EC 501- Digital Communications

Unit – I Elements of Digital Communication Systems: Elements of digital communication systems: model of digital communication systems, digital representation of analog signal, certain issues in digital transmission, advantages of digital communication systems, bandwidth-s/n tradeoff, hartley shnnon 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 in PCM 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 FSK detector, 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 for optimum transmissions, baseband signal receiver, probability of error, optimum receiver, optimal of coherent reception, signal space representation and probability of error, eye diagrams, cross talk.

Unit – IV Information Theory: Information and entropy, conditional entropy and redundancy, Shannon fano 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 and error 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. Masoud Salehi – 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.

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.

EC 502- Microprocessor and Microcontrollers

Unit-I History of computers: Timing and control, memory devices: semiconductor memory organization, 8-bit microprocessor (8085): Architecture, types of instructions, instruction set, addressing modes, flag register of 8085, and memory segmentation.

Unit-II 16-bit Microprocessors (8086/8088): Architecture, physical address, flag registers, memory organization, bus cycle, addressing modes, instruction set difference between 8086 and 8088, introduction to 80186 and 80286, assembly language programming of 8086/8088

Unit –III Data Transfer Schemes: Introduction, types of transmission, 8257 (DMA), 8255 (PPI), serial data transfer (USART 8251), keyboard-display controller (8279), Programmable Priority Controller (8259)

Unit-IV Programmable Interval Timer/ Counter (8253/8254): Introduction, modes, interfacing of 8253, applications, ADC and DAC: Introduction, DAC converters, ADC converters, DAC and ADC interfacing and applications.

Unit -V Microcontroller (8051): Introduction, architecture, instruction set, addressing modes, registers, memory organization, timers/counters, interrupts, addressing modes, 8051 instruction set , applications of microcontrollers.

References:

1. Hall Douglas V.,Microprocessor and interfacing, Revised second edition 2006, Macmillan, McGraw Hill .
2. A.K. Ray & K.M.Bhurchandi, Advanced Microprocessors and peripherals- Architecture, Programming and Interfacing, Tata McGraw – Hill, 2009 TMH reprint.
3. Kenneth J. Ayala, The 8086 microprocessor: programming and interfacing the PC, Indian -edition, CENGAGE Learning.
4. Muhammad Ali Mazidi and Janice Gillespie Mazidi, The 8051 Microcontroller and Embedded
   Systems, Pearson education, 2005.
5. Kenneth J. Ayala, The 8051 Microcontroller Architecture, III edition, CENGAGE Learning.
6. Microprocessor Architecture, Programming and Applications with the 8085 6/e
   October 2013, Ramesh Gaonkar.

List of Experiment:

1. To study 8085 based microprocessor system.
2. To study 8086 based microprocessor system.
3. Write an Assembly Language Program to add two 16 bit numbers.
4. Write an Assembly Language Program to subtract two 16 bit numbers.

5. To develop and run a program for finding out the largest/smallest number from a given set of numbers.
6. To perform multiplication/division of given numbers.
7. To perform computation of square root of a given number.
8. To obtain interfacing of RAM chip to 8085/8086 based system

EC 503 – Power 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

1. 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. Vedam Subramanyam, Power Electronics New Age International Revised II ed. 2006.

EC 504 - Control Systems

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, Routh Hurtwitz 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.

EC 505-Antenna & Wave Propagation

Unit I- Introduction to Antenna: Antenna Terminology, radiation, retarded potential, radiation field from current element, radiation resistance of short dipole & half wave dipole antenna, network theorems applied to antenna, self and mutual impedance of antenna, effect of earth on vertical pattern & image antenna.

UNIT – II Antenna Fundamentals: Introduction, network theorems, directional properties of dipole antennas, travelling-wave antennas and effect of feed on standing-wave antennas, two element array, horizontal patterns in broad-cast arrays, linear arrays, multiplication of patterns effect of earth on vertical patterns, Binomial array, antenna gain, effective area.

Unit III -Types of Antennas: Babinet's principles and complementary antenna, horn antenna, parabolic reflector antenna, slot antenna,log periodic antenna, loop antenna, helical antenna, biconical antenna, folded dipole antenna, Yagi-Uda antenna, lens antenna, turnstile antenna. Long wire antenna: resonant and travelling wave antennas for different wave lengths, V-antenna, rhombic antenna, beverage antenna, microstrip antenna.

UNIT IV- Antenna Array Synthesis: Introduction, retarded potentials, array structures, weighting functions, linear array analysis, different forms of linear arrays, Schelknoff unit circle, linear array synthesis, sum and difference patterns, Dolph-Chebychev synthesis of sum pattern, Taylor synthesis of sum patterns, Bayliss synthesis of difference patterns, planar arrays, arrays with rectangular boundary.

UNIT –V Propagation of Radio Waves: Fundamentals of electromagnetic waves, effects of the environment, modes of propagation, ground wave propagation, plane earth reflection, surface wave, transition between surface and space wave, tilt of wave front due to ground losses, space wave propagation, field strength relation, effects of imperfect earth, curvature of earth and interference zone, shadowing effect of hills and buildings, absorption by atmospheric phenomena, variation of field strength with height, super refraction, scattering, tropospheric propagation, fading, path loss calculations, sky wave propagation, structural details of the ionosphere, wave propagation mechanism, refraction and reflection of sky waves by ionosphere, ray path, critical frequency, MUF, LUF, virtual height, skip distance.

References:

1. B. L. Smith: Mordern Anteenas, 2nd Edition, Springer, Macmillan India Ltd.
2. Jordan and Balmain: Electromagnetic Waves and Radiating System, PHI Learning.
3. Krauss: Antennas and wave propagation, TMH.
4. Balanis: Antenna Theory Analysis and Design, Wiley India Pvt. Ltd
5. Harish and Sachidananda: Antennas and wave propagation, Oxford University Press.
6. Raju: Antennas and Wave Propagation, Pearson Education.
7. Kennedy: Electronic Communication Systems, TMH.

List of Experiments:

1. To plot the radiation pattern of an omni directional antenna.
2. To plot the radiation pattern of a directional antenna.
3. To plot the radiation pattern of a parabolic reflector antenna.

4. To plot the radiation pattern of a log periodic antenna.
5. To plot the radiation pattern of a patch antenna.
6. To plot the radiation pattern of a dipole/ folded dipole antenna
7. To plot the radiation pattern of a Yagi (3-EL/4EL) antenna.
8. To plot the radiation pattern of a monopole/ WHIP/ collinear antenna.
9. To plot the radiation pattern of a broad site antenna.
10. To plot the radiation pattern of a square loop antenna.

EC- 506 Matlab & simulation Lab.

Course Content: Introduction to matlab /scilab, study of matlab /scilab programming, simulation, modeling, design and development of programs, application of the software in the field of control systems and communication systems.

List of Experiment (Expandable)

1. Space model for classical transfer function using MATLAB.
2. Program for the Bode response of a type one transfer function.
3. Program for the Bode response of a type two transfer function
4. Program to determine the time response of a given transfer function for step input and also determine maximum overshoot and peak time.
5. Program to determine the time response of a given transfer function for impulse input, maximum overshoot and peak time.
6. Program for sketching root locus open loop transfer function
7. Program to add the time delay for a specified input.
8. Program for sketching Nyquist plot for open loop transfer function.

References:

1. Proakis: Contemporary Communication System Using MATLAB; Thomson Cengage.
2. Kuo: Automatic Control Systems, PHI Learning.
3. Chapman Stephen J.: MATLAB Programming for Engineers, Thomson Cengage.
4. Singh and Chaudhari: Matlab Programming, PHI Learning.
5. http://ekalavya.it.iitb.ac.in/contents.do?topic=Scilab
6. http://www.scilab.in
7. http://www.matlab.in