

M.Tech. (Electronics & Communication Engineering)

SEMESTER-I

Subject Code	Subject	Schedule of Teaching			Marks		
		L	T	P	Theory	Sessionals	Total Marks
MTECE 101	Statistical Signal Analysis	3	1	0	100	50	150
MTECE 102	Mobile Communication	3	1	0	100	50	150
MTECE 103	VLSI Design	3	1	0	100	50	150
MTECE 104	Electronics System Design	3	1	0	100	50	150
MTECE 105	Embedded System	3	1	0	100	50	150
MTECE 106	VLSI Design Lab				50	50	100
	Total				550	300	850

SEMESTER-II

MTECE 201	Optical Communication System	3	1	0	100	50	150
MTECE 202	Data Communication Network	3	1	0	100	50	150
MTECE 203	Reliability Of Electronics Communication System	3	1	0	100	50	150
MTECE 204	Modern Communication Systems	3	1	0	100	50	150
MTECE 205	Parallel Processing	3	1	0	100	50	150
MTECE 206	Parallel Processing Lab				50	50	100
	Total				550	300	850

SEMESTER-III

MTECE 301	Microelectronics Technology	3	1	0	100	50	150
MTECE 302	Digital Speech And Image Processing	3	1	0	100	50	150
MTECE 303	Information Theory And Coding	3	1	0	100	50	150
MTECE 304	Multimedia Communication System	3	1	0	100	50	150
MTECE 305	Modeling And Simulation Of Communication System	3	1	0	100	50	150
	Total				500	250	750

SEMESTER-IV

Dissertation: Each students will do a dissertation independently under the guidance of faculty member in the fourth semester.

Statistical Signal Analysis

MTECE 101

Review of probability theory and random variables: Transformation (function) of random variables; Conditional expectation;

Sequences of random variables: convergence of sequences of random variables.

Stochastic processes: wide sense stationary processes, orthogonal increment processes, Wiener process, and the Poisson process, KL expansion. Ergodicity, Mean square continuity, mean square derivative and mean square integral of stochastic processes.

Stochastic systems: response of linear dynamic systems (e.g. state space or ARMA systems) to stochastic inputs; Lyapunov equations; correlation function; power spectral density function; introduction to linear least square estimation, Wiener filtering and Kalman filtering.

Texts/References

A. Papoulis, Probability, Random Variables and stochastic processes, 2nd Ed., McGraw Hill, 1983.

A. Larson and B.O. Schubert, Stochastic Processes, Vol.I and II, Holden-Day, 1979.

W. Gardener, Stochastic Processes, McGraw Hill, 1986.

MOBILE COMMUNICATION

MTECE 102

1. Introduction to Cellular Mobile Systems:

A basic cellular system , performance criteria, uniqueness of mobile radio environment, operation of cellular systems, planning a cellular system, analog & digital cellular systems.

2. Elements of Cellular Radio Systems Design:

General description of the problem, concept of frequency reuse channels, co-channel interference reduction factor, desired C/I from a normal case in an Omni directional antenna system, cell splitting, consideration of the components of cellular systems.

3. Interference:

Introduction to co-channel interference, real time co-channel interference co-channel measurement design of antenna system, antenna parameter and their effects, diversity receiver in co-channel interference – different types.

4. Cell Coverage for Signal & Traffic:

General introduction, obtaining the mobile point to point mode, Radio propagation characteristics: models for path loss, shadowing and multipath fading, propagation over water or flat open area, foliage loss, propagation near in distance, long distance propagation, point to point prediction model- characteristics, cell site, antenna heights and signal coverage cells, mobile to mobile propagation.

5. Cell Site Antennas and Mobile Antennas:

Characteristics, antenna at cell site, mobile antennas

6. Frequency Management, Channel Assignment and hand off:

Frequency management, fixed channel assignment, non-fixed channel assignment, traffic & channel assignment, Why hand off, types of handoff and their characteristics, handoff analysis, dropped call rates & their evaluation.

7. Operational Techniques:

Parameters, coverage hole filler, leaky feeders, cell splitting and small cells, narrow beam concept.

8. Multiple access techniques used in mobile wireless communications:

FDMA/TDMA, CDMA. FDM/TDM Cellular systems, Cellular CDMA, soft capacity, Erlang capacity comparison of FDM/TDM systems and Cellular CDMA, Discussion of GSM standards; signaling and call control, mobility management; location tracking.

9. Wireless data networking:

Packet error modeling on fading channels, performance analysis of link and transport layer protocols over wireless channels; mobile data networking (mobile IP); wireless data in GSM, IS-95, and GPRS.

Text Books:

1. Mobile Cellular Telecommunications; 2nd ed.; William, C Y Lee McGraw Hill
2. Wireless and Digital Communications; Dr. Kamilo Feher (PHI)
3. Principles of Mobile Communication, G.LStuber Kluwer Academic, 1996
4. Wireless Communication; Principles and Practice; T.S.Rappaport

Reference Book

1. Mobile Communication Hand Book; 2nd Ed.; IEEE Press
2. Mobile Communication Engineering – Theory & Applications; TMH
3. Microwave mobile Communication, IEEE Press. W. Jakes,
4. A.Viteebi, CDMA, Principles of Spread Spectrum Communications, Addison Wesley

VLSI DESIGN

MTECE 103

1. Introduction

Basic principle of MOSFETs, Introduction to large signal MOS models (long channel) for digital design.

2. The MOS Inverters

Static and Dynamic characteristics: Inverter principle, Depletion and enhancement load inverters, the basic CMOS inverter, transfer characteristics, logic threshold, Noise margins, and Dynamic behavior, transition time, Propagation Delay, Power Consumption.

3. MOS Circuit Layout & Simulation

Layout design rules, MOS device layout: Transistor layout, Inverter layout, CMOS digital circuits layout & simulation, Circuit Compaction; Circuit extraction and post-layout simulation.

4. Combinational MOS Logic Design

Static MOS design: Complementary MOS, Ratioed logic, Pass Transistor logic, complex logic circuits, DSL, DCVSL, Transmission gate logic.

Dynamic MOS design: Dynamic logic families and performances.

Memory Design: ROM & RAM cells design

5. SEQUENTIAL MOS LOGIC DESIGN

Static latches, Flip flops & Registers, Dynamic Latches & Registers, CMOS Schmitt trigger, Monostable sequential Circuits, Astable Circuits.

Adders, Multiplier Circuits.

5

6. INTERCONNECTS & IO BUFFERS

Interconnect delays, Cross Talks. Introduction to low power design, Input and Output Interface circuits.

7. BICMOS LOGIC CIRCUITS

Introduction, Basic BiCMOS Circuit behavior, Switching Delay in BiCMOS Logic circuits.

TEXT BOOK:

1. Kang & Leblebici “CMOS Digital IC Circuit Analysis & Design”- McGraw Hill, 2003
2. JM Rabey, “Digital Integrated Circuits Design”, Pearson Education, Second Edition, 2003
3. Weste and Eshraghian, “Principles of CMOS VLSI design” Addison-Wesley, 2002

Reference Books:

1. W Wolf “Modern VLSI Design”.
2. David A. Hodges, Horace G. Jackson, Resve Saleh, “Analysis & Design of Digital Integrated Circuits”, 3rd Edi Mc Graw Hill, 2003.

ELECTRONICS SYSTEM DESIGN

MTECE 104

Signal conditioning, Instrumentation & Isolation amplifiers, Analog filters, Analog switches, Programmable circuits, Switched-capacitors circuits and applications. A/D and D/A conversion: sampling and quantization, antialiasing and smoothing filters, Data converters, interfacing with DSP blocks. Signal measurement in the presence of noise: synchronous detection, signal averaging. Noise in electronic systems; design of low noise circuits. Interfacing of analog and digital systems. PCB design and layout; System assembly considerations.

Texts/References

- A. S Sedra and KC Smith, Microelectronic circuits, Oxford, 1998.
- S. Soclof, Applications of analog integrated circuits, Prentice Hall 1990.
- T. T. Lang, Electronics of measuring systems - practical implementation, Wiley, 1987.
- P. Horowitz and W Hill, The art of electronics, Cambridge, 1995.
- H.W.Ott, Noise Reduction Techniques in Electronic Systems, Wiley, 1989.
- S. K Mitra, Digital signal processing: a computer based approach, McGraw Hill, 1998.
- W.C. Bosshart, Printed Circuit Boards: Design and Technology, Tata McGraw Hill, 1983.
- G.L. Ginsberg, Printed Circuit Design, McGraw Hill, 1991.

Embedded Systems Design

MTECE 105

The concept of embedded systems design. Embedded microcontroller cores, embedded memories. Examples of embedded systems.

Technological aspects of embedded systems: interfacing between analog and digital blocks, signal conditioning, digital signal processing. sub-system interfacing, interfacing with external systems, user interfacing. Design trade offs due to process compatibility, thermal considerations, etc.

Software aspects of embedded systems: real time programming languages and operating systems for embedded systems.

Texts/References

J.W. Valvano, "Embedded Microcomputer System: Real Time Interfacing", Brooks/Cole, 2000.

Jack Ganssle, "The Art of Designing Embedded Systems", Newnes, 1999.

V.K. Madiseti, "VLSI Digital Signal Processing", IEEE Press (NY, USA), 1995.

David Simon, "An Embedded Software Primer", Addison Wesley, 2000.

K.J. Ayala, "The 8051 Microcontroller: Architecture, Programming, and Applications", Penram Intl, 1996.

OPTICAL COMMUNICATION SYSTEMS

MTECE201

Optical Networking: Principles and Challenges: Wavelength-Division Multiplexing (WDM) WDM Networking Evolution, WDM Network Constructions, WDM Economics.

Enabling Technologies: Building Blocks Optical Fiber, Optical Transmission in Fiber Optical Transmitters, Optical Receivers and Filters, Optical Amplifiers, Switching Elements, Wavelength Conversion, Designing WDM networks, Experimental WDM Lightwave Networks.

Single-Hop Networks: A Passive-Star-Based Local Lightwave Network, Characteristics of a Single-Hop System, Experimental WDM Systems, Other Non-Pretransmission Coordination Protocols, Pretransmission Coordination Protocols, Special Case: Linear Bus with Attempt-and-Defer Nodes, Introduction, Rainbow Protocol, Model.

Multihop Networks: Characteristics of a Multihop System, Topological Optimization Studies, Regular Structures, Near-Optimal Node Placement on Regular Structures, Shared-Channel Multihop Systems, Introduction to GEMNET.

Channel-Sharing and Multicasting: Introduction, Background, Shared-Channel Multihop GEMNET, Performance Evaluation, Illustrative Examples: Unicast Traffic, Illustrative Examples: Multicast Traffic.

Elements of Virtual Topology Design: Introduction, System Architecture, Formulation of the Optimization Problem, Algorithms, Experimental Results -Physical Topology as Virtual Topology (No WDM), Multiple Point-to-Point Links (No WRS), Arbitrary Virtual Topology (Full WDM), Comparisons, Effect of Nodal Degree and Wavelength, Network Design: Resource Budgeting and Cost Model, Virtual Topology Reconfiguration.

Routing and Wavelength Assignment: Introduction, Problem Formulation, Illustrative Examples - Static Lightpath Establishment (SLE), Dynamic Lightpath Establishment (DLE), Introduction, Basics of Wavelength Conversion, Network Design, Control, and Management Issues, Benefit Analysis, Benefits of Sparse Conversion, Circuit-Switched Approaches, Packet-Switched Approaches, Reconfiguration in WDM Networks, WDM Network Control and Management, Amplification-Related Issues, Systems Design Considerations.

Multiwavelength Ring Networks: Introduction, System Architecture and Assumptions (Model), Illustrative Examples, Optimization Criteria, Flow-Based Algorithms, delay-Based Algorithms, Illustrative Examples-Network Description, Delay vs. N Characteristics, Delay vs. Throughput Characteristics, Two or Greater Partitions.

All-Optical Cycle Elimination: Introduction, Wavelength Crossconnect Switches, Network Assumptions,

Overview of Solution and Algorithms, Details of Algorithms, Illustrative Examples-Dynamic Analysis, Static Analysis.

Optimizing Amplifier Placements in an Optical LAN/MAN: Introduction to Network Environment, Solution Approach, Solver Strategies, Amplifier-Placement Module, Open Problems-Switched Networks, Gain Model.

Optical TDM and CDM Networks: Optical TDM Networks, Optical CDMA Networks.

Laboratory Work: Basic optical communication link experiments, DWDM experiments, Amplifier, Splicing, and OTDR experiments, System design and performance analysis using simulation tools.

Recommended Books:

1. Murthy, C. Siva Ram, Mohan Gurusamy, WDM Optical Networks: Concepts, Design, and Algorithms, PHI (2001).
2. Maier, Marti, Optical Switching Networks, Cambridge University Press (2005).
3. Sivalingam, Krishna M., Subramaniam, Suresh, Emerging Optical Networks Technologies: Architectures, Protocols, and Performance, Springer (2005).
4. Mukherjee, Biswanath, Optical WDM Networks, Tata McGraw Hill (2006).

Data Communication Network

MTECE 202

Introduction to computer communication networks and layered architecture overview. Packet switching and Fast packet switching.

Point to Point Protocols and links: ARQ retransmission strategies. Selective repeat ARQ. Framing and standard Data Link Control protocol-HDLC, SDLC, LAPD. Queuing models in communication networks.

Multiaccess Communication and multiple access protocols:

ALOHA, slotted ALOHA, CSMA, CSMA/CD. Performance modelling and analysis.

Local Area Networks: Ethernet, Token Ring and FDDI. Design and analysis.

Internetworking issues: Bridges, Routers and Switched networks. Routing and Flow Control algorithms in data networks.

Broadband Networks: ATM, Frame relay and Gigabit Ethernet. Traffic Management in ATM networks.

Texts/References

R G Gallager and D Bertsekas, Data Networks, Prentice Hall of India, 1992.

J F Hayes, Modelling and Analysis of Computer Communication Networks, Plenum Publishing Corporation, New York, 1984.

W Stallings, Data and Computer Communications, Prentice Hall of India, 1997.

R Rom and M Sidi, Multiple Access Protocols, Springer Verlag, 1990.

M DePrycker, ATM-solutions for Broadband ISDN, Prentice Hall of USA, 1995.

Reliability of Electronics & Communication Systems

MTECE203.

1. Concept of reliability: Failures of systems and its modes. Measure of Reliability, Reliability function, Hazard rate MTBF and their interrelations.
2. Reliability Data and Analysis: Data sources. Data collection, use of Reliability Data, Reliability Analysis, Performance Parameters, calculation of failure rate, Application of Weibull distribution.
3. System Reliability and Modeling: Series systems, Parallel system, series parallel systems. Time dependence, Reliability Determination, Stand by systems, r out of n, Configurations, Methods of tie set and cut sets of Or reliability evaluation, simulation and Reliability prediction. Monte Carlo method, concepts of network topology. Overall reliability evolution.
4. Maintainability and Availability: Maintainability and its equation. Factors Affecting maintainability. Measures of Maintainability, Mean Down Time, Availability Intrinsic availability equipment availability & Mission availability. Replacement processes and Policies.
5. Life Testing of Equipments: Nondestructive tests, destruction tests and their Mathematic modeling. Quality and Reliability, Measurement & prediction of Human Reliability, Reliability and safety, safety margins in critical Devices, case studies.
6. Value Engineering: Techniques in value Engg; Structure of value Engg. Reliability Management.
Books Recommended:

1. Reliability Engg. By Govil, 1992.

2. Reliability Engg. By Dr. A.K. Aggarwal, 1992.

3. Related IEEE/IEE publications 14

Modern communication System

MTECE204

Introduction: Introduction to analog and digital communication systems, baseband, bandpass and equivalent lowpass signal representations, concept of pre-envelope and Hilbert transform, representation of bandpass stochastic processes, concept of sampling and reconstruction of signal, introduction to oversampling, sigma-delta A/D converter, PCM, DPCM and ADPCM systems, memoryless modulation methods, linear modulation with memory, nonlinear modulation methods with memory, power spectra of CPFSK and CPM signals, Comparison of QPSK, MSK and GMSK.

Optimum Receivers for AWGN Channels: Correlation demodulator, Matched filter demodulator, optimum detector, maximum likelihood sequence detector, A symbol by symbol MAP detector for signals, Probability of error calculations for, “binary modulation, M-ary orthogonal signals, biorthogonal signals, simplex signals, M-ary binary coded signals, M-ary PAM, M-ary PSK, DPSK, QAM,” optimum demodulation and detection of CPM, optimum receiver design for signals with random phases, comparison of coherent and non-coherent receivers.

Carrier and Symbol Synchronization: Likelihood function, carrier recovery and symbol synchronization in signal demodulation, ML carrier phase estimation, PLL, decision directed loops and non-decision directed loops, ML timing estimation, non-decision directed timing estimation, joint estimation of carrier phase and symbol timing.

Signal Design for Band Limited Channels: Characterization of band limited channels, design of band limited signals for no ISI, Design of band limited signals with controlled ISI, data detection for controlled ISI, signal design for channels with distortion, probability of error for detection of PAM with zero ISI and with partial response signals, modulation codes for spectrum shaping.

Communication through Band Limited Linear Filter Channels: ML receiver for channels with ISI and AWGN, discrete time model for channel with ISI, Viterbi algorithm for discrete time white noise filter model, Performance of MLSE for channels with ISI, linear equalization – peak distortion criterion, MSE criterion and its performance, fractionally spaced equalizers, decision feedback equalization – coefficient optimization, performance characteristics.

Satellite Communication Systems: Basic Transmission Theory, System Noise Temperature and G/T Ratio, Design Of Down Links, Domestic Satellite Systems Using Small Earth Stations, Uplink Design, Design Of Satellite Link For Specified (C/N), VSAT .

Selected Areas in Communication: Introduction to MIMO, CDMA, MC-CDMA, OFDM, BLAST and Ultra-wideband systems, Modern Coding Techniques – block coding, convolution coding, Turbo coding, STBC, STTC, soft-decoding, hard-decoding and Viterbi

decoder.

Laboratory Work: Practicals based upon hardware using communication kits and simulation with the help of simulation packages.

Recommended Books:

1. Proakis, John G., Digital Communications, McGraw-Hill (1995).
2. Haykin, Simon, Digital Communications, Wiley (1988).
3. Haykin, Simon, Communication Systems, Wiley (2001).
4. Proakis, John G. and Masoud, Salehi, Communication Systems Engineering, Prentice Hall (2001).

Parallel Processing

MTECE205

1. Theory Of Parallelism :Parallel computer models the state of computing, Multiprocessors and Multicomputers and Multivectors and SIMD computers, PRAM and VLSI models, Architectural development tracks. Program and network properties Conditions of parallelism, Program partitioning and scheduling, Program flow mechanisms, System interconnect architectures. Principles of scalable performance performance matrices and measures, parallel processing applications, speedup performance laws, scalability analysis and approaches.

2. Hardware Technologies :Processor and memory hierarchy advanced processor technology, superscalar and vector processors, memory hierarchy technology, virtual memory technology, bus cache and shared memory backplane bus systems, cache memory organisations, shared memory organisations, sequential and weak consistency models.

3. Pipelining And Superscalar Technologies :Parallel and scalable architectures, Multiprocessor and Multicomputers, Multivector and SIMD computers, Scalable, Multithreaded and data flow architectures.

4. Software And Parallel Programming :Parallel models, Languages and compilers, Parallel program development and environments, UNIX, MACH and OSF/1 for parallel computers.

Books Recommended:

1. Kai Hwang, "Advanced Computer Architecture", McGraw Hill International, 1993.

2. William Stallings, "Computer Organization and Architecture", Macmillan Publishing Company, 1990.

3. M. J. Quinn, "Designing Efficient Algorithms for Parallel Computers", McGraw Hill International, 1994.

4. John L. Hennessy and David A. Patterson, Computer Architecture A Quantitative approach, Morgan Kaufman Publishers. Inc., 1990.

5. D.P. Siewiorek, G.G. Bell, A. Newell, Computer Structures, Principle and Examples, McGraw Hill, 1982.

.Related IEEE/IEE publications 16

MTECE 301

1. Review of MOS technology: Basic MOS transistors, enhancement and depletion model transistors, NMOS and CMOS processor, thermal aspects of processing, and production of masks.
2. Electrical properties of MOS circuit: Parameters of MOS transistors, pass transistor, NMOS inverter, pull-up to pull down ratio for an NMOS inverter, CMOS inverters, MOS transistor circuit model, latch up on CMOS circuits.
3. Design processes: MOS layers, stick diagram, design rules, AWA OX CMOS process description, double metal single poly silicon CMOS process.
4. Basic circuit concepts: Sheet resistance, area capacitance delay unit, inverter delay, super buffers, propagation delays.
5. Subsystem design & layout :Architectural issues, switch logic, gate logic, examples of combinational logic, clocked sequential circuits, and other system consideration.
6. Scaling of MOS circuits :Scaling factor, limitations, scaling of wires and inter connections

Books Recommended:

1. Basic VLSI design systems & circuits by DA. And Eshrachian K (phi), 1988.
2. VLSI design techniques for analog & digital circuit by Geigar BR, Allen PE & Strader ME (Mc Graw hill 1990).
3. Related IEEE/IEE publications 23

Digital Speech and Image Processing

MTECE 302

1. Review of Filter design. Linear phase FIR filters. Methods of FIR filter design. Methods of IIR filter design. Applications of FIR & IIR filters in speech, image, seismic, medical and other areas.

2. Speech Processing :Review of human speech and Acoustic theory, nature of sound, harmonics, resonance measurement, virtual display. Music theory, pitch, duration, intervals, rhythm. Human speech production, the vocal tract, the Larynx, the source filter. Speech signal processing the phasor mode, Fourier transfer, DFT, FFT. The hardware use of FIR & IIR filters. Software, Elements of speech Synthesis speech Recognition speech in the computer human interface.

3. Image Processing :Characterization of images as two dimensional discrete fields, unitary transforms— DFT. Hadamard, slant and cosine transforms, compression schemes Karhunen Loeve compression predictive coding schemes. Image enhancement gray scale modification, edge enhancement, restoration Wiener filtering, constrained deconvolution, recursive filtering. Segmentation, edge detection, thresholding, textural properties, geometry and shape description.

Books Recommended:

1. Digital Signal Processing by Proakis & Manolakis

2. Speech and Audio Processing for multimedia PC's by Iain Murray

3. Digital Image Processing by Keenneth R Castleman, Pearson Education Society.

4. Digital Image Processing by Rafact Gonzalez and Richard E. Woods, Pearson Education Society.

5. Related IEEE/IEE publications 10

MTECE303

Probability and Induction: Axioms of Probability, Set Theory, Probability Space, Conditional Probability, Repeated Trials, Combined Experiments, Bernoulli Trials, Bernoulli's Theorem, and Games of Chance, Concept of a Random Variables, Distribution and Density, Function Specific Random Variables, Conditional Distributions, Binomial Random Variables, Functions of One Random Variable, its Distribution, Mean and Variance, Moments, Characteristic Functions; Bivariate Distributions, Two Functions of Two Random Variables, Joint Moments, Joint Characteristic Functions, Conditional Distributions, Conditional Expected Values, Normality, Stochastic Convergence and Center Limit Theorem.

Estimation and Hypothesis Testing: Time and Ensemble Averages, Covariance and Correction Functions. Simple binary hypothesis tests, Decision Criteria, Neyman Pearson tests, Bayes Criteria, Multiple Hypothesis testing, Composite hypothesis testing, Asymptotic Error rate of LRT for simple hypothesis testing.

Stochastic Processes: Systems with Stochastic Inputs, Power Spectrum, Random Walks and Poisson Points, Cyclostationary Processes, Band limited Processes and Sampling Theory, Deterministic Signals in Noise Bispectra and System Identification, Poisson Sum Formula, Schwarz Inequality Problems, Spectral Representation of Random Processes, Factorization and Innovations, Finite-Order Systems and State Variables, Karhunen–Loeve Expansions, Ergodicity, Extrapolating Spectra and Youla's Parametrization, Minimum-Phase Functions, All-Pass Functions, Mean Square Estimation, Entropy, Maximum Entropy Method, Markov Chains, Higher Transition Probabilities and Chapman – Kolmogorov Equation, Stationary Distributions and Limiting Probabilities, Transient States and Absorption Probabilities, Branching Processes, Mixed Type Population of Constant Size, Structure of Periodic Chains.

Queueing Systems: Characteristics of Queueing Process, birth-death process, arrival and service, steady state solution; M/G/1 and G/M/1, occupancy distribution, renewal theory, waiting time and busy period, Series Queues, Jackson Networks, Cyclic Queues. Little's theorem, modeling and analysis of M/M/- queues, Burke's Theorem, Reversibility, Queues with vacations, Work conservation principle, Priority queues, Queues served in cyclic order, Fluid-flow and diffusion approximations.

Statistical Modeling of Noise: Probability density of a jointly-Gaussian random vector, Fourier transforms for joint densities, Wide-sense stationary (WSS) processes, Poisson process noise, sources of noise in communication systems, shot noise, resistor noise, calculation of noise in linear systems, noise bandwidth, noise temperature, noise in two-port networks, noise-figure, cascaded stages, signal in presence of AWGN, narrow band noise and colored noise.

Information Theory: Unit of information, rate of information, joint entropy and conditional entropy, mutual information, Shannon-Hartley Theorem, bandwidth SNR trade off, channel capacity calculations of different channels, Source Coding- Coding efficiency, Shannon-Fano coding, Huffman coding, Lempel-Ziv adaptive coding.

Recommended Books:

1. Papoulis, Athanasios, Probability Random Variables and Stochastic Processes, McGraw-Hill (1984).
2. Daigle, John N., Queuing Theory with Applications to Packet Telecommunication, Springer (2005).
3. Peebles, P.Z., Probability, Random Variables, and Random Signal Principles, McGraw-Hill (1980).
4. Bertsekas, Dimitri P. and Gallager, Robert G., Data Networks, Prentice-Hall (1987).
5. Larson, A., and Schubert, B. O., Stochastic Processes, vol. I and II, Holden-Day (1979).
6. Gardener, W., Stochastic Processes, McGraw Hill (1986).

Multimedia Communication System

MTECE 304

1. Multimedia Communications: Introduction to various multimedia comm. Techniques, Applications, Networks, Protocols and Standards, bandwidth and compression issues.
2. Digital Communication basics :Source encoding, Channel encoding, Circuit switched Networks; Packet switched networks, ATM, Frame Relay.
3. Multimedia Information Representation :Different types of multimedia information, Information representation.
4. Compression Techniques :Encoding and decoding techniques, Text compression techniques, Image compression techniques, Audio and Video Compression, Standards for Multimedia Compression, Huffman, Run length, Variable length, Lossy/ Lossless compression.
5. Multimedia File Formats :Various files formats for multimedia and their applications, BMP, PNG, TIFF, JPEG, DFX, AVI, MPEG Audio/ Video Standards, Challenges for encryption and decryption.
6. World Wide Web :The Internet, Internet Multimedia Applications, Enterprise networks, Entertainment Networks, High Speed Modems, Application Support Functions, Audio/ Video Streaming, Video Conferencing.

Books Recommended:

1. Multimedia Communications by Fred Halsall, Prentice Hall.
2. Digital Communication by Proakis, Prentice Hall.
3. Related IEEE/IEE publications 15

Modeling and Simulation of Communication Systems

MTECE 305