

**Common for Communication and Signal Processing Students**

- I. **Random Process:** Random variables, discrete and continuous, mixed Random variables, distribution and density functions, properties, various distributions and their properties, moments, multiple random variables. Mean square calculus, Stochastic continuity and Derivatives.
- II. **Noise Performance of Systems:** Baseband signal receiver, probability of error ( $P_e$ ), calculation of  $P_e$  for ASK, PSK, FSK, QPSK schemes. Adaptive Filters Adaptive filters, Concepts of Adaptive filter as a Noise Canceller, Other configurations of the adaptive filter, Main components of the adaptive filter, Basic Wiener filter theory, Basic LMS adaptive algorithm, Practical limitations of the basic LMS algorithm, Recursive Least Square Algorithm, Limitations, Factorization Algorithm.
- III. **Channel Capacity & Multiple Access Techniques:** Shanon's theorem, Shanon Fano Coding, Huffman Coding, Efficiency calculations, Channel capacity of Discrete and analog channels, capacity of Gaussian channel, SNR bandwidth tradeoff. TDMA, FDMA, CDMA, spread spectrum, M-ary signaling schemes (ASK, PSK, FSK).
- IV. **Advanced Signal Processing:** Introduction to Multi-rate Digital Signal Processing, Sample rate reduction, decimation by integer factors- sampling rate increase, interpolation by integer factor, Design of practical sampling rate converters Filter Specification- filter requirement for individual stages, Case study on determining the number of stages and decimation factors.
- V. **DSP Processors:** General and special purpose DSP Processors, Computer Architecture for signal processing, Harvard Architecture, Pipelining, Hardware Multiply and Accumulate, Special Instructions, Replication, On-chip Memory Cache, Extended Parallelism, SIMD – VLIW and static super-scalar Processing ,Study of TMS320C4X and ADSP 2106 processors.

**Text Books:**

1. Probability and Random Processes with Applications to Signal Processing by H. Stark and J.W.Woods, Third Edition, PEA
2. Digital and Analog Communication Systems by K. Sam Shanmugam, John Wiley & Sons, New York
3. Digital Signal Processing By Emmanuel C Ifeakor, Barrie W Jrevis, Pearson Education.
4. Analog Devices & Texas Instruments Users Manuel of TMS320C4X and ADSP 2106x

**Reference Books:**

1. Electronic filter Desig Hand Book By A .B Williams and FT Taylor, McGraw Hill
2. Theory and Applications of DSP By L.R Rabiner and B gold, PHI

**ELECTRONIC DESIGN & AUTOMATION TOOLS**

**Unit-I          Synthesis and Simulation using HDLs**

Verilog and logic synthesis, VHDL and logic synthesis, memory synthesis, FSM synthesis, Performance-driven synthesis, Simulation-types of simulation, logic systems, working of logic simulation, cell models, delay models, static timing analysis, formal verification, switch-level simulation, transistor-level simulation, CAD tools for synthesis and simulation Modelsim and Leonardo Spectrum

**Unit-II          Circuit design and Simulation using Pspice**

Pspice models for transistors, A/D & D/A converters, sample and hold circuits, digital system building blocks, design and analysis of analog and digital circuits Using Pspice.

**Unit-III        Mixed Signal Design**

Fundamentals of analog and digital simulation, mixed signal simulator configurations, understanding modeling, integration to CAD environments, analysis of analog circuits-A/D and D/A converters, up and down converters, comparators etc.

**Unit-IV        PCB Design and Layout**

An overview of high speed PCB design, design entry, simulation and layout tools for PCB, introduction to Orcad PCB Design Tools.

**Unit-V          Electronic Instrument Design**

Electronic circuit design, circuit layout, necessary software, debugging and testing, case studies offering practical electronic instrument design.

**Text Books:**

1. J.Bhaskar, A Verilog HDL Synthesis BS Publications.
2. SPICE for circuits and electronics Using Pspice-M.H.Rashid, Prentice Hall, Second Edition.
3. Electronic Instrument Design-Kim R.Fowler, Oxford University press.

**Reference Books:**

1. A VHDL Synthesis Primer-J.Bhaskar, B S Publications.
2. Application-Specific Integrated Circuits- M.J.S.Smith, Wesley
3. ORCAD-Technical reference manual, Orcad, USA.
4. SABER- Technical reference manual, Analogy Nic, USA.