MEMT – 201 Modeling and Simulation

UNIT-1

System Models: Concept of a system, System Environment, Stochastic activities, Continuous & Discrete system modeling, System modeling, Types of models, Static & Dynamic systems, Principle used in modeling, System studies. System Simulation: Techniques of simulation, Comparison of simulation & analytical methods, Numerical computation techniques for continuous & discrete models, Simulation study.

UNIT 2

Probability concepts in simulation: Stochastic variable, Discrete & Continuous probability function, Continuous uniform distributed and computer generation of random number, Uniform random number generator, Non uniform continuously distributed random numbers, Rejection method.

UNIT-3

Discrete system simulation: Discrete event, Representation of time, Generation of and telephone system, Delayed calls,
arrival patterns, Simulation of queuing sys
ics, Discrete simulation languages.
Simulation programming tasks, Gathering st
SIMSCRIPT, Arena.

UNIT-4

Input modeling: data collection, identifying the distribution with data, parameter estimation, goodness of fit tests, selection of input model without data, multivariate and time series input models. Verification and validation of simulation models:

Unit 5

Output analysis for a single model, stochastic nature of output data, types of simulation with respect to output analysis, Measures of performance and their estimation, output analysis for terminating simulations, output analysis for steady-state simulations.

REFERENCE:

1. G. Gordan; System Simulation, Pill, 1995
2. T. A. Payar; Introduction to Simulation
3. W. A. Spriet; Computer Oriented Modeling & Simulation
4. B. Bames; Modeling & Performance Measurement of Computer Systems
5. A. M. Law, W. D. Kelton; Simulation Modeling & Analysis, McGraw Hill, 1982
6. Narsing Deo; System Simulation with Digital Computers, Prentice Hall, 1976
7. Bank and Carson, Modeling and Simulation, PHI.
8. Garcia & Garcia, Network Modeling, Simulation and Analysis, Marcel Dekker

MEMT – 202 Digital Signal Processing

UNIT-1
Review of Discrete Time Signals, sequences, representation. Discrete Time Systems, Linear, Time invariant, LTI System, Properties, Constant-Coefficient difference equation. Frequency Domain Representation of discrete time signals & systems. Review of Z Transform, properties, R.O.C., Stability, Casualty, Criterion. Inverse Z Transform, Recursive and Non Recursive Systems, Realization of discrete time system.

Unit 2
Theory & Approximation of finite duration impulse response digital filters, Characteristics of FIR filters with linear phase, Frequency of Linear phase FIR system design techniques for linear phase FIR systems design techniques, Windowing Hamming window, Kaiser window, Some practical techniques with window. Chebyshev approximation, Weighted Chebyshev approximation. Non linear equation solution for maximal ripple FIR filters.

UNIT-3
Theory & Approximation of infinite impulse response digital filters, Some elementary Properties of IIR filters, Magnitude square response, Phase response & Group delay, Technique for determining IIR filter coefficients, Digital filter design from continuous time filters, Matched Z- Transform.

UNIT-4
Finite word length effect in digital filters fixed point arithmetic, Floating arithmetic types of quantization in digital filters, Truncation rounding, Spectrum analysis & the Fast Fourier transforms, Introduction to Radix-2 FFTs Data suffering bit reversal, Decimation in time algorithm & Decimation in frequency algorithm, Spectrum & analysis at a single point in the Z-plane, Spectrum analysis using FFTs, Windows in spectrum analysis.

UNIT-5
Application of signal processing in Radar systems, Signal design & Ambiguity functions, Digital Matched filters for Radar Signals, Airborne Surveillance Radar For air traffic Control.

Reference Books:
1. S. Mittra “Digital Signal Processing using MATLAB”, (2nd Edition).
2. Proakis “Digital Signal Processing”, Pearson Education.
3. Digital Signal Processing By Rabinar Gold
4. Digital Signal Processing By John G. Proakis
5. Digital Signal Processing By Oppenhiem and Schaffer

MEMT – 203 Info Theory and Coding

Unit 1
Introduction to uncertainty, information, entropy and its properties, entropy of binary memoryless source and its extension to discrete memoryless source, source coding theorem, data compression, prefix coding, Huffman coding, Lempel-Ziv coding.

Unit 2
Discrete memoryless channels, Binary Symmetric Channel, mutual information & its properties, Channel capacity, channel coding theorem and its application to BSC, Shannon's theorem on channel capacity, capacity of a channel of infinite bandwidth, bandwidth – S/N trade off, practical communication systems in light of shannon's theorem, Fading channel.

Unit 3
Groups and fields in binary system, Galois field and its construction in GF (2_m) and its basic properties, vector spaces and matrices in GF (2), Linear block codes, systematic codes and its encoding circuit, syndrome and error detection, minimum distance, error detecting and correcting capabilities of block code, decoding circuit, probability of undetected error for linear block code in BSC, Hamming code and their applications.

Unit 4
Cyclic codes and its basic properties, Generator and parity check matrix of cyclic codes, encoding and decoding circuits, syndrome computation and error detection, cyclic Hamming codes.

Unit 5
Introduction to BCH codes, its encoding and decoding, error location and correction. Introduction to convolution codes, its construction and Viterbi algorithm for maximum likelihood decoding.

References Books:
1. Haykins Simon, Digital Communication, Wiley Publ.
2. Shu Lin and Costello, Error Control Coding: Theory and Application, PH.
3. Lathi B.P., Modern Analog and Digital Communication Systems, Oxford University. Press.
4. Sklar, Digital Communication, Pearson Education Asia.
5. Taub & Schilling, Principles of Communication System, TMH.
6. Peterson W., Error correcting codes, MIT Press.
7. Schaum's Outline Series, Analog and Digital Communication.
8. Netravali Arun & Haskell, Digital pictures: Representation and compression, Plennum press.
9. Carson, Digital Communication, MGH.

MEMT – 204 THEORY OF RANDOM SIGNALS & SYSTEMS

UNIT-1
Random variable distribution & density functional Expected values, Central limit theorem.

UNIT-2
Ergodicity shot noise thermal noise band limited processes. Wine pal Mogorov theory, Optimal Filtering, Generalized harmonic analysis, Non stationary processes.

UNIT-3
Two dimensional Fourier transform with Random inputs, Study of signal-to-noise ratio in various digital Modulation Techniques, Linear prediction and optimum linear filters, Forward & Backward linear filter prediction, Properties of the linear Prediction Error Filters, Weiner Filter for Filtering & Prediction

UNIT-4
Power Spectrum Estimation, Estimation of Auto-correlation and Power spectrum of Random signals, The period gram, Non parametric methods For Power spectrum Estimation, Parametric method of Power spectrum Estimation.

REFERENCE
1. Theory of Random Variables By Populis
2. Digital Signal Processing By Proakis
3. Digital Signal Processing ByOppenhiem & Schaffer

MEMT – 205 ADVANCED COMMUNICATION SYSTEM

UNIT -1

Review of basic communication theoretical concept, Digital Modulation Techniques, On-Off Keying: Frequency shift keying, Phase shift keying, Quadrature Phase shift keying,. Frequency Multiple access; Demand assigned multiple access, Code Division Multiple access.

UNIT -2

Noise & Communication System, Error Rate in Binary Transmission, Optimum decision levels information capacity of PCM systems; Noise, Power & Spectral representation of noise Random signals & noise through linear systems, Matched Filter Detection, Narrow band noise representation, Signal-to-noise ratio in FM & AM, AM detector spectral analysis, Thermal noise consideration & other types of the noise encountered in communication.

UNIT-3

Statistical communication theory in digital communication, Statistical decision theory signal vectors, Multiple sample detector optimum, Binary transmission, M-array transmission additive white Gaussian noise channel, Matched filter detection signal constellation and probability of error calculation, Binary signals M-array orthogonal signals.

UNIT -4

Mobile communication, Introduction, Spread spectrum, Direct sequence spread spectrum, Cellular systems, Access contracts SDMA, FDMA, TDMA, CDMA systems architecture, Radio interface, Protocols, Wireless LAN, Wireless ATM, Mobile Network Layer, Mobile transport layer.

REFERENCE:

1. Mobile Communication By Jochen Schiller
2. Digital Communication By Taub & Schiller
3. Modulation, Coding By Swartz & Noise.