ECC 501- Digital Communication

Unit – I

Elements of Digital Communication Systems: Elements of digital communicationsystems: model of digital communication systems, digital representation of analog signal, certain issues in digital transmission, advantages of digital communication systems, bandwidth-s/ntradeoff, Hartley Shannon law, sampling theorem.

Unit – II

Pulse Code Modulation: PCM generation and reconstruction, quantization noise, non uniform quantization and commanding, DPCM, adaptive DPCM, DM and adaptive DM. noise inPCM and DM.
Digital Modulation Techniques: Introduction, ASK, AKS modulator, coherent ASK detector,non-coherent ASK detector, FSK, bandwidth and frequency spectrum of FSK. non coherent FSKdetector, coherent FSK detector, FSK detection using PLL, BPSK, coherent PSK detection,QPSK, differential PSK.

Unit – III

Baseband transmission and optimal Reception of digital signal: Pulse shaping foroptimum transmissions, baseband signal receiver, probability of error, optimum receiver, optimalof coherent reception, signal space representation and probability of error, eye diagrams, crosstalk.

Unit – IV

Information Theory: Information and entropy, conditional entropy and redundancy, Shannonfano coding, mutual information, information loss due to noise, source coding –Huffman code, variable length coding, source coding to increase average information per bit,lossy source coding.

Unit – V

Linear Block Codes: Matrix description of linear block codes, error detection anderror correction capabilities of linear block codes, cyclic codes, algebraic structure, encoding, syndrome calculation.
Convolution Codes: Encoding, decoding using state, tree and trellis diagrams, decoding using
Viterbi algorithm, comparison of error rates in coded and encoded transmission.

References:

1. Principles of communication systems- Herbert Taub. Donald L Schiling, Goutam Sana,3rd Edition, McGraw-Hill, 2008
2. Digital and Analog Communication Systems – Sam Shanmugam, John Wiley, 2005.
3. Digital Communications – John G. Proakis. MasoudSalehi – 5th Edition, McGraw-Hill,2008.
4. Digital Communications – Simon Haykin, Jon Wiley, 2005.
5. Digital Communications – Ian A. Glover, Peter M. Grant, Edition, Pearson Edu., 2008.
6. Communication Systems – B.P. Lathi, BS Publication, 2006.

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List of Experiment: (Extendable)

1. Study of Sampling Process and Signal Reconstruction and Aliasing.
2. Study of PAM, PPM and PDM.
3. Study of PCM Transmitter and Receiver.
4. Time Division Multiplexing (TDM) and Demultiplexing.
5. Study of ASK, PSK and FSK Transmitter and Receiver.

ECC-502
Digital Signal Processing

Unit – I

Discrete-Time Signals and Systems : Review of discrete-time sequences and systems, linear constant coefficient difference equations, derivation of transfer function of LTI systems, frequency domain, Representation of discrete time signals & systems, signal flow graph representation of digital network, matrix representation .

Unit – II

The z-Transform Applications : The review of direct Z-transform and inverse- Z transform, mapping of S-domain to Z-domain, system stability in Z-domain, rational Z-transforms, chirp – Z transform, two dimensional Z-transform, design of LTI systems using Z-transform.

Unit – III

Frequency Analysis of Discrete Time Signals : discrete fourier series (DFS), comparison of the DFS and discrete fourier transform (DFT), properties of DFT, circular convolution, two dimensional DFT, FFT algorithms, Radix-2 FFT Algorithm, Goertzel's Algorithm, decimation in time, decimation in frequency algorithm, decomposition for 'N' composite number.

Unit – IV

Basic filter structures : Recursive and non – recursive networks, system connectivity, basic structures of IIR and FIR filters, determining of system response, impulse response and transfer function of filters, determining impulse response using recursion formula, finite word-length effects in digital filters.

Unit – V

Digital filters Design Techniques: Design of IIR and FIR digital filters, impulse invariant and bilinear transformation, windowing techniques – rectangular and other windows, application of MATLAB for design of digital filters, concept of adaptive filtering and applications.

References:

1. A.V. Oppenheim and R.W. Schafer: Digital Signal Processing, Prentice Hall.
2. L.R. Rabiner and B. Gold: Theory and Application of Digital Signal Processing, Prentice Hall. 3. John. G. Proakis and Monolakis: Digital Signal Processing, Pearson Education.

4. Salivahanan and Vallavraj: Digital Signal Processing, McGraw Hill.
5. S.K. Mitra: Digital Signal Processing A Computer based Approach, McGraw Hill.
6. Schilling and Harris: Fundamentals of DSP using MATLAB, Cengage Learning.

List of Experiments (Extendable)

1. Generation, analysis and plots of discrete-time signals.
2. Implementation of operations on sequences (addition, multiplication, scaling, shifting, folding
3. Implementation of Linear time-invariant (LTI) systems and testing them for stability and causality.
4. Computation and plots of z-transforms, verification of properties of z-transforms.
5. Computation and plot of DFT of sequences, verification of properties of DFT.
6. Implementation of various window design techniques (Rectangular, Bartlett, Hann, Hamming etc).

ECC-503

VLSI Design

Unit I

Introduction: Concept of CMOS VLSI circuit, VLSI design flow, MOS transistor as a switch, CMOS Logic, NMOS and CMOS fabrication, combinational circuits latches, register, threshold voltage with body effect, model parameter& its variation with scaling and biasing.

Unit II

Dynamic CMOS Circuits: Clocked CMOS (C2MOS) logic, DOMINO logic, NORA logic, NP (ZIPPER) logic, PE (pre-charge and Evaluation) Logic, basic memory circuits, SRAM and DRAM.

Unit III

Synchronous Sequential Machine: Introduction and characterizing equation of synchronous sequential machines, realization of state diagram and state table from verbal description, Mealy and Moore model machines state table and transition diagram, minimization of the state table of completely and incompletely specified sequential machines. Asynchronous Sequential Machine: Introduction to asynchronous sequential machine, fundamental mode & pulse mode asynchronous sequential machine, secondary state assignments.

Unit IV

Fault Detection in Combinational Circuit: Types of faults, fault detection using boolean difference and path sensitization method, PROM, PLA, PAL, CPLD and FPGA, PALASM software applications. State Machine: Algorithmic state machine, fundamental concept of hardware/ firmware algorithms, Controllers and data system designing.

Unit V

Layout for Gates: Basic physical design of simple gates and layout issues, layout issues for CMOS inverter, layout for NAND, NOR and complex logic gates, layout optimization using Eular path, DRC rules for layout and issues of interconnects, latch up, VHDL code for simple logic gates, flip-flops, shift registers.

References:

1. Geiger, Allen and Strader: VLSI Design Techniques for Analog and Digital Circuits, TMH

2. Sorab Gandhi: VLSI Fabrication Principles, Wiley India

3. Weste and Eshraghian: Principles of CMOS VLSI design, Addison-Wesley

4. Weste, Harris and Banerjee: CMOS VLSI Design, Pearson-Education. 5. Pucknell and Eshraghian: Basic VLSI Design, PHI Learning.

List of Experiments:

1. Design Universal gates and all other gates using S-edit and getting its transient response
2. Obtain the DC- characteristics of CMOS Inverter using DC-analysis.
3. Design Symbol of CMOS Inverter and using instances of its getting transient response.
4. Design Symbol of Universal gates and using instances of them getting transient response.
5. Design a Transmission gate using PMOS & NMOS by instance calling.
6. Design the Layout of NMOS and PMOS transistor.
7. Design the Layout of CMOS Inverter.

Elective-I ECC-504(A)

Neural Networks

Unit-I

Neural Network (NN) Introduction, benefits of neural network, models of a neuron, neural network as directed graph, network architectures, artificial intelligence and neural network. Learning processes: error correction learning, memory based learning, Hebbian learning, competitive learning, Boltzman learning, learning tasks, adaptation, statistical nature of learning process, statistical learning theory.

Unit-II

Perceptrons Single layer perceptrons: adaptive filtering problem, unconstrained optimization technique, linear least squares filter, least mean square algorithm (LMS), perceptron convergence theorem Multi layer perceptron: architecture, back propagation algorithm, generalization, approximations of functions, network pruning techniques.

Unit-III

Radial Basis Function (RBF) Networks Cover's theorem on the separability of patterns, interpolation problem, supervised learning as an Ill-posed hyper surface reconstruction problem, regularization theory, regularization network, generalized radial basis function networks (RBF), estimation of the regularization parameter, approximation properties of RBF networks, comparison of RBF networks and multilayer perceptrons, Kernel regression and its relation to RBF networks, learning strategies.

Unit-IV

Information- Theoretic Models Entropy, maximum entropy principle, mutual information, Kullback-Leibler divergence, mutual information as an objective function to be optimized, maximum mutual information principle, infomax and redundancy reduction, spatially coherent and incoherent features, independent components analysis, maximumlikelihood estimation, maximum entropy method.

Unit V

Dynamically Driven Recurrent Networks introduction, recurrent network architectures, state space model, non-linear autogressive with exogenous inputs model, computational power of recurrent networks, learning algorithms, back propagation through time, real time recurrent learning, Kalman filter, decoupled Kalman filter, vanishing gradients in recurrent networks, system identification, model reference adaptive control.

References:

1. Haykin: Neural Networks- A Comprehensive Foundation, PHI Learning.

2. Sivanandam, Sumathi and Deepa: Introduction to Neural Networks using Matlab, TMH.

3. Freeman and Skapura: Fundamentals of Neural Networks- algorithms, applications and programming techniques, Pearson Education.

4. Hagan, Demuth and Beale: Neural Network Design, Cengage Learning.

5. Anderson: An introduction to Neural Networks, PHI Learning.

6. Satish Kumar: Neural Networks, TMH.

ECC-504(B)

Control System

Unit I

Introduction to Control System and Their Classification : Differential equations of systems, linear approximation, laplace transform and transfer function of linear system, model of physical system (electrical, mechanical and electromechanical), block diagram, signal flow graph, mason's gain formula, return difference and return ratio, error detectors, servomotor, tachogenerator, servo amplifier , magnetic amplifier, rotating amplifier.

Unit II

Time Domain Analysis: Representation of deterministic signals, first order system response, s- plane root location and transient response, impulse and step response of second order systems, performance characteristics in the time domain, effects of derivative and integral control, steady state response, error constant, generalized definition of error coefficients, concepts of stability, RouthHurtwitz criterion.

Unit III

Frequency Domain Analysis: Frequency response bode plot, polar plot, nicol's chart, closed loop frequency response, frequency domain performance characteristics, and stability in the frequency domain, nyquist criterion.

Unit IV

Root Locus Method: Basis theory and properties of root loci, procedure for the construction of root loci, complete root locus diagram, design and compensation of feed back control system, approaches to compensation, cascade compensation networks and their design in the frequency domain, simple design in s- plane.

Unit V

State Variable Methods: Introduction to state variable concepts, state variable description of linear dynamic systems, representation in matrix forms, block diagram and signal flow graph representation of state equations – transfer matrix from state equations, transition matrix, general solution for linear time invariant state equations, basic principles of adaptive control systems.

References:

1. Ogata K, “Modern Control Engineering “, Prentice Hall

2. KUO B.C, “Automatic Control System”, Prentice Hall

3. Nagarath&Gopal,” Control System Engineering,” Wiley Eastern

4. Bakshi&Goyal. Feedback control system, Technical publication

ECC-504(C)
Data Compression & Cryptography

Unit-I

Introduction to the Concept of Security: Introduction, The Need of Security, Security Approaches, Principal of Security, Types of Attacks.

Unit- II

Cryptographic Techniques: Introduction, Plain Text and Cipher Text, Substitution Techniques, Transposition Techniques, Encryption and decryption, Symmetric and Asymmetric Key Cryptography, Steganography, Key Range and Key Size, Possible Types of Attacks .

Unit-III

Computer-based Symmetric Key Cryptographic Algorithms: Introduction, Algorithm Types and Models, An Overview of Symmetric Key Cryptography, Data Encryption Standard(DES), International Data Encryption Algorithm(IDEA), RC5, Blowfish, Advanced Encryption Standard(AES), Differential and Linear Cryptanalysis.

Unit- IV

Computer-based Asymmetric Key Cryptographic Algorithms: Introduction, Brief History of Asymmetric Key Cryptography, An Overview of Asymmetric Key Cryptography, The RSA Algorithm, Symmetric and Asymmetric Key Cryptography Together, Digital Signatures, Knapsack Algorithm, Some other Algorithms.

Unit- V

Public Key Infrastructure (PKI): Introduction, Digital Certificates, Private Key Management, The PKIX Model, Public Key Cryptography standard(PKCS), XML, PKI and Security .

References:

1.Behrouz A. Forouzan and D. Mukhopadhyay- Cryptography & Network Security, 2nd Edition - 1st reprint 2010, McGraw Hill, New Delhi.
2.WadeTrapple, Lawrence C. Washington- Introduction to Cryptography with coding Theory, 2nd Edition pearson Education

ECC—505(A)

Telecommunication switching system

UNIT-I

Introduction: Evolution of Telecommunication, Simple Telephone Communication, Manual switching system, major telecommunication Networks, Strowger Switching System, Crossbar Switching. 05 10 2

UNIT-II

Electronic Space Division Switching: Stored Program Control, Centralized SPC, Distributed SPC, Enhanced Services, Two stage networks, Three stage network n-stage networks. 06 12 3.

UNIT-III

Switching: Time multiplexed Space Switching, Time Multiplexed time switching, combination Switching, Three stage combination switching, n-stage combination switching. 05 14 4 .

UNIT-IV

Engineering: Network Traffic load and parameters, Grade of service and blocking probability, Modeling Switching Systems, Incoming Traffic and Service Time Characterization, Blocking Models and Losses.

UNIT-V

Estimates, Delay systems. 06 14 5 Telephone Networks: Subscriber Hierarchy Loop Systems, Switching and Routing, Transmission Plan, Transmission Systems, Numbering Plan, Charging Plan, Signaling Techniques, In channel signaling, common channel signaling, Cellular mobile telephony.

REFERENCES

1. Viswanathan. T., “Telecommunication Switching System and Networks”, Prentice Hall of India Ltd., 1994.

2. Bellamy John, “Digital Telephony”, John Wily & Sons, Inc. 3rd edn. 2000.

ECC-505(B)

Design of Analog IC's

UNIT-I

Introduction, MOS Technology CMOS and BJT Technologies, Layout and Design Rules 2 MOS models: dc, ac, capacitive effects, regions of operation, short channel effects.

UNIT-II

BJT models: diodes, high frequency, measurement MOS analysis: large signal, small signal SPICE simulations - MOS and BJT models Switches and active resistors Current sinks and sources .

UNIT-III

Current mirrors and amplifiers Voltage and current reference generators MOS inverting amplifiers BJT inverting amplifiers, cascode amplifiers Differential amplifiers Output stage MOS and BJT operational amplifiers.

UNIT-IV

Fluency with the use of diode, BJT and MOS structures in basic circuits Understanding of device models Catalog of familiar back-of-the-envelope circuit topologies for amplifiers Understand the language and basic operation of multipliers and modulators Quantify the noise contributions of various structures.

UNIT-V

IC Familiarity with the use of a circuit simulator to support analog IC design.Fluency with frequency response. Fluency with feedback techniques.

References:

1.Laker &Sansen: Design of Analog Integrated Circuits and Systems

2.Razavi: Design of Analog CMOS Integrated Circuits

3.Johns& Martin: Analog Integrated Circuit Design

ECC-505(C)
Industrial Electronics

Unit-I

Power Electronic Devices: Power diodes, power transistors, GTO, Triac, Diac, Power MOSFET, IGBT, LASCR, Fast recovery diode, schottey diode, construction, principle , operation & characteristics of SCR, Two transistor analogy, turn on & off of SCR, commutation techniques (Class A,B,C,D,E, & F Commutation), UJT, ramp triggering, SCR rating & protection, snubber circuit, heating, cooling & mounting of SCR, series and parallel operation of SCR, String efficiency.

Unit-II

Rectifier: Single phase half wave & full wave uncontrolled and controlled rectifier circuit with resistive, resistive & inductive load (continuous & non continuous conduction), & RLE loads, average load voltage and load current, active and reactive power, effect of free wheeling diode and source inductance, comparison of mid point & bridge rectifier circuits.

Unit-III

Inverter: Series and parallel inverter, Voltage source & current source inverter, Single phase and three phase bridge inverter, Self cumulated inverters,, Mc- murray& MC murray bed ford inverters, Voltage control of single phase and three phase bridge inverter, Harmonics & their reduction.

Unit-IV

Chopper: Chopper operation, Step up & step down choppers, chopper configuration (A, B, C, D, & E), Steady state analysis, Current & voltage commutation of chopper circuits, Jones &Morgens chopper.

Unit-V

AC voltage controllers: AC voltage controllers using SCRs &traics, single phase full wave controller with R and RL load, RMS load voltage, load current and input power factor, three phase AC voltage controller, Dual converter, Switched mode voltage regulator, buck, Boost, & Chuck regulators, Single phase & three phase cyclo convertor.

References:

1.M.H. Rashid, Power Electronics Circuits, Devices and Applications, Pearson Education, Singapore, **1993.**
2. M Ramsmoorthy, An Introduction to transistor and their application, Affiliated East-West Press.
3. P.C. Sen, Power Electonics, TMH.
4. M.D. Singh, K.B. Khanchandani, Power Electronics, TMH, Delhi, 2001.
5. Chakravarti A., Fundamental of Power Electronics and Drives, Dhanpat Ray & Co.
6. P.S. Bhimbhra, Power Electonics, Khanna Pub.
7. VedamSubramanyam, Power Electronics New Age International Revised II ed. 2006

Open Elective

ECC-506(A)

OPERATING SYSTEM

UNIT I

Introduction:- History of operating System, Types of Operating System: Batch Processing, RealTime, Multitasking & Multiprogramming, Time-sharing system, Operating system services,Operating system structure, System Call & System Boots, Operating system design &Implementations, System protection, Buffering & Spooling**.**

UNIT II

Processes Management:- The Process concept, The process control block, Systems programmer'sview of processes, Operating system services for process management, Scheduling algorithms, FirstCome first serve, Round Robin, Shortest run time next, Highest response ratio next, MultilevelFeedback Queues, Performance evaluation of scheduling algorithms stated above**.**

UNIT III

Deadlock:- Characterization, Methods for deadlock handling, deadlock prevention, deadlockavoidance, deadlock detection, recovery from deadlock, Process Management in Linux.File Management:- File system, access methods, free space managements, allocation methods,directory systems, protection, organization,sharing& implementation issues, Disk & DrumScheduling, File system in Linux & Windows

UNIT IV

I/O Management:- I/0 devices organization, I/0 devices organization, I/0 buffering, I/O Hardware,Kernel I/O subsystem, Transforming I/O request to hardware operations.Device Management:- Path managements, Sub module, Procedure, Scheduler, Handler, InterruptService Routine.

UNIT V

Memory Management:- Memory Hierarchy, MFT & MVT, logical and physical address space,Concept of swapping and Paging, Memory management without swapping or paging, contiguousand non-contiguous allocation, segmentation, demand paging, page replacement algorithms,allocation of frames, thrashing, demand segmentation and paging combined with segmentation.Structure& implementation of Page table, Virtual memory, Cache Memory Organization.

REFERENCES:

1. Silberschatz ,"Operating system", Willey Pub.

2. Stuart,"Operating System Principles, Design & Applications",Cengage Learning.

3. Tannanbaum, "Modern operating system",PHI Learning.

ECC-506(B)
Biometric Signal

UNIT-I

BIOMETRIC FUNDAMENTALS AND STANDARDS: Definition, Biometrics versus traditional techniques, Characteristics, Key biometric processes: Verification - Identification - Biometric matching, Performance measures in biometric systems, assessing the privacy risks of biometrics - Designing privacy sympathetic biometric systems, Different biometric standardsand Application properties.

UNIT-II

PHYSIOLOGICAL BIOMETRICS: Facial scan, Ear scan, Retina scan, Iris scan, Finger scan, automated fingerprint identification system, Palm print, Hand vascular geometry analysis, DNA.

UNIT-III

BEHAVIOURAL BIOMETRICS: Signature scan, Keystroke scan, Voice scan, Gait recognition, Gesture recognition, Video face, Mapping the body technology.

UNIT-IV

USER INTERFACES: Biometric interfaces: Human machine interface - BHMI structure, Human side interface: Iris image interface - Hand geometry and fingerprint sensor, Machine side interface: Parallel port - Serial port - Network topologies, Case study: Palm Scanner interface.

UNIT-V

BIOMETRIC APPLICATIONS: Categorizing biometric applications, Application areas: Criminal and citizen identification – Surveillance - PC/network access - E-commerce and retail/ATM, Costs to deploy, Issues in deployment, Biometrics in medicine, cancellable biometrics.

REFERENCES:

1. Anil K Jain, Patrick Flynn and Arun A Ross, “Handbook of Biometrics”, Springer, USA, 2010.
2. John R Vacca, “Biometric Technologies and Verification Systems”, Elsevier, USA, 2007.
3. Samir Nanavati, Michael Thieme and Raj Nanavati, “Biometrics – Identity Verification in a Networked World”, John Wiley & Sons, New Delhi, 2003.
4. Paul Reid, “Biometrics for Network Security”, Pearson Education, New Delhi, 2004.
5. Ruud M. Bolle et al, “Guide to Biometrics”, Springer, USA, 2003.

ECC-506(C)

Advance Instrumentation

UNIT-I

Significance of measurements – method of measurements – type of instruments – classification of instruments – functions of instruments and measurement system. Measurement and error: Accuracy and precision – significant figures – types of errors – statistical analysis – probability of errors – limiting errors.

Unit- II

Potentiometers – general principles – use of DC potentiometer in the measurement of voltage, current, resistance and power – calibration of ammeter, voltmeter, wattmeter – A.C. potentiometers – use of A.C. potentiometers in magnetic measurements – measurement of low and medium resistance – bridge methods – measurement of high resistance – insulation measurement of inductance and capacitance – bridge methods.

Unit- III

Magnetic measurements : Classification of magnetic measurements – measurement of flux density and magnetizing force – magnetic potentiometers – determination of B.H. curve – hysterisis loop – testing of bar and ring specimens – parameters – separation and measurement of iron loss – measurement of air gap flux – testing of permanent magnets.

Unit- IV

Electrical instruments: constructional details – dynamic behavior of D' Arsonval galvanometer – galvanometer sensitivity – PMMC type – MI type – dynamometer type – induction type measurement of current voltage and resistance – multimeters – power and energy measurements – single phase and polyphase meters – instrument transformers.

Unit- V

Electronic instruments: C.R.O. – Block diagram – CRT circuit – vertical deflection system – delay line – multiple trace – horizontal deflection system – oscilloscope probes and transducers – oscilloscope techniques – storage oscilloscope – sampling oscilloscope.

References:

1. Albert. D. Helfrick and William D. Cooper – Modern electronic instrumentation and measurement techniques – Prentice Hall of India Ltd.

2. A.K. Sawhney – Electrical and electronic measurements and instrumentation – DhanpatRai& Sons