JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTAPUR

Course Structure and Syllabi for Pre Ph.D
ELECTRONICS & COMMUNICATION ENGINEERING (2009-10)

PART - I

Choose any **one** subject of the following

S.NO	PAPER	PAPER CODE
1.	Digital Data Communications and Networks	09PH04101
2.	Electromagnetics and Microwave Engineering	09PH04102
3.	Micro Electronics	09PH04103
4.	Concepts of Signal and Image Processing	09PH04104
5.	Instrumentation and Embedded Systems	09PH04105

PART - II

Choose any **one** subject of the following

S.NO	PAPER	PAPER CODE
1	Wireless Communications	09PH04201
2	Advanced Communications	09PH04202
3	Advanced Computer Networks	09PH04203
4	Microwave Antennas	09PH04204
5	Microwave Integrated Circuits (MIC's)	09PH04205
6	Radar Engineering	09PH04206
7	Digital IC Design	09PH04207
8	Testing and Testability	09PH04208
9	Low Power VLSI Design	09PH04209
10	Advanced Digital Signal Processing	09PH04210
11	Stochastic Signal Processing	09PH04211
12	Digital Image Processing	09PH04212
13	Microcontroller Interfacing	09PH04213
14	Transducer Technology and Signal Conditioning Circuits	09PH04214
15	DSP Processor and Architectures	09PH04215

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANTAPUR
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Pre-Ph.D - ELECTRONICS & COMMUNICATION ENGINEERING

(09PH04101) DIGITAL DATA COMMUNICATIONS AND NETWORKS

UNIT – I:

Digital Modulation: Introduction, Information Capacity Bits, Bit Rate, Baud and M-ARY Coding, ASK,FSK, PSK, QAM, BPSK, 8PSK, 16PSK, 8QAM, 16QAM, DPSK, Methods, Band Width Efficiency, Carrier Recovery, Clock Recovery.

UNIT – II:

Basic Concepts of Data Communication, Interfaces and Modems: Data Communication., Components, Networks, Distributed Processing, Network Criteria- Applications, Protocols and Standards, Standards Organizations, Regulatory Agencies, Line Configuration – Point – to – point- Multipoint, Topology, Mesh, Star, Tree, Bus, Ring, Hybrids Topologies, Transmission Modes, Simplex, Half duplex – Full Duplex, Categories of Networks – LAN,MAN,WAN and Internetworking, digital Data Transmission – parallel and Serial, DTE-DCE Interface-Data Terminal Equipment , Data Circuit- Terminating Equipment, Standards EIA 232 Interface, other Interface Standards, Modems- Transmission Rates.

UNIT – III:

Error Detection and Correction: types of Errors- Single- Bit Error, CRC (Cyclic Redundancy Check), performance, Checksum, Error Correction- Single-Bit Error Correction, Hamming Code.

UNIT – IV:

Switching: Circuit Switching – Space division Switches- Time Division Switches, TDM Bus pace and Time Division Switching Combinations, public Switched Telephone Network,
Packet Switching-Datagram Approach-Virtual Circuit Approach, Circuit Switched
Connection Versus Virtual Circuit Connection, Message Switching.
Multiplexing : Time Division multiplexing (TDM), Synchronous Time Division
Multiplexing , digital Hierarchy, Statistical Time Division Multiplexing, Concept of OFDM & its application.

UNIT-V:

The data Link layer design issues – Error detection and correction – Elementary Data Link Protocols – Sliding Window protocols – Data link layer in HDLC, Internet and ATM.

UNIT – VI :

Channel allocation methods – TDM, FDM, ALOHA, Carrier sense multiple access protocols, Collision Free protocols – IEEE standard BO2 for LANS – Ethernet, Token Bus, token ring – Bridges.

UNIT – VII:

Network LYER Routing Algorithms – Shortest path, flooding, flow based Distance Vector, Link state , Hierarchical, Broadcast routing, congestion Control algorithms- General principles of congestion control, Congestion prevention polices, Choke packets and Load shedding.

UNIT – VIII :

The Transport Layer Elements of transport protocols – addressing establishing a connection, releasing connection, flow control and buffering and crash recovery, END TO END PROTOCOLS –UDP, reliable Byte Stream (TCP) end format, segment format, connection establishment and termination, sliding window revisited, adaptive retransmission, TCP extension, Remote Procedure Call – BLAST, CHAN, SELECT, DCE.

References:

1. **"Data Communication and Computer Networking "** by .A.Forouzan, 3/e, TMH, 2008.
2. **"Advanced Electronic Communication Systems"** by W.Toprmasi, 5ed., PE12008.
3.**Computer Networks Andrew TanenBaum by** prentice Hall of India New Delhi – third edition.
4. **"Data and Computer Communications"** by Wiiliam Stallings, 8th ed., PHI 2007.
5**. "Data Communication and Tele processing Systems**" by T.Housely, 2/e, BSP, 2008.
6.**Computer Networks – A System Approach** by o Larry L. Peterson & Bruce S. Davie – Second Edition – Harcourt Asia PTE LTD.

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Pre-Ph.D - ELECTRONICS & COMMUNICATION ENGINEERING

(09PH04102) ELECTROMAGNETICS & MICROWAVE ENGINEERING

UNIT- I:
Maxwell equations, faradays law, Guass laws for electric & magnetic fields, conservation of charge , Amperes law, displacement current, Summary of Maxwells equations, constitutive properties of media, boundary conditions on field vectors, power flow & pointing vector, related problems.

UNIT – II:
Uniform plane waves for different media Incidence (Normal, oblique) of Uniform plane waves on plane boundaries.

UNIT – III:
Wave guides:
rectangular , Circular & dielectric , Wave guides –their modes, electromagnetic filed patterns of different modes in rectangular & circular wave guides.

UNIT – IV:
Resonators :
Types of Resonators, filed expressions for resonant frequencies in different modes, Applications of resonators.

UNIT – V:
O-type Tubes :
Klystron amplifiers velocity modulation with space charge forces, gain characteristics, Reflex Klystrons , Traveling wave tubes, Analysis of Traveling wave interaction, helix TWTS, coupled cavity TWTS, efficiency of tubes.

UNIT – VI:
Cross field tubes:
Magnetrons , different types of modes of operation, performance analysis, cross fields amplifiers, M-Type backward wave oscillators, voltage tunable magnetrons, efficiency of tubes.

UNIT – VII:
Solid State Microwave devices:
Construction, Principle operation, characteristics of GUNN diode, PIN diode , IMPATT diode, TRAPATT Low noise Microwave Amplifiers.

UNIT- VIII:
Microwave components & Measurements:
Principle, characteristics & applications of Two port, Three port and four port microwave components (Reciprocal, Nonreciprocal), scattering of matrix and its characteristics, scattering parameters of microwave components. Measurement of power, frequency, VSWR, Impedance , Q using microwave bench setup.

References:

1. **Microwave Tubes** by A.S.Gilmour , Artech House
2. **Introduction to Electromagnetic fields** by Clayton R paul, Keith W Whites, Syed A Nasar , Tata Mcgraw hill.
3. **Microwave Engineering & its application**s by Om. P. Gandhi.

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Pre-Ph.D - ELECTRONICS & COMMUNICATION ENGINEERING

(09PH04103) MICRO ELECTRONICS

Unit-I:

Logic families:

Performance analysis of DTL, DCTL, RTL, TTL, ECL logic families

Unit-II:

Analysis of clock sequential N/Ws, sequential parity checker, analysis of signal tracking & timing charts – state tables & graphs

Review of combinational N/W design – design of N/W with limited gating Fan-in. simulation & testing of logic N/Ws.

Unit-III:

Linear Ics:

Dc effects & limitations of OP-AMPs, low frequency model of OP-AMP, input & output impedance, noise gain, offset voltage & currents. Applications of OP-AMPs

Unit-IV:

Digital Ics:

CMOS open drain & Tri-state outputs. CMOS Transmission gate. Design using TTL 74XX & CMOS 40XX series for code converters , decoders, de-multiplexers, priority encoders, digital arithmetic operations, digital comparators & counters.

Unit-V:

VLSI:

Building blocks of digital design. Multiplexer, De-multiplexer, encoder, comparator, adder, ALU carry look ahead adder

Unit-VI:

FPGA Architectures:

Channel type of FPGAs- Xlinx, Actel, Structured programmable logic, Altera, computational logic arrays, algotronix, VLSI primitives-bench mark

Unit-VII:

Building blocks for CMOS amplifiers, CMOS Transconductance amplifier, design of single ended telescopic, cascade, folded cascade & two stage amplifiers. Frequency compensation scheme.

Unit-VIII:

Fundamentals of data converters, niquist rate A/D converters (Flash interpolating over sampled A/D & D/A converters

References:

1. **Operational amplifiers with linear integrated circuits** by William D. Stanley LPE Fourth edition
2. **Fundamentals of Logic Design** By Charles H. Roth ,Jr.,Jaico publications,4Th Ed. 2006
3. **The Art of Digital design** by Processer & Winkel, Prentice Hall,1994.
4. **FPGAs: Old Field & DORF** by Prentice Hall.
5. **Analog MOS integrated circuits for Signal Processing by** R.Gregorian & Temes.
6. **Analog VLSI by** Mohammed Ismail & Terri Fiez .McGraw-Hill,19994.

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Pre-Ph.D - ELECTRONICS & COMMUNICATION ENGINEERING

(09PH04104) CONCEPTS OF SIGNAL AND IMAGE PROCESSING

Unit – I:

REVIEW OF SIGNALS AND SYSTEMS: classifications of discrete signals and systems- frequency analysis of discrete time signals, frequency response of discrete time system- sampling

Unit – II:

Z-Transform- discrete Fourier transform-convolution-fast Fourier transform-different fast Fourier algorithms

UNIT – III

IIR filters: Design Of Filters From Analog Filters- analog low pass filter design(Butterworth and chebyshev)- realization of digital filters.

Unit – IV:

FIR FILTERS: Linear-phase FIR filters- design of FIR filters using windowing techniques, realization of FIR filters.

Unit – V:

APPLICATIONS OF DIGITAL SIGNAL PROCESSING: speech processing- speech analysis and coding. Sub band coding- radar signal processing.

Unit – VI:

DIGITAL IMAGE FUNDAMENTALS: digital image through scanner, digital camera. Concepts of gray levels.gray level to binary image conversion. Sampling and quantization.relation between pixels. Imaging geometry.

Unit – VII:

IMAGE TRNSFORMS : Two dimensional FFT, properties, walsh transform, hadmard transform, DCT, Haar transform, Slant transform

Unit - VIII :

COLOUR IMAGE PROCESSING: Psedo colour image processing, full colour image processing.

References:

1. **Digital signal processing** by P.Ramesh Babu, SCITECH second edition
2. **Digital signal processing** by John Proakis, PHI
3. **Digital image processing** by R.C. Gonzalez & R.E. Woods, Addison Wesley/ Pearson education, second education, 2002.
4. **Digital image processing** by William K.Pratt, John Wilely, third edition, 2004
5. **Fundamentals of electronic image processing** by Weeks Jr., SPIC/IEEE Series PHI

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Pre-Ph.D - ELECTRONICS & COMMUNICATION ENGINEERING

(09PH04105) INSTRUMENTATION & EMBEDDEDSYSTEMS

UNIT- I:

GENERALISED PERFORMANCE CHARACTERISTICS OF INSTRUMENTS: Functional elements of an instrument, Generalised performance characteristics of instruments - static characteristics, dynamic characteristics, Zero order, first order, second order instruments - step response ramp response and impulse response. Response of general form of instruments to periodic input and to transient input. Experimental determination of measurement system parameters, loading effects under dynamic conditions.

UNIT- II:

TRANSDUCERS FOR MOTION AND DIMENSIONAL MEASUREMENTS: Relative displacement, translation and rotational resistive potentiometers, resistance strain guages, LVDT, synchros, capacitance pickups. Piezo-electric transducers, electro-optical devices, nozzle-flapper transducers, digital displacement transducers, ultrasonic transducers. Magnetic and photoelectric pulse counting methods, relative acceleration measurements, seismic acceleration pickups, calibration of vibration pickups, gyroscopic sensors.

UNIT- III:

DESIGN OF FOLLOWING CONFIGURATIONS WITH EXAMPLES: Inverting amplifier, non-inverting amplifier, summer/ difference amplifier, practical integrator and differentiator circuits, charge amplifiers and impedance converters, voltage to current and current to voltage converters, Current booster for output stage, logarithmic circuits, precision rectifiers, comparator with and without hysterisis, active filters, analog multipliers and PLLs.

UNIT- IV:

INSTRUMENTATION AMPLIFIERS: Specifications and use of instrumentation amplifiers for signal conditioning circuits using commercial ICs.

UNIT- V:

BUILDING BLOCKS FOR DIGITAL DESIGN: Multiplexer, Demultiplexer, Decoder, Encoder, Comparator, Adder, ALU, Carry-look-ahead adder.

UNIT-VI:

MEMORY MANAGEMENT - Virtual memory concepts, memory management unit.

Differences between 80386 and 80486, Pentium processor architectural enhancements.

UNIT- VII:

MICROCONTROLLERS: Overview of microcontrollers - 8051 family microcontrollers, architecture, instruction set, pin out, programming examples, application examples - implementation of UART, use of parallel ports, ADC/ DAC interface.

UNIT- VIII:

DISPLAY SYSTEMS: LCD Flat panel displays, Storage CRT displays, Plasma displays, Projection Systems and their interfacing.

References:

1. **Operational amplifiers with linear integrated circuits** by William D. Stanley LPE Fourth edition
2. **Measurement Systems-Application And Design Doebelin** by E.O McGraw-Hill Fourth Ed 1990
3. **Hand Book Of Operational Amplifiers Circuit Design** by DAVID F STOUT and MILTON KAUFMAN
4. **Users hand book of D/A and A/D converters** by ERHNATEK
5. **Electronic Analog and Digital converters** by H.SCHMID
6. **Intel Microprocessor, Architecture, Programming and Interfacing** – 8086/8088, 80186, 80286, 80386 and 80486 by Barry B. Brey,PHI,1995.

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Pre-Ph.D - ELECTRONICS & COMMUNICATION ENGINEERING

(09PH04201) WIRELESS COMMUNICATIONS

UNIT I

INTRODUCTION TO WIRELESS COMMUNICATIONS SYSTEMS: Evolution, Examples of Wireless Communication systems, Comparision, Second Generation Cellular Networks, WLL, Bluetooth and Personal Area Networks.

UNIT II

MOBILE RADIO PROPAGATION: Large-Scale Path Loss, Introduction to Radio Wave Propagation, Free Space Propagation Model, Propagation Mechanisms, Reflection, Ground Reflection (Two-Ray) Model, Diffraction, Scattering.

Small-Scale Fading and Multipath, Impulse Response Model of a Multipath Channel, Small-Scale Multipath Measurements, Parameters of Mobile Multipath Channels, Types of Small-Scale Fading, Rayleigh and Ricean Distributions, Statistical Models for Multipath Fading Channels, Theory of Multipath Shape Factors for Small-Scale Fading Wireless Channels.

UNIT III

DIVERSITY TECHNIQUES: Repetition coding and Time Diversity- Frequency and Space Diversity, Receive Diversity- Concept of diversity branches and signal paths- Combining methods- Selective diversity combining - Switched combining- maximal ratio combining- Equal gain combining- performance analysis for Rayleigh fading channels.

UNIT IV

CELLULAR COMMUNICATION: Cellular Networks, Multiple Access: FDM/TDM/FDMA/TDMA, Spatial reuse, Co-channel interference Analysis, Hand over Analysis, Erlang Capacity Analysis, Spectral efficiency and Grade of Service- Improving capacity - Cell splitting and sectorization.

UNIT V

SPREAD SPECTRUM AND CDMA: Motivation- Direct sequence spread spectrum- Frequency Hopping systems, Time Hopping., Anti-jamming- Pseudo Random (PN) sequence, Maximal length sequences, Gold sequences, Generation of PN sequences.

UNIT VI

DIVERSITY IN DS-SS SYSTEMS: Rake Receiver- Performance analysis. Spread Spectrum Multiple Access, CDMA Systems- Interference Analysis for Broadcast and Multiple Access Channels, Capacity of cellular CDMA networks- Reverse link power control, Hard and Soft hand off strategies.

UNIT VII

FADING CHANNEL CAPACITY: Capacity of Wireless Channels- Capacity of flat and frequency selective fading channels, Multiple Input Multiple output (MIMO) systems- Narrow band multiple antenna system model, Parallel Decomposition of MIMO Channels- Capacity of MIMO Channels.

UNIT VIII

CELLULAR WIRELESS COMMUNICATION STANDARDS: GSM specifications and Air Interface, specifications, IS 95 CDMA- 3G systems: UMTS & CDMA 2000 standards and specifications.

References:

1. **"Wireless Communications" by** Andrea Goldsmith, Cambridge University press.
2. **"Modern Wireless Communications" by** Simon Haykin and Michael Moher, Person Education.
3. **"Wireless Communication, principles & practice" by** T.S. Rappaport, PHI, 2001.
4. **"Principles of Mobile Communications"** by G.L Stuber 2nd edition, Kluwer Academic Publishers.
5. **'Wireless digital communication'** by Kamilo Feher PHI, 1995.
6. **"Introduction to Spread Spectrum Communication" by** R.L Peterson, R.E. Ziemer and David E. Borth,Pearson Education.
7. **"CDMA- Principles of Spread Spectrum" by** A.J.Viterbi, Addison Wesley, 1995.

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Pre-Ph.D - ELECTRONICS & COMMUNICATION ENGINEERING

(09PH04202) ADVANCED COMMUNICATIONS

UNIT I

REVIEW OF RANDOM VARIABLES AND PROCESSES: Random variable – Moment generating function – Markov's inequality – Chebyshev's inequality – Central limit theorem – Chi square, Rayleigh, and Ricean distributions – Correlation – Covariance matrix – Stationary processes – Wide sense stationary processes – Ergodic process – Cross correlation – Autocorrelation functions – Gaussian process.

UNIT II

CHARACTERIZATION OF COMMUNICATION SIGNALS AND SYSTEMS: Signal space representations- Vector Space Concepts, Signal Space Concepts, Orthogonal Expansion of Signals. Representation of Digitally Modulated Signals-Memory less Modulation Methods.

UNIT III

COMMUNICATION OVER ADDITIVE GAUSSIAN NOISE CHANNELS: Optimum waveform Receiver in additive white Gaussian noise (AWGN) channels,Cross correlation receiver, Matched Filter receiver and error probabilities. Optimum receiver for signals with random phase in AWGN channels, Optimum receiver for binary signals, Optimum receiver for M-ary orthogonal signals, Probability of error for envelope detection of M-ary orthogonal signals. Optimum waveform receiver for colored Gaussian noise channels,

UNIT IV

COMMUNICATION OVER BAND LIMITED CHANNELS: Communication over band limited Channels- Optimum pulse shaping- Nyquist criterion for zero ISI, partial response signaling- Equalization Techniques, Zero forcing linear Equalization- Decision feedback equalization.

UNIT V

DIGITAL COMMUNICATION OVER FADING CHANNELS: Characterization of fading multipath channels, Statistical Models for fading channels, Time varying Channel impulse response, narrow and wide band fading models, channel correlation functions, Key multipath parameters, Rayleigh and Ricean fading channels, Simulation methodology of fading channels. Performance of digital Modulation schemes such as BPSK, QPSK, FSK, DPSK, MSK etc. over wireless channels.

UNIT VI

OPTICAL SOURSES AND DETECTORS: Optical sources for communication, LED, injection lasers, modulation technique, direct and indirect methods, optical waveguide devices. Photodiodes in repeaters, receiver design, digital and analog, transmission system design, system design choices,

passive and low speed active optical components for fiber system, micro-optic components, lens-less components.

UNIT VII

OPTICAL FIBER TECHNIQUES:Modulation and demodulation, signal formats, direction detection receivers, coherent detection. Optical switching, polarization control, inter office transmission system, trunking system, performance and architecture, under sea cable system, optical fibers in loop distribution system, photonic local network

UNIT VIII

ORTHOGONAL FREQUENCY DIVISION MULTIPLEXING (OFDM): Carrier Synchronization, Timing synchronization, Multichannel and Multicarrier Systems.

References:

1. **Digital Communications,** by J. Proakis, McGraw Hill, 2000.
2. **Principles of Digital Communications and Coding by** J. Viterbi and J. K. Omura McGraw Hill, 1979.
3**."Optical Fiber Communication" by** Gerd Kaiser McGraw Hill.
4 **CDMA Principles of Spread Spectrum Communications** by Andrew J Viterbi Addison Wesley, 1995.
5. **Mustafa Ergen**, "**Multi-carrier Digital Communications: Theory and Applications of OFDM."** by Ahmad R S Bahai ,Burton R Saltzberg Springer Publications.
6. **"Optical Fiber Telecommunication" by** S E Miller, A G Chynoweth,
7. **"Digital Communication" by** J.S.Chitode, Technical Publications.
8. **"Digital Communication" by** Edward. A. Lee and David. G. Messerschmitt, Allied Publishers (second edition).
9. **"Digital Communication Techniques"** by J Marvin.K.Simon, Sami. M. Hinedi and William. C. Lindsey, PHI.
10. **"An introduction to Probability Theory and its applications" by** William Feller,Vol 11, Wiley 2000.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANTAPUR
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Pre-Ph.D - ELECTRONICS & COMMUNICATION ENGINEERING

(09PH04203) ADVANCED COMPUTER NETWORKS

UNIT -I:

CONGESTION AND QUALITY OF SERVICE (QOS)

Data traffic, Congestion, Congestion Control, Open loop and Closed Loop Congestion Control in TCP and Frame Relay, Quality of Service, Flow Characterization, Flow Classes, Need For QoS, Resource Allocation, Best Effort Service Features, Techniques to Improve QoS.

UNIT -II:

Queue Management: Passive, Active (RED), and Fair (BRED, Choke) Queue Management Schemes, Scheduling, Traffic Shaping, Resource Reservation and Admission Control Scheduling, Integrated and Differential Services.

UNIT-III:

Wireless Local Area Networks: Introduction, Wireless LAN Topologies, Wireless LAN Requirements, the Physical Layer, the Medium Access Control (MAC) Layer, Latest Developments.

Wireless Personal Area Networks (WPANs): Introduction to PAN Technology and Applications, Commercial Alternatives- Bluetooth, Home RF.

Wireless Wide Area Networks and MANS: The Cellular Concept, Cellular Architecture, The First- Generation Cellular Systems, The Second- Generation Cellular Systems, The Third-Generation Cellular Systems, Wireless in Local Loop, Wireless ATM, IEEE 802.16 Standard.

UNIT-IV:

Cellular Systems and Infrastructure- Based Wireless Networks: Cellular Systems Fundamentals, Channel Reuse, SIR and User Capacity, Interference Reduction Techniques, Dynamic Resource Allocation, Fundamental Rate Limits.

UNIT -V:

Virtual Private Network (VPN): Types of VPN, VPN General Architecture, Current VPN Advantages and Disadvantages, VPN Security Issues, VPN Standards.

UNIT-VI:

ATM Protocol Reference Model: Introduction, Transmission Convergence (TC) Sub-layer, Physical Medium Dependent (PMD) Sub-layer, Physical Layer Standards for ATM.

ATM Layer: ATM Cell Header Structure at UNI, ATM Cell Header Structure at NNI, ATM Layer Functions.

ATM Adaptation Layer: Service Classes and ATM Adaptation Layer, ATM Adaptation Layer 1 (AAL1), ATM Adaptation Layer 2 (AAL2), ATM Adaptation Layer 3/4 (AAL3/4), ATM Adaptation Layer 5 (AAL5).

ATM Traffic and Service Parameterization: ATM Traffic Parameters, ATM Service Parameters, Factors Affecting QoS Parameters, ATM Service Categories, QoS and QoS Classes.

UNIT-VII:

Interconnection Networks: Introduction, Banyan Networks- Properties, Crossbar Switch, Three Stage Class Networks, Rearrangeable Networks, Folding Algorithm, Benes Networks, Looping Algorithm, Bit- Allocation Algorithm.

UNIT -VIII:

SONET/SDH: SONET/SDH Architecture, SONET Layers, SONET Frames, STS Multiplexing, SONET Networks.

References:

1. **Wireless Communications** by Andrea Goldsmith, 2005, Cambridge University Press.
2. **Ad Hoc Wireless Networks: Architectures and Protocols** by C. Siva Ram Murthy and B.S.Manoj, 2004, PHI.
3. **Data Communication and Networking** by B. A.Forouzan, 2nd updating, 2004,TMH
4. **Introduction to Broadband Communication Systems by** Sadiku, Mathew N.O., Akujuobi, Cajetan.M, PHI
5. **Wireless Networks- P. Nicopolitidis by** A. S. Pomportsis, G. I. Papadimitriou, M. S. Obaidat, 2003, JohnWiley & Sons
6. **High Performance TCP / IP Networking** by Mahaboob Hassan, Jain Raj, PHI

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Pre-Ph.D - ELECTRONICS & COMMUNICATION ENGINEERING

(09PH04204) MICROWAVE ANTENNAS

Unit-I:

Antenna Parameters: Radiation Patterns, Radiation Power Density, Radiation Intensity, Gain, Antenna Efficiency, Bandwidth, Polarization, Input Impedance, Antenna Radiation Efficiency, Antenna as an Aperture, Directivity and maximum Aperture, Friis Transmission Equation, Antenna Temperature.

Unit-II & III:

Reflector Antennas: Plane Reflector, Corner Reflector, 90^o Corner Reflector, Other Corner Reflectors, Parabolic Reflector, Front-Fed Parabolic Reflector, Cassegrain Reflectors, Lens Antennas, Lenses with $n>1$, Lenses with $n<1$, Lenses with Variable Index of Refraction.

Unit-IV & V:

Antenna Arrays: Introduction, Two Element Array, N-Element Linear Array- Uniform amplitude and Spacing, Broadside Array, Ordinary End-Fire Array, Phased Array, Hansen-Woodyard End-Fire Array, N-Element Linear Array- Directivity, Nonuniform Amplitude, Binomial Array-Design equations.

Unit-VI & VII:

Microstrip Radiators: Definition of microstrip antenna, advantages and disadvantages of microstrip antennas, applications, Radiation mechanism and Radiation fields of microstrip antennas, excitation techniques.

Unit-VIII:

Rectangular microstrip patch antennas: Introduction, Analysis of Rectangular patch radiators, The vector potential approach, Dyadic Green's Function Techniques, the cavity model, Model Expansion Model, the transmission line model, Bandwidth Enhancement Techniques.

References:

1. **Antennas** by J.D. Kraus MC Graw-Hill, ISE, 1988.
2. **"Antenna theory analysis and Design"** by Constantine A. Balanis, John Wiley.
3. **"Microstrip antennas"** by J.J. Bahl and Bhartia, Artech House, 1982.
4. **"Microwave Antenna – Theory and Design"** by Samuel Silver, IEE Press, London 1984.
5. **Microstrip Antenna – Theory and Design** by James J. Hall, P.S. Wood, 1981.

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Pre-Ph.D - ELECTRONICS & COMMUNICATION ENGINEERING

(09PH04205) MICROWAVE INTEGRATED CIRCUITS

Unit-I:

Introduction to Microwave circuit concepts: one port junction, terminal voltages & currents in multi port junctions, Poynting's Energy Theorem, Normalized waves and scattering matrix. Properties of [S] matrix.

Unit-II:

Relation between [S], [Z] and [Y] parameters, Wave amplitude transmission matrix [A], relation between [A] and [S], [S] matrix of magic T, E and H plane Tees, directional coupler, Application of Hybrid junction and magic tee.

Unit-III:

MIC technology – Thick film & thin film technology, Hybrid MICs

Unit-IV:

STRIP LINES:

Analysis of strip lines, Characteristic parameters of strip lines , Impedance transformers.

Unit-V:

MICRO STRIP LINES: Analysis of Micro strip lines, method of conformal transformation, characteristic parameters of micro strip lines, micro strip circuit design, lumped constant micro strip circuits.

Unit-VI:

Lumped elements for MIC's design & fabrication of lumped elements, circuits using lumped elements.

Unit-VII:

Design of Micro-strip circuits - high power & low power circuits.

Unit-VIII:

BASIC CONCEPTS OF RF DESIGN: Non-linearity and time variance ISI, random process and noise, sensitivity, dynamic range, passive impedance transformation

References:

1. **Microwave Circuits** by Altman, JL., D. Van Nostrand Co., Inc., 1964.
2. **Microwave Integrated Circuits** by D. Van Nostrand Co. Inc.
3. **Microwave Integrated Circuits** by K.G. Gupta & Amarjit Singh.
4. **Advances in Microwave** by Leo young.
5. **The design of CMOS radio frequency integrated circuits by** Thomas H.Lee, Cambridge university press

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Pre-Ph.D - ELECTRONICS & COMMUNICATION ENGINEERING

(09PH04206) RADAR ENGINEERING

Unit –I

INTRODUCTION: basic radar equation, range delay, velocity delay, Doppler effect, accuracy, resolution and ambiguity .Tradeoffs and penalties in waveform design .Significance of matched filter in radar signal analysis: complex representation of band-pass signal, matched filter response to Doppler shifted signal.

Unit- II

AMBIGUITY FUNCTION: main properties of ambiguity function, cuts through ambiguity function, periodic ambiguity functions .Basic radar signals: constant frequency pulse, linear frequency modulated pulse, Costas frequency modulated pulse, nonlinear frequency modulation.

Unit –III

PHASE CODED PULSE: Barker code, chirp-like phase code, asymptotically perfect codes, Huffman code, and bandwidth considerations in phase-coded signals. Diverse pulse repetition interval (PRI) pulse trains: introduction to moving target indication (MTI) radar, blind speed, MTI radar performance analysis, optimal MTI weights, diversifying the PRI.

Unit- IV

Multi carrier phase coded signal in radar signals.Bistatic radar: advantages of a bistatic configuration, bistatic RCS, bistatic range-ambiguity function, multistatic radar configuration. Synthetic aperture radar (SAR): SAR principle, k-space understanding of SAR, different compensation techniques, sparse SAR, nonlinear SAR, apodization.

Unit- V

DETECTION AND RECOGNITION USING RADAR: detection and recognition using 1-D range profile, detection and recognition using SAR image. Space time adaptive processing (STAP): understanding STAP, uses of STAP, bistatic STAP .Civilian uses of radar: space based SAR, segmentation of SAR images from satellite.

Unit – VI

Radio direction finding and radio ranges, the loop antenna, The goniometer, errors in direction finding the LF/MF four-course radio range, VHF-VOR, VOR receiving equipment.

Unit – VII

Hyperbolic systems of navigation & DME ; TACAN : Loran-A, Loran-C, The decca navigation system, decca receivers. DMA-operation, TACAN STACAN equipment.

Unit – VIII

PULSE COMPRESSION IN RADAR SIGNALS: introduction, significance, types. Linear FM pulse compression- block diagram, characteristics, reduction of time sidelobes, stretch techniques, generation and decoding of FM waveforms- block schematick and characteristics of passive system, digital compression SAW pulse compression.

References:

1. **Radar Signals** by N. Levanon, and E. Mozeson, Wiley-Interscience, 2004.
2. **Radar Principles** by P. Z. Peebles, John Wiley, 2004.
3. **Introduction to Radar Systems** by M. I. Skolnik, Tata McGraw Hill, 2001.
4. **Radar System Analysis and Modeling** by D. K. Barton Artech House, 2005
5. **IEEE standards on radar related areas** by IEEE Explorer.
6. **Introduction to radar systems** by "M.I.Skolmik", 2nd edition – TMH 1980.
7. **Elements on electronic navigation** by "N.S.Nagaraja", 2nd edition - TMH 1996.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANTAPUR ANANTAPUR

Pre-Ph.D - ELECTRONICS & COMMUNICATION ENGINEERING

(09PH04207) DIGITAL IC DESIGN

UNIT I

CMOS inverters -static and dynamic characteristics.

UNIT II

Static and Dynamic CMOS design- Domino and NORA logic - combinational and sequential circuits.

UNIT III

Method of Logical Effort for transistor sizing -power consumption in CMOS gates- Low power CMOS design.

UNIT IV

Arithmetic circuits in CMOS VLSI - Adders- multipliers- shifter -CMOS memory design - SRAM and DRAM

UNIT V

Bipolar gate Design- BiCMOS logic - static and dynamic behaviour -Delay and power consumption in BiCMOS Logic.

UNIT VI&VII

LAYOUT DESIGN RULES: Need for Design Rules, Mead Conway Design Rules for the Silicon Gate NMOS Process, CMOS Based Design Rules, Simple Layout Examples, Sheet Resistance, Area Capacitance, Wire Capacitance, Drive Large Capacitive Load**.**

UNIT VIII

SUBSYSTEM DESIGN PROCESS: General arrangement of 4-bit Arithmetic Processor, Design of 4-bit shifter, Design of ALU sub-system, Implementing ALU functions with an adder, Carry-look-ahead adders, Multipliers, Serial Parallel multipliers, Pipeline multiplier array, modified Booth's algorithm.

References:

1. **"CMOS Digital Integrated Circuits - Analysis & Design"** by Sung-Mo Kang & Yusuf Leblebici, MGH, Second Ed., 1999
2. **"Digital Integrated Circuits - A Design Perspective" by** Jan M Rabaey Prentice Hall, 1997
3. **"Introduction to VLSI Design"** by Eugene D Fabricus, McGraw Hill International Edition.1990
4. **"Digital Integrated Circuit Design" by** Ken Martin,Oxford University Press, 2000
5. **,"Principles of CMOS VLSI Design: A System Perspective" by** Neil H E West and Kamran Eshranghian Addision-Wesley 2nd Edition,2002.
6. **"CMOS circuit design, layout, and simulation" by** R. J. Baker, H. W. Li, and D. E. Boyce, New York: IEEE Press, 1998.

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Pre-Ph.D - ELECTRONICS & COMMUNICATION ENGINEERING

(09PH04208) TESTING & TESTABILITY

UNIT I

INTRODUCTION TO TEST AND DESIGN FOR TESTABILITY (DFT) FUNDAMENTALS: Modeling: Modeling Digital Circuits at Logic Level, Register Level and Structural Models. Levels of Modeling. Logic Simulation: Types of Simulation, Delay Models, Element Evaluation, Hazard Detection, Gate Level Event Driven Simulation.

UNIT II

FAULT MODELING: Logic Fault Models, Fault Detection and Redundancy, Fault Equivalence and Fault Location. Single Stuck and Multiple Stuck – Fault Models. Fault Simulation Applications, General Techniques for Combinational Circuits.

UNIT III

TESTING FOR SINGLE STUCK FAULTS (SSF): Automated Test Pattern Generation (ATPG/ATG) For Ssfs In Combinational and Sequential Circuits, Functional Testing With Specific Fault Models. Vector Simulation – ATPG Vectors, Formats, Compaction and Compression, Selecting ATPG Tool.

UNIT IV&V

DESIGN FOR TESTABILITY: Testability Trade-Offs, Techniques. Scan Architectures and Testing – Controllability and Absorbability, Generic Boundary Scan, Full Integrated Scan, Storage Cells for Scan Design. Board Level and System Level DFT Approaches. Boundary Scans Standards. Compression Techniques – Different Techniques, Syndrome Test and Signature Analysis.

UNIT VI

BUILT-IN SELF-TEST (BIST): BIST Concepts and Test Pattern Generation. Specific BIST Architectures – CSBL, BEST, RTS, LOCST, STUMPS, CBIST, CEBS, RTD, SST, CATS, CSTP, BILBO. Brief Ideas on Some Advanced BIST Concepts and Design for Self-Test at Board Level.

UNIT VII

MEMORY BIST (MBIST): Memory Test Architectures and Techniques – Introduction to Memory Test, Types of Memories and Integration, Embedded Memory Testing Model. Memory Test Requirements for MBIST.

UNIT VIII

BRIEF IDEAS ON EMBEDDED CORE TESTING: Introduction to Automatic in Circuit Testing (ICT), JTAG Testing Features.

References:

1. **Arthur D.Friedman, Digital Systems Testing and Testable Design** by Miron Abramovici, Melvin A. Breur, Jaico Publishing House, 2001.
2. **Design for Test for Digital ICs & Embedded Core Systems, Alfred Crouch by** Prentice Hall.
3. **Steven M.Mentyn, Introduction to VLSI Testing by** Prentice Hall, Robert J.Feugate, Jr., Englehood Cliffs, 1998.

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Pre-Ph.D - ELECTRONICS & COMMUNICATION ENGINEERING

(09PH04209) LOW POWER VLSI DESIGN

UNIT I

LOW POWER DESIGN, AN OVER VIEW: Introduction to low- voltage low power design, limitations, Silicon-on-Insulator.

UNIT II

MOS/BiCMOS PROCESSES: Bi-CMOS processes, Integration and Isolation considerations, Integrated Analog/Digital CMOS Process.

UNIT III

LOW-VOLTAGE/LOW POWER CMOS/ BICMOS PROCESSES: Deep submicron processes, SOI CMOS, lateral BJT on SOI, future trends and directions of CMOS/Bi-CMOS processes.

UNIT IV

DEVICE BEHAVIOR AND MODELING: Advanced MOSFET models, limitations of MOSFET models, Bipolar models. Analytical and Experimental characterization of sub-half micron MOS devices, MOSFET in a Hybrid mode environment.

UNIT V

CMOS AND Bi-CMOS LOGIC GATES: Conventional CMOS and Bi-CMOS logic gates, Performance Evaluation.

UNIT VI

LOW- VOLTAGE LOW POWER LOGIC CIRCUITS: Comparison of advanced Bi-CMOS Digital circuits. ESD-free Bi-CMOS, Digital circuit operation and comparative Evaluation.

UNIT VII

LOW POWER LATCHES AND FLIP FLOPS: Evolution of Latches and Flip flops-quality measures for latches and Flip flops, Design perspective.

UNIT VIII

SPECIAL TECHNIQUES: Power Reduction in Clock Networks, CMOS Floating Node,Low Power Bus, Delay Balancing, Low Power Techniques for SRAM.

References:

1. **"CMOS/BiCMOS ULSI low voltage, low power" by** Yeo Rofail/ Gohl(3 Authors), Pearson Education Asia 1st Indian reprint,2002.
2. **"Practical Low Power Digital VLSI Design" by** Gary K. Yeap KAP, 2002.
3., **"Basic VLSI Design" by** Douglas A.Pucknell & Kamran Eshraghian 3rd edition PHI.
4. **"Digital Integrated circuits" by** J.Rabaey, PH,1996
5 **"CMOS Digital ICs" by** Sung-mo Kang and yusuf leblebici, 3rd edition TMH 2003 .
6. **IEEE Trans Electron Devices, IEEE** J.Solid State Circuits, and other National and International Conferences and Symposia.

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Pre-Ph.D ELECTRONICS & COMMUNICATION ENGINEERING

(09PH04210) ADVANCED DIGITAL SIGNAL PROCESSING

UNIT I

OVERVIEW : Discrete-Time Signals, Sequences and sequence Representation, Discrete-Time Systems, Time-Domain Characterization and Classification of LTI Discrete-Time Systems. The Continuous-Time Fourier Transform, The discrete-Time Fourier Transform, energy Density Spectrum of a Discrete-Time Sequence, Band-Limited Discrete-Time signals, The Frequency Response of LTI Discrete-Time System.

UNIT II

LTI DISCRETE-TIME SYSTEMS IN THE TRANSFORM DOMAIN: Types of Linear-Phase transfer functions, Simple Digital Filters, Complementary Transfer Function, Inverse Systems, System Identification, Digital Two-Pairs, Algebraic Stability Test.

UNIT III

DIGITAL FILTER SRTUCTURE AND DESIGN: All Pass Filters, Tunable IIR Digital Filter, IIR Tapped Cascade Lattice Structures, FIR Cascaded Lattice Structures, Parallel All Pass Realization of IIR Transfer Functions, State Space Structures, Polyphase Structures, Digital Sine-Cosine Generator, Computational Complexity of Digital Filter Structures, Design of IIR Filter using pade' approximation, Least Square Design Methods, Design of Computationally Efficient FIR Filters.

UNIT IV

DSP ALGORITHEMS: Fast DFT algorithms based on Index mapping, Sliding Discrete Fourier Transform, DFT Computation Over a narrow Frequency Band, Split Radix FFT, Linear filtering approach to Computation of DFT using Chirp Z-Transform.

UNIT V

MULTI RATE SIGNAL PROCESSING: Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D, Filter design & Implementation for sampling rate conversion.

UNIT VI

POWER SPECTRAL ESTIMATION: Estimation of spectra from finite duration observation of signals, Non-parametric methods: Bartlett, Welch & Blackmann & Tukey methods.

PARAMETRIC METHODS FOR POWER SPECTRUM ESTIMATION: Relation between auto correlation & model parameters, Yule-Waker & Burg Methods, MA & ARMA models for power spectrum estimation.

UNIT VII

ANALYSIS OF FINITE WORDLENGTH EFFECTS IN FIXED-POINT DSP SYSTEMS: Fixed, Floating Point Arithmetic – ADC quantization noise & signal quality-Finite word length effect in IIR digital Filters – Finite word-length effects in FFT algorithms.

UNIT VIII

APPLICATIONS OF DIGITAL SIGNAL PROCESSING: Dual Tone Multi-frequency Signal Detection, Spectral Analysis of Sinusoidal Signals, Spectral Analysis of Non stationary Signals, Musial Sound Processing, Over Sampling A/D Converter, Over Sampling D/A Converter, Discrete-Time Analytic Signal Generation.

References:

1. **Digital Signal Processing** by Sanjit K Mitra, Tata MCgraw Hill Publications.
2. **Digital Signal Processing Principles, Algorithms, Applications** by J G Proakis, D G Manolokis, PHI.
3. **Discrete-Time Signal Processing** by A V Oppenhiem, R W Schafer, Pearson Education.
4. **DSP- A Practical Approach- Emmanuel C Ifeacher Barrie**. W. Jervis, Pearson Education.
5. **Modern spectral Estimation techniques** by S. M .Kay, PHI, 1997.

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Pre-Ph.D - ELECTRONICS & COMMUNICATION ENGINEERING

(09PH04211) STOCHASTIC SIGNAL PROCESSING

Unit-I

Introduction to Stochastic Processes:

Definition, properties, stationary and non-stationary processes.

Unit –II&III

Characteristics of Stochastic Processes & Wiener Filtering:
Partial characterization of a discrete-time stochastic process. Properties of correlation matrix Eigenvalue problem, Properties of eigenvalues & eigenvectors. Power spectral density, Auto regressive models, other stationary stochastic models, Selecting the order of the model, Statement of optimum filtering problem, solution to Wiener half equation, Error performance surface, Normal equation, Principle of orthogonality Minimum mean squared error, Canonical form of error – performance surface.

Unit IV&V

Linear Prediction:
Linear prediction, forward & backward predictions, prediction-error filter, Levinson-durbin recursion, Relation among the auto correlation function & the reflection coefficients, Transfer function of prediction-error filter, Whitening property, Eigenvector representations of lattice predictors and their correlation properties, prediction errors viewed as a Gram – Schmidt Orthogonalization process, Relation between backward prediction – error vector, positive definiteness of the correlation – matrix of the tap inputs and the minimum – phase property of the prediction error filter, Burg formula.

Unit - VI

Method of Estimation by LMS Algorithm:
Structure of adaptive filter, Method of steepest descent, Stability of steepest – descent algorithm, mean squared error, Average tap weight vector and error correlation matrix, Average mean – squared error, Properties of transient behavior of it, Summary of LMS Algorithm, LMS Algorithm in a non-stationary environment, Digital implementation of LMS Algorithm.

Unit -VII

Kalman Filter Theory and its Applications:
Recursive minimum mean square estimation for scalar random variables, Statement of Kalman filtering problem, Innovation process, Estimation of state using the innovations process, Filtering methods of LS.

Unit -VIII

Method of Least Squares:

Statement of linear least – squares estimation problem, Windowing of the data, Principle of orthogonality, Uniqueness theorem, Minimum sum of error squares, Reformulation of deterministic normal equation in terms of correlation functions, Properties of least squares estimates, Linear prediction problem Singular – value decomposition, Estimation of sine waves in the presence of additive noise.

References:

1. **Adaptive filter theory** by Simon Haykin
2. **Probability, Random Variables and Stochastic processes** - by A.Papulis(TMH)
3. **Probability, Random Variables and Stochastic processes** - by Peebles

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Pre-Ph.D - ELECTRONICS & COMMUNICATION ENGINEERING

(09PH04212) DIGITAL IMAGE PROCESSING

Unit – I

IMAGE REPRESENTATION AND MODELING: Monochrome and color representation, color-ordinate systems Monochrome and Color vision Model, sampling and Quantization – Rectangular and Nonrectangular Grid sampling and interlacing. Optimum Lioyd-Max quantizer, Compandor design, Practical limitations.

Unit - II

IMAGE TRNSFORMS : Two dimensional Orthogonal Transforms, Basic Image, Kroneekes products and Dimensionality: proportion Algorithm etc. for D F T. Hadamard Haar, Slant, DCT and KL Transforms.

Unit-III

SUD techniques Image Enhancement, Point operation, Histogram Modeling, Spatial operations, Transform cooperations, Image Restoration-Increase and Weian Filtering, Filtering using transforms, Least square and constrained least square restoration. Maximum Entropy Restoration.

Unit - IV

IMAGE ANALYSIS AND VISION : Spatial features extraction, Transform, Features, Edge detection, Boundary detection, region representation, Moment Refresevation, Structuctures sgape, Texture, Scene Matching, Image segmentation and classification techniques.

Unit – V & VI

IMAGE DATA COMPRESSION: Huffman coding, Pixel coding, Entropy coding, Run-length coding, Bit plane coding. Predictive coding. Delta and DPCM techniques, Transform coding –zonal versus threshold coding. Adaptive transform coding. Vector quantization for compression.

Unit VII

VIDEO PROCESSING: Representation of Digital Video, Spatio-temporal sampling, Motion Estimation.

Unit VIII

Video Filtering, Video Compression, Video coding standards.

References:

1. **,"Digital Image Processing" by** Woods R. C. Gonzalez, R. E. Pearson Education. 2nd dition,2002
2. **"Digital image processing" by** W. K. Pratt Prentice Hall, 1989
3. **"Digital image processing" by** A. Rosenfold and A. C. Kak, Vols. 1 and 2, Prentice Hall, 1986.
4. **"Digital image restoration"** by H. C. Andrew and B. R. Hunt, Prentice Hall, 1977
5. **"Machine Vision" by** R. Jain, R. Kasturi and B.G. Schunck, McGraw-Hill International Edition, 1995
6. **"Digital Video Processing by A. M. Tekalp,",** Prentice-Hall, 1995
7. **"Handbook of Image & Video Processing"** by A. Bovik, Academic Press, 2000

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Pre-Ph.D - ELECTRONICS & COMMUNICATION ENGINEERING

(09PH04213) MICROCONTROLLERS & INTERFACING

UNIT I

INTEL 8051: Architecture of 8051, Memory Organization, Register banks, Bit addressing media, SFR area, addressing modes, Instruction set, Programming examples.

UNIT II

8051 Interrupt structure, Timer modules, Serial Features, Port structure, Power saving modes.

UNIT III

MOTOROLA 68HC11: Controllers features, Different modes of operation and memory map, Functions of I/O ports in single chip and expanded multiplexed mode, Timer system.

UNIT IV

Input capture, Output compare and pulsed accumulator features of 68HC11, Serial peripherals, Serial Communication interface, Analog to digital conversion features.

UNIT V

PIC MICROCONTROLLERS: Program memory, CPU registers, Register file structure, Block diagram of PIC 16C74, I/O ports. Timer 0,1 and 2 features, Interrupt logic, serial peripheral interface, I^2C bus, ADC, UART, PIC family parts.

UNIT VI

MICROCONTROLLER INTERFACING: 8051, 68HC11, PIC-16C6X and ATMEL External Memory Interfacing – Memory Management Unit, Instruction and data cache, memory controller. On Chip Counters, Timers, Serial I/O, Interrupts and their use. PWM, Watch dog, ISP, IAP features.

UNIT VII

INTERRUPT SYNCHRONIZATION: Interrupt vectors & priority, external interrupt design. Serial I/O DevicesRS232 Specifications, RS422/Apple Talk/ RS 423/RS435 & other communication protocols. Serial Communication Controller.

UNIT VIII

CASE STUDIES: Design of Embedded Systems using the micro controller 8051/ARM6TDMI, for applications in the area of Communications, Automotives, industrial control.

References:

1. **"The 8051 Micro Controller & Embedded Systems" by** M.A. Mazadi & J.G. Mazidi, Pearson Education. Asia (2000).
2. **Designing with PIC Micro Controllers by** John B. Peatman, Pearson Education.
3. **Embedded Microcomputer systems by** Jonathan W. Valvano, Real Time Interfacing, Brookes/Cole, Thomas learning, 1999.
4. **8-bit Embedded Controllers** byINTEL Corporation 1990.
5 **"Designing with PIC Microcontrollers" by** John B.Peatman, Pearson Education Inc, India, 2005.

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Pre-Ph.D - ELECTRONICS & COMMUNICATION ENGINEERING

(09PH04214) TRANSDUCER & SIGNAL CONDITIONING CIRCUITS

Unit-I:

GENERALISED PERFORMANCE CHARACTERISTICS OF INSTRUMENTS: Functional elements of an instrument, Generalised performance characteristics of instruments - static characteristics, dynamic characteristics, Zero order, first order, second order instruments - step response ramp response and impulse response. Response of general form of instruments to periodic input and to transient input. Experimental determination of measurement system parameters, loading effects under dynamic conditions.

Unit-II:

TRANSDUCERS FOR FORCE MEASUREMENT: Bonded strain guage transducers, photoelectric transducers, variable reluctance pickup, torque measurement dynamometers.

Unit-III:

TRANSDUCERS FOR PRESSURE MEASUREMENT: Manometers, elastic transducers, liquid systems, gas systems, very high pressure transducers, thermal conductivity gauges, ionisation gauges, microphone.

TRANSDUCERS FOR FLOW MEASUREMENT: Hot-wire and hot-film anemometers, electromagnetic flow meters, laser doppler velocimeter.

Unit-IV:

TRANSDUCERS FOR TEMPERATURE MEASUREMENT: Thermal expansion methods, thermometers (liquid in glass), pressure thermometers, Thermocouples - materials, configuration and techniques, Resistance thermometers, Thermistors, Junction semiconductors and Sensors, Radiation methods, Optical pyrometers. Dynamic response of temperature sensors, heat flux sensors. Transducers for liquid level measurement, humidity, silicon and quartz sensors, fiber optic sensors.

Unit-V:

INTRODUCTION TO SIGNAL CONDITIONING CIRCUITS: Characteristics of various blocks in a measurement system, need for pre-processing, identification of signal conditioning blocks and their characteristics.

BRIDGE CIRCUITS: Analsis of DC and AC bridges, Application of bridge circuit for variable resistance, inductance and capacitance elements, bridge sensitivity and calibration circuits.

Unit-VI:

DESIGN OF FOLLOWING CONFIGURATIONS WITH EXAMPLES: Inverting amplifier, non-inverting amplifier, summer/ difference amplifier, practical integrator and differentiator circuits, charge amplifiers and impedance converters, voltage to current and current to voltage converters, Current booster for output stage, logarithmic circuits, precision rectifiers, comparator with and without hysterisis, active filters, analog multipliers and PLLs.

Unit-VII:

ISOLATION AMPLIFIERS: Necessity for isolation amplifiers, industrial and medical applications of isolation amplifiers.

Unit-VIII:

Electro-mechanical integrators and their applications, Grounding and shielding.

References:

1. **Measurement systems- Applications and Design by** Doebelin, E.O., 4th Ed., McGraw Hill International, Singapore.
2. **Handbook of Operational Amplifier Circuit Design by** David F Stout And Milton Kaufman.
3. **Measurement systems -Application and Design** by Doebelin, E.O., McGraw Hill, 4th Ed.1990.

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Pre-Ph.D - ELECTRONICS & COMMUNICATION ENGINEERING

(09PH04215) DSP PROCESSORS & ARCHITECTURES

UNIT I

INTRODUCTION TO DIGITAL SIGNAL PROCESING: Introduction, A Digital signal-processing system, The sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation, Analysis and Design tool for DSP Systems MATLAB, DSP using MATLAB.

UNIT II

COMPUTATIONAL ACCURACY IN DSP IMPLEMENTATIONS: Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT III

ARCHITECTURES FOR PROGRAMMABLE DSP DEVICES: Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues, Features for External interfacing.

UNIT IV

EXECUTION CONTROL AND PIPELINING: Hardware looping, Interrupts, Stacks, Relative Branch support, Pipelining and Performance, Pipeline Depth, Interlocking, Branching effects, Interrupt effects, Pipeline Programming models.

UNIT V

PROGRAMMABLE DIGITAL SIGNAL PROCESSORS: Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX Processors, Pipeline Operation of TMS320C54XX Processors.

UNIT VI

IMPLEMENTATIONS OF BASIC DSP ALGORITHMS: The Q-notation, FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, PID Controller, Adaptive Filters, 2-D Signal Processing.

UNIT VII

IMPLEMENTATION OF FFT ALGORITHMS: An FFT Algorithm for DFT Computation, A Butterfly Computation, Overflow and scaling, Bit-Reversed index generation, An 8-Point FFT implementation on the TMS320C54XX, Computation of the signal spectrum.

UNIT VIII

INTERFACING MEMORY AND I/O PERIPHERALS TO PROGRAMMABLE DSP DEVICES: Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA). A Multichannel buffered serial port (McBSP), McBSP Programming, a CODEC interface circuit, CODEC programming, A CODEC-DSP interface example.

References:

1. **Digital Signal Processing by** Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
2. **DSP Processor Fundamentals, Architectures & Features** by Lapsley et al.S. Chand & Co, 2000.
3. **Digital Signal Processors, Architecture, Programming and Applications** by B.Venkata Ramani and M. Bhaskar, TMH, 2004.
4. **Digital Signal Processing** by Jonatham Stein, John Wiley, 2005.