MTECE-101

Advanced Digital Communication Techniques

Unit I

Characterization of Communication Signals and Systems :- Representation of Band pass Signals and Systems ,Representation of Linear Band pass Systems ,Response of a Band pass System to a Band pass Signal ,Representation of Band pass Stationary Stochastic Processes, Signal Space Representation ,Signal Space Concepts , Memory less Modulation Methods ,Spectral Characteristics of Digitally Modulated Signals ,Power Spectra of Linearly Modulated Signals .

Unit-II

Optimum Receivers for the Additive White Gaussian Noise Channel :- Optimum Receiver for Signals Corrupted by AWGN ,Correlation Demodulator ,Matched-Filter Demodulator, Performance of the Optimum Receiver for Memory less ,Modulation ,Probability of Error for Binary Modulation , Probability of Error for M-ary Orthogonal Signals , Probability of Error for Simplex Signals, Probability of Error for M-ary Binary-Coded Signals ,Differential PSK (DPSK) and its Performance , Comparison of Digital Modulation Methods , Optimum Receiver for CPM Signals, Optimum Demodulation and Detection of CPM , Optimum Receiver for Signals with Random Phase in AWGN Channel.

Unit-III

Synchronization

Timing and Frequency Offset in OFDM, Synchronization & System Architecture, Timing and Frame Synchronization, Frequency Offset Estimation, Phase Noise Channel Estimation and Equalization, Introduction, Channel Estimation, Coherent Detection, Block-Type Pilot Arrangement, Comb-Type Pilot Arrangement, Non-coherent Detection, Performance, Channel Estimation for MIMO-OFDM.

Unit-IV

Equalization, Time Domain Equalization, Equalization in DMT, Delay Parameter, Frequency Domain Equalization, Echo Cancellation, OFDM based Multiple Access Techniques, FDM/ Multiple Access, TDM/ Multiple Access, CDMA, Space Division and Polarization- division Multiple Access, Multiple Access Information flow, ALOHA.

References

1. Proakis J. Digital communications (4ed., MGH, 2001).
2. Digital Communications Fundamentals and Applications , 2ed, Bernard Sklar, Pearson Education.
3. Ahmad R. S. Bahai, Burton R. Saltzberg, Mustafa Ergen, Multi-carrier Digital Communications: Theory and Applications of OFDM, Springer; 2nd edition (October 7, 2004).
4. Edward A Lee & David G Messerschmitt: Digital Communication, 3rd Ed; Kluwer Academic Publishers, 2003.
5. Simon Haykin and Michael Moher, “Modern Wireless Communications”, Person, 2004.

MTECE-102
Advanced Digital Signal Processing

Unit-I
Brief recapitulation of linear & circular convolutions, linear filtering, DFT, Goertzel and chirp-z transform algorithms,Radix-4 FFT algorithms, Quantization errors in FET algotithms. Linear Phase FIR filters, realizations, design using Rectangular window, Bartlett window, Hanning window, Hamming window, Kaiser window, FIR filter design using LABVIEW.

Unit-II
Multirate signal processing, decimation, interpolations, sampling rate conversion, Filters in sampling rate alternation systems, LABVIEW examples, Polyphase decomposition. Filter banks, decimation & inverse decimation, M-band filter banks, reconstruction, transmultiplexers, QMF & CQF filter banks, Cosine-modulated filter banks, Lapped , Orthogonal Transforms, wavelet transforms.Programmable Digital Signal Processors, Multiplier Accumulator, Modified bus structures, VLIW architecture, pipelining, Addresing Modes, On-chip peripherals.

Unit-III
DSP Processors: Introduction, Basic features, requirements, Computational characteristics of DSP algorithms and applications; Influence of Digital Signal processing in defining generic instruction-set architecture for DSPs. Design requirement of DSPs- High throughput, low cost, low power, small code size, embedded applications. Techniques for enhancing computational throughput: parallelism and pipelining.

Unit-IV
Data-path of DSPs- Multiple on-chip memories and buses, dedicated address generator units, specialized processing units (hardware multiplier, ALU, shifter) and on-chip peripherals for communication and control; Control-unit of DSPs- pipelined instruction execution, specialized hardware for zero-overhead looping, interrupts; Architecture of Texas Instruments fixed-point and floating-point DSPs: brief description of TMS320 C5x /C54x/C3x DSPs; Programmer's model. Architecture of Analog Devices fixed-point and floating-point DSPs: brief description of ADSP 218x / 2106x DSPs; Programmer's model. Advanced DSPs: TI's TMS 320C6x, ADI's Tiger-SHARC, Lucent Technologies' DSP 16000 VLIW processors. A few case studies of application of DSPs for signal processing, communication and multimedia.

Books

1.Digital Signal Processing : Principles, Algorithms, and Applications, 4/e *Authors* : John G. Proakis Dimitris G Manolakis *Imprint* : Pearson Education
2.Digital Signal Processing, 2/e *Authors* : Emmanuel Ifeachor Barry Jervis *Imprint* : Pearson Education
3.Digital Signal Processors : Architectures, Implementations, and Applications, 1/e *Authors* : Sen M. Kuo Woon-Seng S. Gan *Imprint* : Pearson Education
4. Clark Cory.L, "Lab view DSP and Digital comm.", TMH 2005.
5. Venkataramani, Bhaskar, "Digital signal processors", TMH 2002.

Other References:

1. Architectures for Digital Signal Processing- P. Pirsch, John Wiley
2. Digital Signal Processing in VLSI- R. J. Higgins, Prentice-Hall,
3. Texas Instruments TMSC5x, C54x and C6x Users Manuals.
4. Analog Devices ADSP 2100-family and 2106x-family Users Manuals.
5. VLSI Digital Signal Processing Systems- K. Parhi,John Wiley;
6. Digital Signal Processing for Multimedia Systems- K. Parhi and T. Nishitani: Marcel Dekker;
7. Digital Signal Processors- Kuo and Gan, Pearson Education

MTECE-103
Advances in Information Theory and Coding

1. Elements of information theory
Source coding theorem, Huffman coding, Channel coding theorem, channel capacity theorem, Shenonfano theorem, entropy
2. Sampling Process
Base band and band pass sampling theorems reconstruction from samples, Practical aspects of sampling and signal recovery TDM
3. Waveform Coding Techniques
PCM Channel noise and error probability DPCM and DM Coding speech at low bit rates Prediction and adaptive filters. Base band shaping for data transmission, PAM signals and their power spectra Nyquist criterion ISI and eye pattern Equalization.
4. Digital Modulation Techniques
Binary and M-ary modulation techniques, Coherent and non-coherent detection, Bit Vs symbol error probability and bandwidth efficiency. Bit error analysis, using orthogonal Signaling
5. Error Control Coding
Rationale for coding Linbear block codes, cyclic codes and convolution codes Viterbi decoding algorithm and trellis codes.

Books Recommended:
1. Principles of digitals communication: J. Dass. , S.K. Malik & P.K. Chatterjee, 1991.
2. Introduction to the theory of Error correcting codes: Vera Press, 1992
3. Information Theory and Reliable Communication: Robert G. Gallanger Mc Graw Hill, 1992
4. Related IEEE/IEE publications

MTECE-104

Antenna Theory and Design

UNIT I: Radiation and Antennas :

Performance parameters of Antenna : Radiation resistance ,Power gain,Directive gain, Directivity, Half –Power Beamwidth & Bandwidth , Radiation from Hertzian dipole : Calculation of field strength at different points in spherical coordinates & calculation of Radiation resistance.Radiation from half-wave dipole : Calculation of field strength at different points in spherical coordinates & calculation of Radiation resistance

UNIT II: Analysis of linear arrays :

Various forms of Antenna Arrays . Analysis of Array of two point sources with : Equal amplitude and same phase, Equal amplitude and opposite phase, Unequal amplitude and any phase. Calculation of field strength at distant point due to linear array of N- Isotropic sources. Calculation of : Direction of Pattern maximum ,Direction of pattern minimum, Beam width of Major lobe for Broadside & End fire arrays of N Isotropic sources .Multiplication of Pattern, Tapering of arrays.Binomial & Dolph-Chebychef arrays.

UNIT III: Frequency Independent Antennas and Antenna Measurements :

Rumseys Principal for frequency independent antenna, Frequency independent log spiral antenna, Frequency independent Log Periodic antenna
Antenna Ranges,Radiation Patterns,Gain Measurements,Directivity Measurements, Impedance Measurements,current Measurements,Polarization Measurements

UNIT IV: Antennas for Special Applications :

Micro strip patch antennas-basic configuration and advantages, radiation mechanism, basic characteristics and feeding techniques, broadbanding techniques, microstrip arrays, Antennas for biomedical applications. Smart antennas for mobile communications. Antenna for infrared detectors.

Reference Books:

1. John D. Kraus and R.J. Marhetka " Antennas for All Applications ", 3rd edition Tata McGraw Hill, 2003.

2. Balanis. C.A , "Antenna Theory Analysis and Design", 2nd edition John Wiley & Sons Inc., 2003.

3. S.N.Raju, " Antenna Propagation", Pearson Education , 1st edition 2005.

4 Antenna Theory- Collin and Zucker, Mc Graw Hill,

MTECE-105
Antenna and Microwave Design Lab

1. Construction analysis and to find the radiation patterns, S-Parameters of monopole antenna.
2. Find the radiation patterns, Construction analysis and, S-Parameters of dipole antenna.
3. Construction analysis and to find the radiation patterns , S-Parameters of yagi-uda antenna,
4. Construction analysis and find the S-Parameters and radiation patterns , of turnstile antenna,
5. Find the radiation patterns, S-Parameters Construction and analysis of patch antenna and parabolic antenna.
6. To study microwave bench and to find the frequency generated by the Microwave source.
7. To find parameters of microwave components by using microwave bench.

MTECE-106

Digital Signal Processing Lab

The following experiments to be performed using LabVIEW S/W & Speedy33 H/W.

1. To study and perform Sampling and Quantization.
2. To generate different types of test signals.
3. To study and create a two-tone sine wave.
4. To study various Window types (Hanning, Hamming, Flat Top, Blackman, Kaiser).
5. To study DFT and determine its response (DFT Coefficients and phase) for different type of signals.
6. To design FIR filter with different topology and to study its response.
7. To design IIR filter with different topology and to study its response.
8. To study different Digital Modulation techniques (ASK, PSK, FSK, QPSK).
9. To study and perform the results convolution sum with a square, triangle and sinc data sequence.
10. To Perform FFT transform with different windowing functions and perform various spectral measurement (Magnitude, Power Spectral Density and Power Spectrum).
11. To study and perform Laplace, Fourier and Z transform.
12. To design Fast Hilbert and Inverse Fast Hilbert Transform.
13. To acquire the audio signal and perform different operations (Windowing, filtering...) using DSP processor

MTECE-201
Wireless and Mobile Communication

Unit - I

Introduction to Wireless Mobile Communications ,Personal Communication Services (PCS): PCS architecture, Mobility ,Types of mobile wireless services / systems- Cellular, WLL, Paging, Satellite systems, Standards, management, Networks signaling. Global system for Mobile Communication (GSM) system overview: GSM Architecture, Mobility Management, Network signaling. Future trends in personal wireless systems

Unit II: Cellular Concept and System Design Fundamentals

Cellular concept and frequency reuse, Multiple Access Schemes, channel assignment and handoff, Interference and system capacity, Trunking and Erlang capacity calculations; cellular concept, spectral efficiency; design parameters at base station: antenna configurations, noise, power and field strength; design parameters at mobile unit: directional antennas and diversity schemes: frequency dependency; noise; antenna connections; field component diversity antennas; signaling and channel access: word-error-rate, channel assignment.

Unit - III

History and evolution of mobile radio systems; General Packet Radio Services (GPRS): GPRS architecture, GPRS Network nodes. Mobile Data Communication: WLANs (Wireless LANs) IEEE 802.11 standard, Mobile IP.

Wireless Application Protocol (WAP): The Mobile Internet standard, WAP Gateway and Protocols, Wireless Markup Languages (WML) Third Generation (3G) Mobile Services: Introduction to International Mobile Telecommunications 2000 (IMT 2000) vision, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of services in 3G.

Unit – IV

Wireless local Loop (WLL): Introduction to WLL architecture, WLL technologies.

Global Mobile Satellite Systems: Case studies of IRIDIUM and GLOBALSTAR systems. Bluetooth technology and Wi-Max

Text Books:

1. “Wireless and mobile Networks Architecture,” by Yi –Bing Lin & Imrich Chlamatac, John Wiley & Sons, 2001.
2. “Mobile & Personnel communication Systems and Services”, By Raj Pandya, Prentice Hall India, 2001.
3. “Wireless Communication- Principles and practices,” 2nd Ed., Theodore S. Rappaport, Pearson Education Pvt. Ltd, 2003.
4. “Mobile communications,” Jochen Schiller, Pearson Education Pvt. Ltd., 2002.
5. “The Wireless Application Protocol,” Singhal & Bridgman et. al., Pearson Education, 2004.

References:

1. “Principles of Mobile Computing,” 2nd Ed., Hensmann, Merk, & Stober, Springer International Edition, 2003.
2. Ad Hoc Wireless Networks : Architectures and Protocols, 1/e Authors : C. Siva Ram Murthy,B.S. Manoj
3. Modern Wireless Communications, 1/e Authors : Simon Haykin,Michael Moher
4. “Mobile Computing,” Talukdar & Yaragal, TMH, 2005.
5. “3G Wireless Networks,” Smith & Collins, TMH, 2007.

MTECE-202
Advanced Image Processing

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

MTECE-203
Advanced Optical Communication

Unit-1
Introduction: concepts of information, general communication systems, evolution of optical fiber communication systems, advantages, disadvantage of optical fiber, communication systems. Attenuation in optics fibers: Fiber attenuation, connectors &splices, bending loses, Absorption, scattering, very low loss materials, plastic & polymer-clad-silica fibers.

Unit-2
Access network- network architecture, HFC, FTTC, optical access network architecture, deployment considerations, upgrading the transmission capacity, SDM, TDM, WDM, application areas, inter exchange, undersea, local exchange networks; Packaging and cabling of photonics components- photonic packet switching, OTDM, multiplexing and demultiplexing, optical logic gates, synchronization, broadcast OTDM network, OTDM test beds.

Unit-3
Optical fiber communication system: telecommunication, local distribution series, computer networks local data transmission & telemetry. Optical networking: data communication networks, network topologies, MAC protocols, Network Architecture- SONET/TDH, optical transport network, optical access network, optical premise network.

Unit-4
Optical detectors: 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, all fiber components; Design of LED's for optical fiber communications, semiconductor LASER for optical fiber Communication system, Liquid crystal devices; porous silicon optical devices.

Reference Books:

1. Senior J., optical fiber communications, principles & practice, PHI.
2. Keiser G., optical fiber communications, McGraw-hill.
3. Gowar J., optical communication systems, PHI.
4. William B. Jones jr., Introduction to optical fiber communication systems, Holt, Rinehart and Winston, Inc.
5.Fiber Optic Communications, By: Joseph C. Palais, Pearson Education
6. Optical Network Design and Implementation, By : Vivek Alwayn,, Cisco Press
7. Fiber-Optic Communication Systems - by GP Aggarwal - John Wiley & Sons
8. Fiber-Optic Communication Systems - by Mynbev - John Wiley & Sons
9.John Gowar: Optical Communication Systems (2nd Ed.), Prentice Hall,

MTECE-204
Electronic Devices for VLSI Technology

Unit-1

Basic Device Physics, Evolution of VLSI device technology, Electron and holes in silicon, p-n Junctions, Modern VLSI devices, MOS Capacitors, High field effects.

Unit-II

MOSFET Devices, Long channel MOSFETs, Short-Channel MOSFETs,MOSFET Svaling, Threshold voltage, MOSFET Channel Length, Basic CMOS Circuit Elements, Parasitic elements, sensitivity of CMOS delay to device parameters, Performance factors of advanced CMOS.

UNIT-III

Design of emitter region, diffused or implanted, polysilicon emitter, design of the base region, intrinsic based dopant distribution, base transit time, SiGe base, design of the collector region, modern bipolar transistor structures, deep- trench isolation, polysilicon emitter, pedestal collector.

Unit-IV

Bipolar performance factors, figure of merit of bipolar transistor, cutt off frequency, maximum oscillation frequency, digital bipolar circuits, delay components of a logic gate, bipolar device optimization for digital circuits, design points for a digital circuit, bipolar device scaling for ECL, device scaling rules, bipolar device optimization, and scaling for analog circuits, optimizing the individual parameters, technology for analog bipolar devices.

Books

1**. Fundamentals of Modern VLSI Devices by Yuan Taur, Tak H. Ning**
2. W. Ranier, *Nanoelectronics and Information Technology*, Wiley-VCH, 2003.
3. J.H. Davis, *The Physics of Low Dimensional Structure*, Cambridge University Press, 1998.
4. A.M. Lonescu and S. Mahapatra, *Hybrid CMOS Single Electron Transistor Device and Circuit Design*, Artech House Publication, ISBN 1-59693-069-1, 2006

MTECE-205
Simulation of Communication Systems Lab

Experiments Performed using Closed Loop Learning Process – Multisim.

1. **To design a speech filter and perform sensitivity analysis.**
2. **To design a Bipolar Dead-Zone Circuit**
3. To Design a multiple Intrrupt Handler using PIC 16F84A.
4. To Design a RAM Controller using 8052.
5. To Study the operation of Operation Transconductance Amplifier
6. Design a Write Read EEPROM using PIC16F84A
7. Automatic gain control circuit using JFET as voltage controlled resistance.
8. Regulated power supply with fold back current limiting and crowbar protection.
9. Frequency multiplier using Phase locked loop.
10. Differential amplifier using IC transistor array.
11. Light detectors and characteristics, Application of a LED/ Laser source to send data and recovery using photo detectors.
12. TDM-PAM: Modulation & demodulation.
13. Operation of a PCM encoder & decoder.
14. TDM-PCM: Modulation & demodulation.

MTECE-206

Wireless and Mobile Communication LAB

1. Generation of Voice, Data and Video traffic.

2. Simulation of the Radio Channel.

3. Simulation of Hand off mechanisms.

4. Simulation of CDMA Transmitter and Receiver.

5. Coding Techniques for Wireless Communication.

7. Simulation of Security Algorithms.

MTEC: ELI-301
VLSI Design of Digital System

Unit-1

Introduction to VLSI Design, Levels of abstraction and the complexity of design, Challenges of VLSI design: power, timing, area, noise, testability, reliability and yield ; CAD tools: simulation, layout, synthesis, test; MOS modeling, MOS device models, Short-channel effects and velocity saturation,

Unit-II

Scaling of MOS circuits; VLSI fabrication technology, Layout design, Design rules, Stick diagrams; The CMOS inverter, VTC, Switching behavior, Noise margins and power dissipation; Static and dynamic CMOS combinational logic gate, Transistor sizing in static CMOS, logical effort , Pass-transistor logic, sizing issues , Domino logic gates , estimating load capacitance ,

Unit-III

Simple delay models (RC) for CMOS gates , Power consumption; Latches and clocking, Flip-flops, Set-up and hold tests, Static and dynamic latch and flip-flop, Clock design; Datapath units, Adders, Shifters, Multipliers; Control logic strategies, PLAs , Multi-level logic, Synthesis and place-and-route CAD; MOS memories , Register, SRAM , DRAM; Global interconnect modeling, Capacitance, resistance and inductance of interconnect;

Unit-IV

Signal and power-supply integrity issues, Electromigration, RC interconnect modeling Driving large capacitive load, reducing RC delays; Layout design, Standard-cell layout, Chip layout and floor planning, Array layout; Implementation issues, Design for testability, Packaging technology, I/O issues: ESD protection, boundary scan, inductance, synchronization

Essential Reading:

1. J.M. Rabaey, A. Chandrakasan and B. Nikolic, *Digital Integrated Circuits: A Design Perspective*, Second Edition, Pearson/PH, 2003. (Cheap Edition)

Supplementary Reading:

1. J.P. Uyemura, *Introduction to VLSI Circuits and Systems*, Wiley, 2001.
2. W.Wolf, *Modern VLSI Design: Systems-on-Chip Design*, Third Edition, Pearson/PH, 2002. (Cheap Edition)
3. R. L. Geiger, P. E. Allen and N. R. Strader, *VLSI Design Techniques for Analog and Digital Circuits*, McGraw-Hill, 1990.

MTEC: ELI-302
Smart Materials

Unit-I

Materials and architecture ,The contemporary design context ,The phenomenological boundary ,Characteristics of smart materials and systems ,Moving forward ,Organization of the text ,Fundamental characterizations of materials, Traditional material classification systems ,Alternative classification systems, Classification systems for advanced and smart materials ,The internal structure of materials ,Properties of materials ,General classes of materials ,Nonmaterial

Unit-II

Types and characteristics of smart materials ,Fundamental characteristics ,Type 1 smart materials – property-changing ,Type 2 smart materials – energy-exchanging ,Elements and control systems ,Sensors, detectors, transducers and actuators:, definitions and characterization ,Control systems ,MEMS (micro-electrical mechanical systems) ,Sensor networks ,Input/output models

Unit-III

Smart products ,A phenomenological perspective, Product technologies and forms,Smart material product forms

Unit-IV

Smart components, assemblies and systems , Facade systems ,Lighting systems ,Energy systems ,Structural systems

Books

1. Smart Materials and New Technologies by D. Michelle Addington Daniel L. Schodek Harvard University Architectural Press An imprint of Elsevier
2. Smart Materials, by Mel Schwartz, CRC, Press

MTEC: ELI-303
Advanced Communication Systems

1. Introduction

Introduction to communications systems, analog and digital communication systems, Applications of communication systems.

2. Digital Communication

Introduction, Digital Modulation techniques, BPSK, QPSK, PCM, DPCM, Delta Modulation, Digital Transmission and Transmission Impairments.

3. Optical Networks

WDM, TDM, Telecommunication Infrastructure, Switching, 3G systems, SONET, SDH, Architecture of Optical Transport Network, Link Management Protocols, Solutions.

4. Satellite Communication

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). Multiple Access Techniques, Frequency Division Multiple Access (FDMA), TDMA, CDMA, Estimating Channel Requirements, Practical Demand Access Systems, Random Access, Multiple Access With On Board Processing. VSAT

5. Mobile Communications

Mobile telephone service, Transmission protocols, Introduction to GSM, GPRS, CDMA, Switching techniques, Fading, Quality of service (QOS).

Books Recommended:

1. Advanced Communication Systems - by Wayne Tomasi; Pearson.
2. Digital Communication - by Proakis; PHI
3. Optical Networks - by Uyless Black; Pearson
4. Satellite Communication - by Timothy Pratt; Addison Wesley.
5. Related IEEE/IEE publications

MTEC: ELI-304
Embedded Systems for Communication Engg.

Unit-1:
Microprocessor and Architectural Concept:- Microprocessor, Review 16-bit Microprocessor architecture, Word Lengths, Addressable memory, Microprocessor speed, Architecture. ALU,GPR's, Control Logic and Internal Data Bus, Introduction to Pentium Architectures. Introduction to Embedded System Design, Embedded System Architecture, Embedded System model, an overview of Programming Languages and examples of their standards, Embedded Processor: ISA Architecture Models, Application-specific ISA models, FSMD model, JVM model, CISC & RISC model, Instruction – Level Parallelism ISA model, Von Neumann & Harvard Architectures.

Unit-2
Microprocessor Instructions and Communications: Instruction set of 80x86 processors, Basic instruction types, Addressing modes, Memory Interfacing, Polling and Interrupts, 8259 and DMA.

Unit-3:-
Microprocessor I/O & Systems: Introduction to I/O interface, Port address decoding, 8254 Programmable Interval timer, 16550 Programmable Communication Interface ADc and Dac, 809186 and 80188 Architecture, Addressing modes, Instruction Set, Introduction to 80286 Microprocessor.

Unit-4:
Embedded Controllers & Systems: Introduction to embede systems, 8051 Microcontroller Architecture, Instruction set, Interfacing, Introduction to Arm and SHARC processors.

Books:

1) Intel series of Microprocessors by Berry B.Bray: TMH. &th Edition
2) 8086 Microprocessor and Architecture by Liu Gibson: PHI
3) Advanced Microprocessors by Danial Tabak: TMH
4) Embeded Controllers by Berry B.Bray: Pearson Education.

MTEC: ELI-305
Detection & Estimation Theory

1. Statical communication theory
Representation of deterministic signals, orthogonal representation of signals. Dimensionality of signal spaces. Construction of orthogonal basis functions. Timebandwidth
relationship: RMS duration and bandwidth, uncertainty relations.

2. Review of random processes
Definition and classification, stochastic integrals, Fourier transforms of random processes, stationary and non-stationary processes, correlation functions. Ergodicity, power spectral density, transformations of random processes by linear systems. Representation of random processes (via sampling, K-L expansion & narrow band representations), special random processes (white gaussian noise, Wiener-Levy processes, special random processes, shot-noise processes Markov processes).

3. Optimum filtering
Matched filters for deterministic signals in white and coloured gaussian noise. Wiener filters for random signals in white and coloured gaussian noise. Discrete and continuous time filters.

4. Detection and estimation theory
Hypothesis testing- Bayes, Minimax and Neyman-Pearson criteria, Types of estimates and error bounds, General gaussian problem, Detection and estimation in coloured noise, Elements sequential and non-parametric detection. Wiener-Hopf and Kalman filtering, Applications to communication, radar and sonar systems

Books Recommended:

1. Detection Estimation and Modulation Theory - by HL Van Trees Wiley New York
2. Introduction to Statistical Signal Processing with Application - by MD Srinath, PK. Rajasekran, R.Viswamathan (PHI)
3. Signal detection theory - by Hancock and Wintz.
4. Detection of signals and noise - by AD Whalen.
5. Related IEEE/IEE publications

MTEC:EL II-306
RF MEMS FOR COMMUNICATIONS

UNIT I

Wireless systems – Introduction, spheres of wireless activities, the home and office, the ground Fixed/mobile platform, the space platform, wireless standards, systems and architectures, conceptual. Wireless systems, wireless transceiver wireless appliances enable ubiquitous connectivity.

UNIT II

Elements of RF circuit design – Physical aspects of RF circuit design, skin effect, transmission lines on thin substrates, self-resonance frequency, quality factor packaging, practical aspects of RF circuit design, DC biasing, impedance mismatch effects in RF MEMS.

UNIT III

RF MEMS – enabled circuit elements and models – RF/Microwave substrate properties, Micro machined – enhanced elements – capacitors, inductors, varactors, MEM switch – shunt MEM switch, low voltage hinged MEM switch approaches, push-pull series switch, folded – beam – springs suspension series switch, Resonators – transmission line planar resonators, cavity resonators, micromechanical resonators, film bulk acoustics wave resonators, MEMS modeling – mechanical modeling, electromagnetic modeling.

UNIT IV

RF MEMS based circuit design – Phase shifters – fundamentals, X-Band RF MEMS phase shifter for phased array applications, Ka-Band RF MEMS phase shifter for radar systems applications, Film bulk acoustic wave filters – FBAR filter fundamentals, FBAR filter for PCS applications, RF MEMS filters – A Ka-Band millimeter-wave Micro machined tunable filter, A High-Q 8 MHz MEM Resonators filter, RF MEMS Oscillators – fundamentals, A 14GHz MEM Oscillator, A Ka-Band Micro machined cavity oscillator, A 2.4 GHz MEMS based voltage controlled oscillator.

Text Book:

Hector J. De Los Santos, “RF MEMS Circuit Design for Wireless Communications”, Artech House, 2002.

Reference:

1. Vijay K. Varadan, K.J. Vinoy, K.A. Jose, “RF MEMS and their Applications”, John Wiley and sons,
Ltd., 2002.
2. Gabriel M. Rebeiz, “RF MEMS Theory, Design & Technology”, Wiley Interscience, 2002.

MTEC:ELII-307
Multimedia Communication Systems

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. Internet Resources.
4. Related IEEE/IEE publications

MTEC:ELII-308
Mobile Ad-Hoc Networks

Unit - I

Introduction to Personal Communication Services (PCS): PCS architecture, Mobility management, Networks signaling. Global system for Mobile Communication (GSM) system overview: GSM Architecture, Mobility Management, Network signaling.

Unit - II

General Packet Radio Services (GPRS): GPRS architecture, GPRS Network nodes.
Mobile Data Communication: WLANs (Wireless LANs) IEEE 802.11 standard, Mobile IP.

Unit - III

Wireless Application Protocol (WAP): The Mobile Internet standard, WAP Gateway and Protocols, Wireless Markup Languages (WML) Third Generation (3G) Mobile Services: Introduction to International Mobil Telecommunications 2000 (IMT 2000) vision, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of services in 3G.

Unit IV

AD HOC Wireless

Introduction, Mobile Ad Hoc Networks, Technologies for Ad Hoc Network, Issues in Ad hoc wireless Networks, IEEE 802.11 Architecture and protocols. Protocol for AD HOC Wireless Networks Issues and classification of MAC protocol, other MAC protocols, Dynamic Source Routing (DBR), Adhoc Distance Vector (AoDV) routing, Routing Protocols, Multicasting Routing issues Issues in designing transport layer protocols, TCP over Ad Hoc Wireless Networks, Network Security Attacks, and Key management.

Text Books:

1. Ad HOC Wireless Networks: Architectures & Protocols by C Siva Ram Murty & BS Manoj 2nd Ed, Pearson Education.
2. Adleshein & Gupta, "Fundamentals of Mobile and Pervasive Computing, TMH, 2005
3. "Wireless and mobile Networks Architecture," by Yi –Bing Lin & Imrich Chlamatac, John Wiley & Sons, 2001.
4. "Mobile & Personnel communication Systems and Services", By Raj Pandya, Prentice Hall India, 2001.
5. "Wireless Communication- Principles and practices," 2nd Ed., Theodore S. Rappaport, Pearson Education Pvt. Ltd, 2003.
6. "Mobile communications," Jochen Schiller, Pearson Education Pvt. Ltd., 2002.
7. "The Wireless Application Protocol," Singhal & Bridgman et. al., Pearson Education, 2004.

References:

1. "Principles of Mobile Computing," 2nd Ed., Hensmann, Merk, & Stober, Springer International Edition, 2003.
2. "Mobile Computing," Talukdar & Yaragal, TMH, 2005.
3. "3G Wireless Networks," Smith & Collins, TMH, 2007.
4. Handbook of Ad Hoc wireless network, By Mohamed Illayas, CRC press
5. Protocols and Architectures for Wireless Sensor Networks, By Holger Karl, John Wiley & Sons.
6. Wireless Sensor Networks Technology, Protocols, and applications by Kazem Sohraby, Daniel Minoli, Taieb Znati, John Wiley & Sons.

MTEC:ELII-309
NANOSCIENCE AND NANOTECHNOLOGY

Note for paper setter: Question paper will consist of four units. Eight questions will be set in the question paper by selecting two from each unit. The students will be required to attempt five questions, selecting at least one from each unit.

UNIT I

Introduction of Nano Sceience and Nanotechnology. Introduction. History of Nano Science and Technology. Nanomaterials-Main component of Nano Science and Technology.

Structural, Chemical and Physical properties of Nanomaterials. Kubo theory. Size effects. Surface effects. Quantum and quantum tunneling effects.

UNIT II

Synthesis Techniques of Nanocrysatlline Materials. Introduction. Gas Phase Synthesis Techniques. Liquid Phase Synthesis Methods.Mechanical Synthesis. Techniques. Other related Methods. The Synthesis and Properties of Carbon Nanotubes.

Characteristics of Nanocrystalline Materials. Structures and Particle Size Analysis (SPM、EXAFS & HRTEM).Heat and Magnetic Properties (DSC & VSM or SQUID)

UNIT III

Nanocoating Technologies. Advantages of Nanocoating. Electrochemical Techniques. Surface treatment of nanocrystalline materials. Coating technologies

Nanocomposites. Advantages of nanocomposites. Design concepts. Commercial example of WC/Co system.

UNIT IV

Applications of Nanotechnology. Commercial Trends of Nano applications. Nanobiomaterials. Electronic devices and materials. Textile Industries.Nanocoating and others.

Text/ Reference Books

1. Introduction to Nanotechnology. Charles P. Poole Jr., and Frank J. Owens, John Wiley & Sons, Inc., Hoboken, New Jersey, 2003.
2. NanoTechnology – An Introduction to Nanostructuring Techniques", Michael Köhler, and Wolfgang Fritzsche, Wiely-VCH Verlag GmbH & Co. KGaA, Weinheim, Germany, 2004.
3. National Nanotechnology Initiative: Leading to the Next Industrial Revolution", A Report by the Interagency Working Group on Nanoscience, Engineering and Technology, Committee on Technology National Science and Technology Council, U.S.A., February 2000, Washington D.C.
4. Nanostructured Science and Technology- R&D Status and Trends in Nanomaterials, Nanostructured Materials, and Nanodevices (A worldwide Study)", Edited by R.W., Siegel, E. Hu, M.C. Roco, WTEC, September 1999, Loyola College in Maryland, U.S.A.
5. Unbounding the future by K Eric Drexler, C.Pelerson, G.Pergamit Willaim Marrow and Company, 1993
6. Biological molecules in Nanotechnology By Stephen Lee and Lynn M Savage,2004
7. Nanotechnology By mark Ratner and Dan Ratner, Prentice Hall, 2005.

Suggested reading

8. 1. www.nanotechweb.org
9. 2. www.nano.gov
10. 3. www.nanotec.org.uk

MTEC:ELII-310
Satellite Communication

Unit-1

Introduction:

Origin and brief history of satellite communications, an overview of satellite system engineering, satellite frequency bands for communication.

Orbital theory:

Orbital mechanics, locating the satellite in the orbit w.r.t. earth look angle determination. Azimuth & elevation calculations.

Unit-2

Spacecraft systems:

Attitude and orbit control system, telemetry, tracking and command (TT&C), communications subsystems, transponders, spacecraft antennas.

Satellite link design:

Basic transmission theory, noise figure and noise temperature, C/N ratio, satellite down link design, satellite uplink design.

Unit-3

Modulation, Multiplexing, Multiple access Techniques:

Analog telephone transmission, Fm theory, FM Detector theory, analog TV transmission, S/N ratio Calculation for satellite TV linking, Digital transmission, base band and band pass transmission of digital data, BPSK, QPSK , FDM, TDM,

Access techniques: FDMA, TDMA, CDMA.

Unit-4

Encoding & FEC for Digital satellite links:

Channel capacity, error detection coding, linear block, binary cyclic codes, and convolution codes.

Satellite Systems:

Satellite Earth station Technology, satellite mobile communication, VSAT technology, Direct Broadcast by satellite (DBS).

Reference Books:

1. Timothy Pratt, Charles W. Bostian, “Satellite communication”, John Wiley &sons Publication, 2003

2. Satellite Communications Systems Engineering, 2/e *Authors:* Wilbur Pritchard, Henri Suyderhoud *Imprint* : Pearson Education

3. J.J. Spilker, “Digital Communication by satellite, PHI Publication, 1997

4. J. Martin, “Communication satellite systems”, PHI publication, 2001