

**Syllabus of Examination for
First Semester M. Tech. (Electronics) Full Time
IFU01 DIGITAL COMMUNICATION**

Section A

Elements of information theory, source coding theorem, Huffman coding, channel coding theorem
channel capacity theorem. Sampling process : base band and band pass sampling theorems,
reconstruction from samples, practical aspect of sampling and signal recovery. TDM, waveform coding techniques, PCM, channel noise and error probability , DPCM & DM. Coding speech at low bit prediction & adaptive filters.

Section B

Baseband shaping for data transmission. PAM single & their power spectra, Nyquist criterion. ISI and eye pattern. Equalization, Digital modulation techniques. Coherent & non coherent detection. Bit VS Symbol error probability & bandwidth efficiency. Error control coding : rationale for coding, liner block codes, cyclic codes & convolution codes. Viterbi decoding algorithm and trellis codes. Spread –spectrum modulation. pseudo noise signal –space dimensionality & processing gain.

Books:

- 1) Simon Haykin, "Design Communications"
- 2) B. P. Lathi, "Digital Communications"
- 3) Taub, Schilling, "Principles of Communication System"

IFU02 VLSI CIRCUITS

Section A

Material Model- Electrical Properties, Junction Diode, MOS Transistor: Operation Modes:

Threshold Voltage: Metal and Polysilicon; Trapped Charge; Implants, Strong Inversion: Charge

Modeling; Constant V_t model: NMOS/PMOS transistors: I/V characteristics, Sign Conventions;

Parasitic Bipolar Transistors: CMOS Latch-up, Analysis (D.C. and Transient), Device

Capacitances and Charge Storage in MOS. NMOS/CMOS circuit analysis, Small signal amplifier

model; Miller Effect. Layout / Fabrication, Diffusion / Implants / Wires, NMOS/CMOS processes,

SCMOS Design Rules - special derivation; self-aligned processes, Resistor / Capacitor Layout,

Logic Level Design, Cube Decomposition, Realization of Duals for CMOS, Euler path layout,

Topological Considerations, Don't Cares and Redundancy, Layout Parasitic Reduction

Section B

I/V for MOS Logic Families, Prop. Delay for CMOS/NMOS/PMOS, Layout Capacitance/Resistance Estimation; Gain effects; MOS Performance Estimation, Buffers/Capacitive Loading, Power Dissipation: Transient Optimization, Sidewall/2-d and 3-d

effects: Cross-talk, Fringing, Ball-Park numbers for process Estimation: Scaling CMOS Design Optimization: High-Speed Logic Strategies, Interconnection, Distributed R/C,

Cross-Talk, Noise, Clocking Strategies, Sub-System Design and Partitioning Dynamic Logic, Dynamic Circuits, Stored Charge and timing, Domino Logic, Switched Capacitor

and Charge Flow Circuits, Pass-Transistor Logic (CPL) Data-Path and Memory Circuits:

Static/Dynamic Memories, Ancillary Memory Analog Circuits.

Books:

1) Weste, "Principles of CMOS VLSI Design (2nd edition)"

2) Douglas A. Pucknell and Kamran Eshraghian, "Basic VLSI Design Systems and Circuits",

Prentice Hall of India Pvt Ltd., 1993.

3) Wayne Wolf, "Modern VLSI Design, 2nd Edition", Prentice Hall, 1998.

IFU03 ADVANCED DIGITAL SIGNAL PROCESSING

Section A

Multirate Signal Processing: Introduction, Sampling and signal Reconstruction, sampling rate conversion, Decimation by an integer factor, interpolation by an integer factor, Sampling rate conversion by rational factor, Sampling rate converter as a time variant system, practical structures for decimators and interpolators, Direct form and Polyphase FIR structures, FIR structures with time varying coefficients.
Multirate FIR Filter Design: Design of FIR filters for sampling rate conversion, Multistage implementation of sampling rate conversion, Applications of Interpolation and decimation in signal processing operations, low pass and band pass filters, filter bank implementation, subband processing, Decimated filter banks, Two channel filter banks, QMF filter banks, Perfect reconstruction filter banks, tree structure filter banks octave, band filter banks, uniform DFT filter banks.

Section B

Power Spectral Estimation: Estimation of spectra from finite duration observations of a signal, the periodogram, use of DFT in power spectral estimation, Non periodic methods for power spectral estimation, Barlett, Welch & Blackman, Tukey methods, comparison of performance of Non periodic power spectral estimation methods.
Parametric Methods of Power Spectral Estimation: Parametric Methods of Power Spectral Estimation, Relationship between auto correlation and model parameters, Auto-Regressive process and linear prediction, Yule-Walker, Burg & unconstrained least square methods, Sequential estimation, Moving average and ARMA models, minimum variance method, Pisarenko's harmonic Decomposition method, MUSIC method.

Books:

1) Oppenheim and Schaffer, "Discrete time signal processing", Prentice Hall

- 2) J. G. Proakis, D. G. Manolakis, "Digital Signal Processing principals", Prentice Hall
- 3) Rabinar and Gold, "Theory and Applications of Digital Signal Processing", Prentice Hall
- 4) Rabinar and Schaffer, "Digital Processing of Speech Signals", Prentice Hall
- 5) Orfanadis S., "Introduction to Digital Signal Processing", Prentice Hall, 1989
- 6) Orfanadis S., "Optimum Signal Processing", Prentice Hall, 1990

IFU04 FUZZY LOGIC & NEURAL NETWORKS

Section A

Fuzzy logic:

Crisp sets & fuzzy sets: introduction, concepts, fuzzy operations general aggregation of operation.

Fuzzy relation, Binary relation, Equivalence & similarity relation. Fuzzy relation equation.

Application: Natural Engineering, Management & decision making & computer science.

Section B

Neural Networks:

Introduction, neural net classifiers, self-organizing nets, associative memory, cellular neural nets.

Adaptation algorithms, pattern capacity, global / local minima, convergence, application of neural networks.

Books:

- 1) George Klir, "Fuzzy Sets Uncertainty & Information", Prentice Hall
- 2) B. Kosko, "Neural Networks and Fuzzy Systems", Prentice Hall, 1992

IFU05 PROGRAMMING & DATA STRUCTURES

Section A

Selection & iteration statements, elementary theory of analysis of algorithms, Order notation, solution of recurrence relation, functions procedure, parameter passing by name, scope rules recursion with examples. Arrays, Multidimensional array,

Section B

Spance matrices files pointer linked list, polynomial manipulations, symbol table and hashing stacks, Queues, Trees, Weight balanced and B trees, Heaps, Graphs & Graph algorithms.

Books:

- 1) Aho: Data Structures & Algorithms.
- 2) Kruse: Data Structures & Program Design.
- 3) Horowitz & Sahani: Data Structures & Through Pascal.