopes:Delayed time-base oscilloscopes, Analog storage, Sampling and Digital storage oscilloscopes

Signal Generators:Introduction, Fixed and variable AF oscillator, Standard signal generator, Laboratory type signal generator, AF sine and Square wave generator, Function generator, Square and Pulse generator, Sweep frequency generator, Frequency synthesizer

Measurement of resistance, inductance and capacitance: Whetstone's bridge, Kelvin Bridge; AC bridges, Capacitance Comparison Bridge, Maxwell's bridge, Wein's bridge, Wagner's earth connection

UNIT III

Transducers – I: Introduction, Electrical transducers, Selecting a transducer, Resistive transducer, Resistive position transducer, Strain gauges, Resistance thermometer, Thermistor, Inductive transducer, Differential output transducers and LVDT. **Miscellaneous Topics**

(a) Transducers - II –Piezoelectric transducer, Photoelectric transducer, Photovoltaic transducer, Semiconductor photo devices, Temperature transducers-RTD, Thermocouple

(b) Display devices: Digital display system, classification of display, Display devices, LEDs, LCD displays

(c) Bolometer and RF power measurement using Bolometer

(d) Introduction to Signal conditioning

16 Hours

TEXT BOOKS:

1. **"Electronic Instrumentation",** H. S. Kalsi, TMH, 2004
2. **"Electronic Instrumentation and Measurements",** David A Bell,PHI/Pearson Edu, 2006.

REFERENCE BOOKS:

1. **"Principles of measurement systems",** John P. Beately, 3rd Edition, Pearson Edu, 2000
2. **"Modern electronic instrumentation and measuring techniques",** Cooper D & A D Helfrick, PHI, 1998.
3. **"Electronic and Electrical measurements and Instrumentation",** J. B. Gupta, S. K. Kataria & Sons, Delhi
4. **Electronics & electrical measurements,** A K Sawhney, , Dhanpat Rai & sons, 9th edition.

ELH 3.4.2 IMAGE PROCESSING

UNIT I

DIGITAL IMAGE FUNDAMENTALS: What is Digital Image Processing. fundamental Steps in Digital Image Processing, Components of an Image processing system, elements of Visual Perception

Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships between Pixels, Linear and Nonlinear Operations.

IMAGE TRANSFORMS: Two-dimensional orthogonal & unitary transforms, properties of unitary transforms, two dimensional discrete Fourier transform.

Discrete cosine transform, sine transform, Hadamard transform, Haar transform, Slant transform, KL transform.

UNIT II

IMAGE ENHANCEMENT: Image Enhancement in Spatial domain, Some Basic Gray Level Trans - formations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations.

Basics of Spatial Filtering Image enhancement in the Frequency Domain filters, Smoothing Frequency Domain filters, Sharpening Frequency Domain filters, homomorphic filtering.

UNIT III

Model of image degradation/restoration process, noise models, Restoration in the Presence of Noise, Only-Spatial Filtering Periodic Noise Reduction by Frequency Domain Filtering, Linear Position-Invariant Degradations, inverse filtering, minimum mean square error (Weiner) Filtering

Color Fundamentals. Color Models, Pseudo color Image Processing., processing basics of full color image processing

TEXT BOOK:

"Digital Image Processing", Rafael C.Gonzalez and Richard E. Woods, Pearson Education, 2001, 2nd edition.

REFERENCE BOOKS:

1. **"Fundamentals of Digital Image Processing"**, Anil K. Jain, Pearson Edun, 2001.
2. **"Digital Image Processing and Analysis"**, B. Chanda and D. Dutta Majumdar, PHI, 2003.

ELS 3.4.3: POWER ELECTRONICS

UNIT I

Introduction to power electronics.
Power semiconductor devices: power diodes, thyristors, power MOSFETs, power transistors, IGBT, MCT, LTT, smart power devices.
Thyristor firing circuits: limitations of di/dt and dv/dt ratings, main features of firing circuits, R and RC firing circuits, UJT firing circuit.
Commutation Techniques: Class A to Class F commutation methods, series and parallel operation of thyristors.
Diode circuits: Diode circuits with DC source – R, L, C, RL, RC, RLC load, recovery of trapped energy, RL load with free wheeling diode.
Diode rectifiers: Half-wave rectifiers with R, L, C, RL, RC load, RL load with free wheeling diode, load with electromotive force.
Phase controlled rectifiers:Single phase half wave rectifiers: with R load, RL load, RL load with free wheeling diode, RLE load.
Single phase full wave converters: single phase semi converters, single phase two pulse converters with continuous and discontinuous current.
Three-phase converter: systems using diodes and thyristors, three-phase full converters, three-phase semi converters, dual converters.

UNIT II

AC voltage controllers: types of AC voltage controllers, integral cycle control, single phase voltage controllers with R and RL loads, single-phase transformer tap changers, single- phase sinusoidal voltage controllers.
Working of three-phase controllers with star & delta loads.
Cycloconverters: Principle of cycloconverter operation, single-phase to single-phase circuit step-up and step-down cycloconverter, three-phase half wave cycloconverter, output voltage equation of a cycloconverter, load commutated cycloconverter.
Principle of operation, single-phase voltage source inverters, basic series and parallel inverter circuits, types of inverters, three-phase bridge inverters, voltage control in single-phase inverters, pulse-width modulated inverters, current source inverters.

Choppers: Basic principle, control strategies, step-up and step-down choppers, types of chopper circuits, forced and load commutated chopper circuits.

UNIT III

Introduction to motors: Classification of motors.**DC motors:** Working principle of DC motor, shunt motor, series motor, starter, closed loop control of DC drive, PLL control of DC drive.

AC motors: Working principle of AC motor, types of AC motors, torque speed characteristics of induction motor, single phase induction motor drive, three phase induction motor drive, speed control of induction motor – stator voltage control and V/F control, synchronous motor, working principle of synchronous motor.

Text Books:

1. Power Electronics: Bimbhra P S, Khanna publishers, 2003.
2. Power Electronics Circuit devices and applications: Rashid M H, PHI,

References:

1. Thyristor Engineering: Berde M S, Khanna publishers,
2. Power Electronics: Vedam Subrahmanyam, New Age International, 2002
3. Modern Power Electronics and AC Drives: Bimal K.Bose, Pearson education, 2002.
4. Power Electronics: Mohan, Undeland, Robbins, John Wiley, 2003

ELE 3.5 FUNDAMENTALS OF DIGITAL ELECTRONICS

UNIT I

Binary Systems: Digital Computers and Digital Systems, binary numbers, number based conversion, Octal and Hexa decimal Numbers, complements, binary codes, binary storage and registers, binary logic, integrated circuits

Boolean Algebra and Logic Gates: Basic definitions, Axiomatic definition of Boolean algebra, basic theorems and properties of boolean algebra, boolean functions, canonical and standard forms, the map method of simplification of boolean functions. Two-Three-Four-Five-Six variable maps, product of Sum simplification, NAND and NOR implementation, don't care conditions, The Tabulation Method, determination and selection of prime implicants

UNIT II

Combinational logic: Introduction, design procedure, adders, binary parallel adder, decimal adder, Subtractor, Code conversion, magnitude Comparators, decoders and multiplexers.

Sequential Logic: Introduction, Flip Flops, Types-SR, JK, D & T, Triggering of Flip Flops, Analysis of Clocked sequential circuits, State reduction and assignment, Flip flop excitation tables, design procedure, shift registers and counters

TEXT BOOKS:

1. **M. Morris Mono**, Digital Logic and Computer Design, PHI, 2002
2. **Floyd T L** " Digital Fundamentals", 7th edn. (Pearson Education Asia), 2002

REFERENCE BOOKS:

A P Malvino and D P Leach, Digital Principles and Applications, TaTa McGraw Hill, 4th edition, 1998

ELP 3.6 ADVANCED COMMUNICATION LAB

LIST OF EXPERIMENTS

1. TDM of two band limited signals.
2. ASK and FSK generation and detection
3. PSK generation and detection
4. DPSK generation and detection
5. QPSK generation and detection
6. PCM generation and detection using a CODEC Chip
7. Measurement of losses in a given optical fiber (propagation loss, bending loss) and numerical aperture
8. Analog and Digital (with TDM) communication link using optical fiber.
9. Measurement of frequency, guide wavelength, power, VSWR and attenuation in a microwave test bench
10. Measurement of directivity and gain of antennas: Standard dipole (or printed dipole), microstrip patch antenna and Yagi antenna (printed).
11. Determination of coupling and isolation characteristics of a stripline (or microstrip) directional coupler
12. (a)Measurement of resonance characteristics of a microstrip ring resonator and determination of dielectric constant of the substrate.
    (b) Measurement of power division and isolation characteristics of a microstrip 3 dB power divider.

ELP 3.7 VHDL LAB

PROGRAMMING (using VHDL and Verilog)

1. Write HDL code to realize all the logic gates
2. Write a HDL program for the following combinational designs
   a. 2 to 4 decoder
   b. 8 to 3 (encoder without priority & with priority)
   c. 8 to 1 multiplexer
   d. 4 bit binary to gray converter
   e. Multiplexer, de-multiplexer, comparator.
3. Write a HDL code to describe the functions of a Full Adder Using three modeling styles.

- ALU should use combinational logic to calculate an output based on the four bit op-code input.
- ALU should pass the result to the out bus when enable line in high, and tri-state the out bus when the enable line is low.
- ALU should decode the 4 bit op-code according to the given in example below.

OPCODE	ALU OPERATION
1.	A + B
2.	A – B
3.	A Complement
4.	A * B
5.	A AND B
6.	A OR B
7.	A NAND B
8.	A XOR B

ELH 4.1 VLSI DESIGN

UNIT I

Introduction:Review of microelectronics
Introduction to IC technology: Introduction to MOS technology, basic MOS transistors, enhancement and depletion mode transistor action, nMOS and CMOS fabrication, BiCMOS technology
Logic design with MOSFETs:MOSFETs as switches, logic gates in CMOS, transmission gate circuits.**Basic electrical properties of MOS transistor:** I_{ds} versus V_{ds} relationships, aspects of threshold voltage V_t, transconductance

UNIT II

Basic MOS circuits:
NMOS transistor: pass transistor, inverter transfer characteristics, pull-up to pull-down ratio Z_{pu} /Z_{pd} for nMOS inverter driven by another NMOS inverter and nMOS inverter driven by one or more pass transistors, alternative forms of pull-up.
CMOS inverter: transfer characteristics, MOS transistor circuit model, latch-up in CMOS circuits. BiCMOS inverters
MOS circuit design fundamentals:MOS layers, stick diagrams, lambda based rules for NMOS and CMOS process, layout diagrams, examples.
Basic circuit concepts:Sheet resistance R_s, R_s concept applied to MOS transistors and inverters, standard unit of capacitance, capacitance calculations, delay unit τ, inverter delays, CMOS inverter delay in terms of rise and fall times, driving large capacitance loads, propagation delays.

UNIT III

Scaling of MOS circuits: Scaling factors, advantages of scaling, limitations to scaling, scaling of wires and interconnections.
Subsystem design and layout: Switch logic, gate logic, design of combinational logic circuits, design of clocked sequential circuits.
Reliability and testing of VLSI circuits:General concepts, CMOS testing, test generation methods.

Text books:
1. Basic VLSI design, 3rd edition, Douglas A Pucknell, Kamran Eshraghian, PHI
2. Introduction to VLSI circuits and systems, John P Uyemura, John Wiley

References:
1. Principals of CMOS VLSI design, 3rd edition, Neil H E Weste and David Harris, Addison Wesley 2004
2. Microelectronic circuits, 5th edition, Adel S Sedra & Kenneth C Smith, Oxford University press, 2003
3. Silicon VLSI technology, James D Plummer, Michael D Deal and Peter B Griffin, Prentice Hall, 2000.
4. CMOS digital integrated circuits, Analysis and Design, 3rd edition, Sung-Ho(Steve) Kang and Yusuf Leblebici, McGraw Hill, 2002

ELH 4.2 COMPUTER COMMUNICATION NETWORKS

UNIT I

Layered tasks, OSI Model, Layers in OSI model, TCP?IP Suite, Addressing, Telephone and cable networks for data transmission, Telephone networks, Dial up modem, DSL, Cable TV for data transmission.

DATA LINK CONTROL: Framing, Flow and error control, Protocols, Noiseless channels and noisy channels, HDLC.

MULTIPLE ACCESSES: Random access, Controlled access, Channelisation.

UNIT II

Wired LAN, Ethernet, IEEE standards, Standard Ethernet. Changes in the standards, Fast Ethernet, Gigabit Ethernet, Wireless LAN IEEE 802.11

Connecting LANs, Backbone and Virtual LANs, Connecting devices, Back bone Networks, Virtual LANs

Network Layer, Logical addressing, Ipv4 addresses, Ipv6 addresses, Ipv4 and Ipv6 Transition from Ipv4 to Ipv6.

UNIT III

Delivery, Forwarding, Unicast Routing Protocols, Multicast Routing protocols

Transport layer Process to process Delivery, UDP, TCP, Domain name system, Resolution

TEXT BOOK:

1. **Data Communication and Networking**, B Forouzan**,** 4th Ed, TMH 2006

REFERENCE BOOKS:

1. **Computer Networks**, James F. Kurose, Keith W. Ross: Pearson education, 2nd Edition, 2003
2. **Introduction to Data communication and Networking**, Wayne Tomasi: Pearson education 2007

ELH 4.3 INFORMATION THEORY AND CODING

UNIT I

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

SOURCE CODING: Encoding of the source output, Shannon's encoding algorithm. Communication Channels, Discrete communication channels, Continuous channels.

FUNDAMENTAL LIMITS ON PERFORMANCE: Source coding theorem, Huffman coding, Discrete memory less Channels, Mutual information, Channel Capacity.

UNIT II

Channel coding theorem, Differential entropy and mutual information for continuous ensembles, Channel capacity Theorem.

INTRODUCTION TO ERROR CONTROL CODING: Introduction, Types of errors, examples, Types of codes Linear Block Codes: Matrix description, Error detection and correction, Standard arrays and table look up for decoding.

UNIT III

Binary Cycle Codes, Algebraic structures of cyclic codes, Encoding using an (n-k) bit shift register, Syndrome calculation. BCH codes.

RS codes, Golay codes, Shortened cyclic codes, Burst error correcting codes. Burst and Random Error correcting codes.

Convolution Codes, Time domain approach. Transform domain approaximation

TEXT BOOKS:

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

REFERENCE BOOKS:

1. **ITC and Cryptography**, Ranjan Bose, TMH, II edition, 2007
2. **Digital Communications** - Glover and Grant**;** Pearson Ed. 2nd Ed 2008