Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal

Branch- Common to All Discipline

ES401	**Energy & Environmental Engineering**	**3L-1T-0P**	**4 Credits**

The objective of this Course is to provide *an introduction to energy systems and renewable energy resources, with a scientific examination of the energy field and an emphasis on alternative energy sources and their technology and application.*

Module 1: Introduction to Energy Science:

Introduction to energy systems and resources; Introduction to Energy, sustainability & the environment; Overview of energy systems, sources, transformations, efficiency, and storage; Fossil fuels (coal, oil, oil-bearing shale and sands, coal gasification) - past, present & future, Remedies & alternatives for fossil fuels - biomass, wind, solar, nuclear, wave, tidal and hydrogen; Sustainability and environmental trade-offs of different energy systems; possibilities for energy storage or regeneration (Ex. Pumped storage hydro power projects, superconductor-based energy storages, high efficiency batteries)

***Module2*: Ecosystems**

- Concept of an ecosystem; Structure and function of an ecosystem; Producers, consumers and decomposers; Energy flow in the ecosystem; Ecological succession; Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of the following ecosystem (a.)Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

***Module 3*: Biodiversity and its conservation**

- Introduction – Definition: genetic, species and ecosystem diversity; Bio-geographical classification of India; Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values; Biodiversity at global, National and local levels; India as a mega-diversity nation; Hot-sports of biodiversity; Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; Endangered and endemic species of India; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

***Module 4:* Environmental Pollution**

- Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards; Solid waste Management: Causes, effects and control measures of urban and industrial wastes; Role of an individual in prevention of pollution; Pollution case studies; Disaster

management: floods, earthquake, cyclone and landslides.

Module 5: **Social Issues and the Environment**

- From Unsustainable to Sustainable development; Urban problems related to energy; Water conservation, rain water harvesting, watershed management; Resettlement and rehabilitation of people; its problems and concerns. Case Studies
  Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies Wasteland reclamation; Consumerism and waste products; Environment Protection Act; Air (Prevention and Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act; Issues involved in enforcement of environmental legislation; Public awareness.

Module 6: Field work

- Visit to a local area to document environmental assets-river/forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc.

REFERENCE

1. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.
2. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB).
3. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai,
4. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
5. Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards', Vol I and II, Enviro Media (R)
6. Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press.
7. Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaiam

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering IV-Semester

EC402 Signals & Systems

Unit-1 Introduction of Signals and Systems: Definition of signal, Classification of Signal and representation: Continuous time and discrete time, even/odd, periodic/aperiodic, random/deterministic, energy/power, one/multidimensional, some standard signals, , Basic Operations on Signals for CT/DT signal, transformation of independent & dependent variables,

Definition of system and their classification: CT/DT, linear/non-linear, variant/non-variant, causal and non-causal system state/dynamic system, interconnection of systems. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability.

Unit-2 Linear Time- Invariant Systems: Introduction, Impulse Response Representation for LTI Systems, Convolution, Properties of the Impulse Response Representation for LTI Systems, Difference Equation for LTI Systems, Block Diagram Representations(direct form-I, direct form-II, Transpose, cascade and parallel). Impulse response of DT-LTI system and its properties.

Unit-3 z-Transform: Introduction, ROC of finite duration sequence, ROC of infinite duration sequence, Relation between Discrete time Fourier Transform and z-transform, properties of the ROC, Properties of z-transform, Inverse z-Transform, Analysis of discrete time LTI system using zTransform, Unilateral z-Transform.

Unit-4 Fourier analysis of discrete time signals: Introduction, Properties and application of discrete time Fourier series, Representation of Aperiodic signals, Fourier transform and its properties, Convergence of discrete time Fourier transform, Fourier Transform for periodic signals, Applications of DTFT.

Unit-5 State-space analysis and multi-input, multi-output representation. The state-transition matrix and its role. The Sampling Theorem and its implications- Spectra of sampled signals. Reconstruction:

Reference Books:

1. Simon Haykin, “Signals and Systems”, John Wiley.
2. Simon Haykin, “Analog and Digital Communications”, John Willey.
3. Bruce Carlson, “Signals and Systems”, TMH.

4. Oppenheim & Wilsky, “Signals & Systems”, PHI.
5. Taub and Schilling "Principles of communication signals", 2nd ed. New York: Mcgraw-Hill, 1986.

LIST OF EXPERIMENTS

1. Introduction to MATLAB Tool.
2. To implement delta function, unit step function, ramp function and parabolic function for continuous-time.
3. To implement delta function, unit step function, ramp function and parabolic function for discrete-time.
4. To implement rectangular function, triangular function, sinc function and signum function for continuous-time.
5. To implement rectangular function, triangular function, sinc function and signum function for discrete-time.
6. To explore the communication of even and odd symmetries in a signal with algebraic operations.
7. To explore the effect of transformation of signal parameters (amplitude-scaling, time-scaling & shifting).
8. To explore the time variance and time invariance property of a given system.
9. To explore causality and non-causality property of a system.
10. To demonstrate the convolution of two continuous-time signals.
11. To demonstrate the correlation of two continuous-time signals.
12. To demonstrate the convolution of two discrete-time signals.
13. To demonstrate the correlation of two discrete-time signals.
14. To determine Magnitude and Phase response of Fourier Transform of given signals.

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New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering IV-Semester

EC403 Analog Communication

Unit-1

Frequency domain representation of signal: Fourier transform and its properties, condition of existence, Fourier transform of impulse, step,signum , cosine, sine, gate pulse, constant, properties of impulse function. Convolution theorem (time & frequency), correlation(auto & cross), energy & power spectral density

Unit-2

Introduction: Overview of Communication system, Communication channels Need for modulation, Baseband and Pass band signals, Amplitude Modulation: Double side band with Carrier (DSB-C), Double side band without Carrier, Single Side Band Modulation, DSB-SC, DSB-C, SSB-SC,Generation of AM, DSB-SC, SSB-SC, VSB-SC & its detection,Vestigial Side Band (VSB).

Unit-3

Types of angle modulation, narrowband FM,wideband FM, its frequency spectrum, transmission BW, methods of generation (Direct & Indirect), detection of FM (discriminators: balanced, phase shift and PLL detector),pre emphasis and de-emphasis. FM transmitter & receiver: Block diagram ofFM transmitter& receiver, AGC, AVC, AFC,

Unit-4

AM transmitter& receiver: Tuned radio receiver &super heterodyne, limitation of TRF, IF frequency, image signal rejection, selectivity, sensitivity and fidelity ,Noise in AM, FM

Unit-5

Noise: Classification of noise, Sources of noise, Noise figure and Noise temperature, Noise bandwidth, Noise figure measurement, Noise in analog modulation, Figure of merit for various AM andFM, effect of noise on AM &FM receivers.

REFERENCES

1. Simon Haykins, Communication System, John Willy
2. Singh &Sapre, Communication System, TMH
3. B.P. Lathi, Modern Digital and analog communication system; TMH
4. Singhal, analog and Digital communication, TMH
5. Rao, Analog communication, TMH
6. P K Ghose, principal of communication of analog and digital, universities press.
7Taub& shilling, Communication System, TMH
8. Hsu; Analog and digital communication(Schaum); TMH
9. Proakis fundamental of communication system. (Pearson edition).

List of Experiments:

1. To analyze characteristics of AM modulator & Demodulators.
2. To analyze characteristics of FM modulators& Demodulators.
3. To analyze characteristics of super heterodyne receivers.
4. To analyze characteristics of FM receivers.
5. To construct and verify pre emphasis and de-emphasis and plot the wave forms.
6. To analyze characteristics of Automatic volume control and Automatic frequency control.
7. To construct frequency multiplier circuit and to observe the waveform.
8. To design and analyze characteristics of FM modulatorand AM Demodulator using PLL.

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New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering IV-Semester

EC404 Control System

Unit-1 Introduction to Control system: Terminology and classification of control system, examples of control system, mathematical modeling of mechanical and electrical systems, differential equations, transfer function, block diagram representation and reduction, signal flow graph techniques.

Feedback characteristics of control systems Open loop and closed loop systems, effect of feedback on control system and on external disturbances, linearization effect of feedback, regenerative feedback

.**Unit-2 Time response analysis** Standard test signals, time response of 1st order system, time response of 2nd order system, steady-state errors and error constants, effects of additions of poles and zeros to open loop and closed loop system.

Time domain stability analysis Concept of stability of linear systems, effects of location of poles on stability, necessary conditions for stability, Routh-Hurwitz stability criteria, relative stability analysis, Root Locus concept, guidelines for sketching Root-Locus.

Unit-3 Frequency response analysis Correlation between time and frequency response, Polar plots, Bode Plots, all-pass and minimum-phase systems, log-magnitude versus Phase-Plots, closed-loop frequency response.

Frequency domain stability analysis : Nyquist stability criterion, assessment of relative stability using Nyquist plot and Bode plot (phase margin, gain margin and stability).

Unit-4 Approaches to system design Design problem, types of compensation techniques, design of phase-lag, phase lead and phase lead-lag compensators in time and frequency domain, proportional, derivative, integral and Composite Controllers.

Unit-5 State space representation of systems, block diagram for state equation, transfer function decomposition, solution of state equation, transfer matrix, relationship between state equation and transfer function, controllability and observability.

Text/Reference Books:

1. Albert D. Helfrick, William David Cooper, "Modern electronic instrumentation and measurement techniques", TMH 2008.
2. Oliver Cage, "Electronic Measurements and Instrumentation", TMH, 2009.
3. Alan S. Morris, "Measurement and Instrumentation Principles", Elsevier (Buterworth Heinmann), 2008.
4. David A. Bell, "Electronic Instrumentation and Measurements", 2nd Ed., PHI, New Delhi 2008.
5. H.S. Kalsi, "Electronics Instrumentation", TMH Ed. 2004
6. A.K.Sawhney, "A Course in Electrical and Electronic Measurements and Instrumentation", Dhanpat Rai.
7. MMS Anand, "Electronic Instruments & Instrumentation Technology", PHI Pvt. Ltd., New Delhi Ed. 2005

CONTROL SYSTEM LAB

Control System performance analysis and applications of MATLAB in Control system performance analysis & design.

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Electronics & Communication Engineering IV-Semester

EC405 Analog Circuits

COURSE CONTENTS:

Feedback Amplifier and Oscillators: Concept of feedback and their types, Amplifier with negative feedback and its advantages. Feedback Topologies.

Oscillators: Concept of Positive feedback, Classification of Oscillators, Barkhausen criterion, Types of oscillators: RC oscillator, RC Phase Shift, Wien Bridge Oscillators. LC Oscillator: Hartley, Colpitt's, Clapp and Crystal oscillator.

Introduction to integrated circuits: Advantages and characteristic parameters of IC's, basic building components, data sheets

Operational Amplifier: Differential amplifier and analysis, Configurations- Dual input balanced output differential amplifier, Dual input Unbalanced output differential amplifier, Single input balanced output differential amplifier, Single input Unbalanced output differential amplifier Introduction of op-amp, Block diagram, characteristics and equivalent circuits of an ideal opamp, Power supply configurations for OP-AMP.

Characteristics of op-amp: Ideal and Practical, Input offset voltage, offset current, Input bias current, Output offset voltage, thermal drift, Effect of variation in power supply voltage, common-mode rejection ratio (CMRR), Slew rate and its Effect, PSRR and gain bandwidth product, frequency limitations and compensations, transient response, analysis of TL082 datasheet.

OP-AMP applications: Inverting and non-inverting amplifier configurations, Summing amplifier, Integrators and differentiators, Instrumentation amplifier, Differential input and differential output amplifier, Voltage-series feedback amplifier, Voltage-shunt feedback amplifier, Log/ Antilog amplifier, Triangular/rectangular wave generator, phase-shift oscillators, Wein bridge oscillator, analog multiplier-MPY634, VCO, Comparator, Zero Crossing Detector. OP-AMP AS FILTERS: Characteristics of filters, Classification of filters, Magnitude and frequency response, Butterworth 1st and 2nd order Low pass, High pass and band pass filters, Chebyshev filter characteristics, Band reject filters, Notch filter; all pass filters, self-tuned filters, AGC,AVC using op-AMP.

TIMER:IC-555 Timer concept, Block pin configuration of timer. Monostable, Bistable and AstableMultivibrator using timer 555-IC, Schmitt Trigger, Voltage limiters, Clipper and

clampers circuits, Absolute value output circuit, Peak detector, Sample and hold Circuit, Precision rectifiers, Voltage-to-current converter, Current-to-voltage converter.

Voltage Regulator: simple OP-AMP Voltage regulator, Fixed and Adjustable Voltage Regulators, Dual Power supply, Basic Switching Regulator and characteristics of standard regulator ICs such as linear regulator, Switching regulator andlow-drop out regulator. Study of LM317, TPS40200 and TPS7250

TEXT BOOKS:

1. RamakantA.Gaikward,"OP- Amp and linear Integrated circuits" Third edition 2006, Pearson.
2. B. Visvesvara Rao Linear Integrated Circuits Pearson.
3. http://www.nptelvideos.in/2012/11/analog-ics.html
4. http://nptel.ac.in/courses/117108107/

REFERENCES:

1. David A. Bell: Operational Amplifiers & Linear ICs, Oxford University Press, 2nd edition,2010.
2. D. Roy Choudhury:Linear Integrated Circuits New Age Publication.
3. B. Somanathan Nair: Linear Integrated Circuits analysis design and application Wiley India Pvt. Ltd.
4. Maheshwary and Anand: Analog Electronics, PHI.
5. S.Salivahanan,V S KanchanaBhaaskaran: Linear Integrated Circuits",second edition, McGraw Hill.
6. Gray Hurst Lewis Meyer Analysis and design of analog Integrated Circuits fifth edition Wiley India.
7. RobertF.Coughlin, Frederick,F.Driscoll: Operational Amplifiers and Linear Integrated Circuits, sixth edition, Pearson.
8. Millman and Halkias: Integrated electronics, TMH.
9. Boylestad and Nashelsky: Electronic Devices and Circuit Theory, Pearson Education.
10. Sedra and Smith: Microelectronics, Oxford Press.

List of Experiments :

Apparatus Required –Dual Channel Cathode Ray Oscilloscope (0-20 MHz), Function Generator (10MHz and above), Dual Power Supply, LM741, TL082, MPY634,TPS7250, Probes, digital multimeter.

1. To measure and compare the op-amp characteristics: offset voltages, bias currents, CMRR, Slew Rate of OPAMP LM741 and TL082.
2. To determine voltage gain and frequency response of inverting and non-inverting amplifiers using TL082.
3. To design an instrumentation amplifier and determine its voltage gain using TL082.
4. To design op-amp integrator (low pass filter) and determine its frequency response.
5. To design op-amp differentiator (high pass filter) and determine its frequency response.

6. Design 2nd order Butterworth filter using universal active filter topology with LM741
7. To design Astable, Monostable and Bistablemultivibrator using 555 and analyse its characteristics.
8. Automatic Gain Control (AGC) Automatic Volume Control (AVC)using multiplier MPY634
9. To design a PLL using opampwith MPY634 anddetermine the free running frequency, the capture range and the lock in range of PLL
10. Design and test a Low Dropout regulator using op-amps for a given voltage regulation characteristic and compare the characteristics with TPS7250 IC.

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New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering IV-Semester

EC406 Simulation Lab

COURSE CONTENTS: Introduction to circuit simulation software (TINA-PRO/ PSPICE/ CIRCUIT MAKER). Study of the key features and applications of the software in the field of Electronic Circuits, Electronic Instrumentation and Network Analysis.

Design, Optimization and simulation of;

1. Basic Electronic circuits (examples rectifiers, clippers, clampers, diode, transistor characteristics etc).

2. Transient and steady state analysis of RL/ RC/ RLC circuits, realization of network theorems.

3. Use of virtual instruments built in the software.

Introduction to PCB layout software

Overview and use of the software in optimization, designing and fabrication of PCB pertaining to above circuits simulated using above simulation software. Students should simulate and design the PCB for at least two circuits they are learning in the current semester.

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Credit Based Grading System

Electronics & Communication Engineering, VI-Semester

EC- 6001 Cellular mobile communication

Course Contents

Unit-I

Introduction to cellular mobile system

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

Elements of cellular radio system design

General description of problem, concept of frequency reuse channels, co-channel interference reduction factor, desired C/I in an omni-directional antenna system, hand off mechanism, cell splitting, components of cellular systems.

Unit-II

Cell coverage for signal and traffic

General introduction, mobile point-to-point model, propagation over water or flat open area, foliage loss, propagation in near- in distance, long distance propagation, path loss from point-to-point prediction model, cell site antenna heights and signal coverage cells, mobile-to-mobile propagation.

Cell site antennas and mobile antennas

Equivalent circuits of antennas, gain and pattern relationship, sum and difference patterns, antennas at cell site, unique situations of cell site antennas, mobile antennas.

Unit-III

Cochannel interference reduction

Cochannel interference, real time cochannel interference measurement at mobile radio transceivers, design of antenna systems - omni directional and directional, lowering the antenna height, reduction of cochannel interference, umbrella- pattern effect, diversity receiver, designing a system to serve a predefined area that experiences cochannel interference.

Types of Noncochannel interference

Adjacent channel interference, near-end-far-end interference, effect on near-end mobile units, cross-talk, effects of coverage and interference by applying power decrease, antenna height decrease, beam tilting, effects of cell site components, interference between systems, UHF TV interference, long distance interference.

Unit-IV

Frequency management and Channel Assignment

Frequency management, frequency spectrum utilization, setup channels, channel assignment, fixed channel assignment, non-fixed channel assignment algorithms, additional spectrum, traffic and channel assignment, perception of call blocking from the subscribers

Handoffs and dropped calls

Value of implementing handoffs, initiation of handoff, delaying a handoff, forced handoff, queuing of handoff, power- difference handoff, mobile assisted handoff and soft handoff, cell-site handoff and intersystem handoff, dropped call rate formula.

Unit-V

Digital Cellular Systems

GSM- architecture, layer modeling, transmission, GSM channels and channel modes, multiple access scheme.

CDMA- terms of CDMA systems, output power limits and control, modulation characteristics, call processing, hand off procedures.

Miscellaneous mobile systems- TDD systems, cordless phone, PDC, PCN, PCS, non cellular systems.

References:

1. Lee: Cellular and Mobile Telecommunication- Analog & digital systems, TMH.
2. Rappaport: Wireless Communications- principles and practice, Pearson Education.
3. Lee: Mobile communications design fundamentals, Wiley India.
4. Faher Kamilo: Wireless Digital Communication, PHI Learning.
5. Raj Kamal: Mobile Computing, Oxford University Press.

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Credit Based Grading System

Electronics & Communication Engineering, VI-Semester

EC- 6002 Digital signal Processing

Unit – I

Discrete-Time Signals and Systems

Discrete-time signals, discrete-time systems, analysis of discrete-time linear time-invariant systems, discrete time systems described by difference equation, solution of difference equation, implementation of discrete-time systems, stability and causality, frequency domain representation of discrete time signals and systems.

Unit - II

The z-Transform

The direct z-transform, properties of the z-transform, rational z-transforms, inversion of the z transform, analysis of linear time-invariant systems in the z- domain, block diagrams and signal flow graph representation of digital network, matrix representation.

Unit - III

Frequency Analysis of Discrete Time Signals

Discrete fourier series (DFS), properties of the DFS, discrete Fourier transform (DFT), properties of DFT, two dimensional DFT, circular convolution.

Unit - IV

Efficient Computation of the DFT

FFT algorithms, decimation in time algorithm, decimation in frequency algorithm, decomposition for 'N' composite number.

Unit - V

Digital filters Design Techniques

Design of IIR and FIR digital filters, Impulse invariant and bilinear transformation, windowing techniques-rectangular and other windows, examples of FIR filters, design using windowing.

References:

1. Oppenheim and Schafer: Digital Signal Processing, PHI Learning.
2. Johnny R. Johnson: Introduction to Digital Signal Processing, PHI Learning.
3. Proakis: Digital Signal Processing, Pearson Education.
4. Rabiner and Gold: Theory and Application of Digital Signal Processing, PHI Learning.
5. Ingle and Proakis: Digital Signal Processing- A MATLAB based Approach, Thompson, Cengage Learning.

List of Experiments:

1. Generation, analysis and plots of discrete-time signals.
2. Implementation of operations on sequences (addition, multiplication, scaling, shifting, folding etc).
3. Implementation of Linear time-invariant (LTI) systems and testing them for stability and causality.
4. Computation and plot of DTFT of sequences, verification of properties of DTFT.
5. Computation and plots of z-transforms, verification of properties of z-transforms.
6. Computation and plot of DFT of sequences, verification of properties of DFT.
7. Computation and plots of linear/circular convolution of two sequences.
8. Computation of radix-2 FFT- Decimation in time and Decimation in frequency.
9. Implementation of IIR and FIR filter structures (direct, cascade, parallel etc).
10. Implementation of **v**arious window design techniques (Rectangular, Bartlett, Hann, Hamming etc).

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Credit Based Grading System

Electronics & Communication Engineering, VI-Semester

EC- 6003 Antennas and wave Propagation

Unit I
Radiation
Potential function and the Electromagnetic field, potential functions for Sinusoidal Oscillations, retarded potential, the Alternating current element (or oscillating Electric Dipole), Power radiated by a current element, Application to short antennas, Assumed current distribution, Radiation from a Quarter wave-monopole or Half wave dipole, sine and cosine integral, Electromagnetic field close to an antenna, Solution of the potential equations, Far-field Approximation.

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- Introduction, plane earth reflection, space wave and surface wave, transition between surface and space wave, tilt of wave front due to ground losses.
Space wave propagation- Introduction, 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- Introduction, structural details of the ionosphere, wave propagation mechanism, refraction and reflection of sky waves by ionosphere, ray path, critical frequency, MUF, LUF, OF, virtual height, skip distance, relation between MUF and skip distance.

References:

1. Jordan and Balmain: Electromagnetic Waves and Radiating System, PHI Learning.
2. Krauss: Antennas and wave propagation, TMH.
3. Balanis: Antenna Theory Analysis and Design, Wiley India Pvt. Ltd.
4. Harish and Sachidananda: Antennas and wave propagation, Oxford University Press.
5. Raju: Antennas and Wave Propagation, Pearson Education.
6. 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.

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Credit Based Grading System

Electronics & Communication Engineering, VI-Semester

EC- 6004 VLSI circuits and systems

Unit I

Introduction

Introduction to CMOS VLSI circuit, VLSI design flow, Design strategies ,Hierarachy, regularity, modularity, locality, MOS Transistor as a Switches, CMOS Logic, Combinational circuit, latches and register, Introduction of CAD Tool , Design entry, synthesis, functional simulation.

Unit II

Specification of sequential systems

Characterizing equation & definition 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.

Unit III

Asynchronous Sequential Machine

Introduction to asynchronous sequential machine, Fundamental mode and Pulse mode asynchronous sequential machine, Secondary state assignments in asynchronous sequential machine, races and hazards.

Unit IV

State Machine

Algorithmic state machine and fundamental concept of hardware/ firmware algorithms. Controllers and data system designing.

Unit V

Fault Detection in combinational circuit

Types of faults, Fault detection using Boolean Difference and path sensitization method.

Concept of PROM, PLA, PAL, CPLD and FPGA, PALASM software applications.

Refrences:

1. Neil Weste: Principle of CMOS VLSI Design, TMH.
2. Kohavi: Switching & Finite Automata Theory, TMH.
3. Lee: Digital Circuits and Logic Design, PHI Learning..
4. Roth Jr.: Fundamentals of Logic Design, Jaico Publishing House.
5. Parag K. Lala: Fault Tolerant and Fault Testable Hardware Design, BS Publication.

LIST OF EXPERIMENTS

1. Write a Verilog/VHDL Code to implement a 4X1 MUX.- (a)Using If-Else Statement (b)Using case statement (c)Using conditional assignment statement
2. Write a Verilog/VHDL code to implement a 2-bit wide 8X1 MUX-(a) Using If-Else Statement (b) Using case statement (C) Using conditional assignment statement
3. Write Verilog/VHDL code to implement 6-bit comparator
   Write a Verilog/VHDL Code to implement a 4Bit Synchronous counter.
4. Write Verilog/VHDL programs to implement an Up/Down counter
5. Write a Verilog/VHDL Code to implement D flip-flop, using positive level triggering.
6. Write a Verilog/VHDL Code to implement D flip-flop, using negative edge triggering.
7. Write a Verilog/VHDL Code to implement JK flip-flop, using negative edge triggering.
8. Write a Verilog/VHDL Code to implement, synthesize and simulate a 4 bit shift register.
9. Write a Verilog/VHDL Code to implement 1011 non-overlapping sequence detector.
10. Write a Verilog/VHDL Code to implement 1010 overlapping sequence detector.

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Credit Based Grading System

Electronics & Communication Engineering, VI-Semester

Elective-II EC- 6005 (1) Nano Electronics

Unit 1: Introduction Nanoscale technology: Consequences of the nanoscale for technology and society. Molecular building blocks for nanostructure systems, Nano-scale 1D to 3D structures, Band structure and density of states at low dimensional structure. Size dependent properties (Elelctrical, mechanical, optical, thermal etc).top down and bottom up technique, lithographic, nanolithographic and nonlithographictechniques:plused laser depositon,plasma arc discharge, e-beam sputtering, ball milling , solgel, electrodeposition, chemical vapour deposition.

Unit 2: Characterization technique Scanning probe microscopy: (Principle, construction and working;) Scanning tunnelling microscope, Atomic force microscope, scanning electron microscope, Transmission electron microscope, Carbon materials :Allotropes of carbon, Structure of Carbon Nanotubes, types of CNTs-, Electronic properties of CNTs, Band structure of Graphene ,Band structure of SWNT from grapbene ,electron transport properties of SWNTs ,

Unit -3:Introduction to magnetism and superconductivity Basic magnetic phenomena: paramagnetism, ferromagnetism, ferrimagnetism, anti-ferromagnetism;nano-magnetism; giant and colossal magnetoresistance; ferrofluids. Basic superconductivity phenomena; flux quantisation and Josephsoneffects.

Unit 4: Fundamental of nanoeletronics Charging of quantum dots, Coulomb blockade, Quantum mechanical treatment of quantum wells, wires and dots, Widening of bandgap in quantum dots, Strong and weak confinement, spin field effect transistor. single electron transistors, other SET and FET structure.

Unit 5: Silicon MOSFETs Silicon MOSFET: fundamental of MOSFET devices, scaling rules, silicon dioxide based gate dielectrics, metal gates , junction and contacts, advanced MOSFET concepts

References:

1.G. W. Hanson: Fundamentals of Nanoelectronics, Pearson Education.
2. K. K. Chattopadhyay and A. N. Banerjee: Introduction to Nanoscience and Nanotechnology, PHI Learning.
3. John H. Davis: Physics of low dimension semiconductor, Cambridge Press.
4.KTu, JW Mayer, LC Feldman, "Electronic Thin Film Science", Macmillan, New York, 1992.
5. Z Cui , "Mico-Nanofabrication", Higher Education press, Springer, 2005.
6.Brian Cantor, "Novel Nanocrystalline Alloys and Magnetic Nanomaterials," Institute of Physics Publications, 2005.
7. S.Chikazumi and S.H. Charap," Physics of Magnetism", Springer-verlag berlin Heideberg, 2005
8.CaoGuozhong, "Nanostructures and Nanomaterials - Synthesis, Properties and Applications", Imperial College Press, 2004.
9. SadamichiMaekawa, "Concepts in Spintronics", Oxford University Press, 2006

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Credit Based Grading System

Electronics & Communication Engineering, VI-Semester

Elective-II EC- 6005 (2) RFID

UNIT I. : Introduction: Automatic Identification Systems, a Comparison of Different ID Systems,Components of an RFID System.**Differentiation Features of RFID Systems:** FundamentalDifferentiation Features, Transponder Construction Formats, Frequency, Range and Coupling,Information Processing in the Transponder, Selection Criteria for RFID Systems.

UNIT II : Fundamental Operating Principles: 1-Bit Transponder, Full and Half Duplex Procedure, Sequential Procedures.**Physical Principles of RFID Systems:** Magnetic Field, Electromagnetic Waves, Surface Waves.

UNIT III : Frequency Ranges and Radio Licensing Regulations: Frequency Ranges Used, European Licensing Regulations, National Licensing Regulations in Europe, National Licensing Regulations.
Standardisation: Animal Identification, Contactless Smart Cards, ISO 69873 — Data Carriers for Tools and Clamping Devices, ISO 10374 — Container Identification, VDI 4470 — Anti-theft Systems for Goods, Item Management.

UNIT IV : Coding and Modulation: Coding in the Baseband, Digital Modulation Procedures. **Data Integrity:** The Checksum Procedure, Multi-Access Procedures — Anticollision. **Data Security :**Mutual Symmetrical Authentication, Authentication Using Derived Keys, Encrypted Data Transfer.

UNIT V : Sensors & sensing technology and interfacing Techniques, Transponder with Memory Function, HF interface, Example circuit — load modulation with subcarrier, Example circuit — HF interface for ISO 14443 transponder, Address and security logic, Read-only transponder, Writable transponder, Transponder with cryptological function, Segmented memory, MIFARE_ application directory, MIFARE_ plus, Modern concepts for the dual interface card, Measuring Physical Variables, Transponder with sensor functions, Measurements using microwave transponders, Sensor effect in surface wave transponders.
Readers: Data Flow in an Application, Components of a Reader, Low Cost Configuration — Reader IC U2270B, Connection of Antennas for Inductive Systems, Reader Designs.
Applications: Contactless Smart Cards, Public Transport, Ticketing, Access Control, Transport Systems, Animal Identification, Electronic Immobilisation, Container Identification, Sporting Events, Industrial Automation, Medical Applications. Interfacing technology, Zigbee

Textbooks:
1. Klaus Finkenzeller"RFIDHandbook"Second Edition John Wiley & Sons Ltd.
2. STEPHEN B. MILES, SANJAY E. SARMA, JOHN R. WILLIAMS"RFID Technology and Applications" Cambridge
University Press 2008.
3. Yan Zhang and Paris Kistos "Security in RFID and sensor networks" CRC press 2009.

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Credit Based Grading System

Electronics & Communication Engineering, VI-Semester

Elective-II EC- 6005 (3) Statistical signal Processing

UNIT- I : REVIEW :
IIR and FIR filters design, Filtering problems, Advanced signal processing techniques and transforms, Multirate Signal processing – Down sampling/up sampling, Introduction to discrete Hilbert transform, wavelet transform, Haar transform.
State Estimation Filter- Concept of Estimation of linear and nonlinear signals, estimation Wiener Filter Non linear Estimation-Concept of sufficient statistics and statistical estimation of parameters .

UNIT- II : ADAPTIVE FILTERING :
Introduction to Adaptive filtering, Types of adaptive filters, Introduction to Statistical signal Detection, Four classes of application in interference (noise, echo) cancellation, Identification, Inverse modeling, prediction. Least mean square filter (LMS), Recursive least square filter (RLS), Simulation and design of LMS and RLS filters ,its Applications. Binary decisions with multiple observations, Vector observations, Waveform Observation, Detection of signals in additive Gaussian Noise, random noise and color noise.

UNIT- III : KALMAN FILTERS :
Introduction to Kalman Filters (KF) . Adaptive beam forming. Kalman filtering.state measurement and estimation for scalar random variables , prediction and estimation of Linear signals, design techniques, Extended Kalman filter (EKF), prediction and estimation of nonlinear signals, applications of KF,EKF in audio and speech signals detection.

UNIT- IV :
Filtering of Random Processes, Spectral factorization, Special types of Random Processes, The Levinson-Durbin Recursion, The Inverse Levinson-Durbin Recursion, The Cholesky Decomposition, Inverting a Toeplitz matrix.

UNIT – V :
Wiener filtering, The FIR Wiener filter, Linear prediction, Noise Cancellation, The IIR Wiener filter, Causal and noncausal IIR Wiener filter, Causal Wiener filtering, Causal linear Prediction, Wiener deconvolution.

References :
1. “Statistical Signal Processing Vol. 1 : Estimation Theory, vol. 2 :
Detection Theory “ by Steven. M. Kay, Prentice Hall Inc, 1995.
2. “Adaptive Filter theory” by S. Haykin, Pearson Education publication.
3. “Detection, Estimation and Modulation Theory Part 1” by Harry L. Van Trees, John
Wiley & Sons Inc, 1968.
4. “Statistical Digital Signal Processing and Modeling” by Monson H. Hayes, John Wiley and Sons, Inc.

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Credit Based Grading System

Electronics & Communication Engineering, VI-Semester

Elective-II EC- 6005 (4) IPR (Intellectual Property Rights)

Course Objective

Acquaint the students with the basic concepts of Intellectual Property Rights; and sensitize the students with the emerging issues in IPR and the rationale for the protection of IPR.

UNIT I Introduction

Introduction and Justifications of IPR, Nature of IP, Major forms of IP- *Copyright, Patent, Trade Marks Designs, Geographic indication, layout design of Semi conductors, Plant varieties, Concept & Meaning of Intellectual Property.*

Major international documents relating to the protection of IP - *Berne Convention, Paris Convention, TRIPS*. The World Intellectual Property Organization (WIPO).

UNIT II Copyright

Meaning and historical development of copyright , Subject matter , Ownership of copyright, Term of copyright, Rights of owner, Economic Rights, Moral Rights. Assignment and licence of rights, Infringement of copyright, Exceptions of infringement, Remedies, *Civil, Criminal, Administrative*, Registration Procedure.

UNIT III Patents

Meaning and historical development,. Criteria for obtaining patents, Non patentable inventions, Procedure for registration, Term of patent, Rights of patentee, Compulsory licence, Revocation, Infringement of patents, Exceptions to infringement, Remedies, Patent office and Appellate Board.

UNIT IV – Trade Marks, Designs & GI

Trade Marks: Functions of marks, Procedure for registration, Rights of holder, Assignment and licensing of marks, Infringement, Trade Marks Registry and Appellate Board.

Designs: Meaning and evolution of design protection, Registration, Term of protection, Rights of holder, unregistered designs.

Geographical Indication: Meaning and evolution of GI, Difference between GI and Trade Marks, Registration, Rights, Authorised user.

UNIT V Contemporary Issues & Enforcement of IPR

IPR & sustainable development, The Impact of Internet on IPR. IPR Issues in biotechnology, E-Commerce and IPR issues, Licensing and enforcing IPR, Case studies in IPR

Course Outcome:

1. Students will be able to understand Primary forms of IPR
2. Students will be able to asses and critique some basic theoretical justification for major forms of IP Protection
3. Students will be able to compare and contrast the different forms of IPR in terms of key differences and similarities.
4. Students will be able understand the registration procedures related to IPR.
5. Students will be exposed to contemporary issues and enforcement policies in IPR.

References:

1. P. Narayanan, Intellectual Property Law, Eastern Law House

2. . Neeraj Pandey and Khushdeep[Dharni, Intellectual Property Rights, PHI, 2014

3. N.S Gopalakrishnan and T.G. Agitha, Principles of Intellectual Property, Eastern Book Co. Lucknow, 2009.

4. Anand Padmanabhan, Enforcement of Intellectual Property, Lexis Nexis Butterworths, Nagpur, 2012.

5. Managing Intellectual Property The Strategic Imperative, Vinod V. Sople, PHI.

6. Prabuddha Ganguli, " Intellectual Property Rights" Mcgraw Hill Education, 2016.

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Credit Based Grading System

Electronics & Communication Engineering, VI-Semester

EC- 6006 Workshop-II

Course Contents

Use and application of Electronic Instruments: CRO, Function generator, Conception Level Introduction: Specifying Parts, Packages and Pin Names, Libraries and Checking foot prints of the components, Partlist, Netlist, Making Netlist Files, Placing Parts, Routing Traces, Modifying Traces, Mounting Holes, Adding Text, PCB Layout, DRC, Pattern Transfer etc.

PCB FABRICATION PROCESS: Etching, cleaning, drying and drilling etc.

ASSEMBLING AND TESTING : Identifying the components and its location on the PCB, soldering of active and passive components, Testing the assembled circuit for correct functionality, Prototype designing etc.

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Credit Based Grading System

Electronics & Communication Engineering, VI-Semester

EC-6007 Creativity and Entrepreneurship Development

Course Objective:

- Understand and use tools for generating entrepreneurial ideas and problem solving.
- Understand and use tools for the selection of ideas.
- Understand and gain the skills that are needed to implement ideas in today's society
- Understand Entrepreneurship's part in process that includes idea generation and implementation.
- Understand the concept of Entrepreneurship and its place in today's society

Course Outcomes:

- Recognize an opportunity for a user group and frame an appropriate design challenge that addresses the need for the user.
- Practice observation, interview and empathy skills to evolve a thorough understanding of the needs of the user.
- Share and integrate team leanings.
- Generate, develop and describe creative ideas that address the design challenge.

Syllabus:

1. The concept of Entrepreneurship, its history and its place in society.
2. The concept of Entrepreneurship and its relation to concept of innovation.
3. Creative processes for idea generation and problem solving.
4. Business plan.
5. Role of creativity, innovation and business research.
6. Entrepreneurship opportunities in contemporary business environment.

Reference Books :

1. Dollinger M.J. "Entrepreneurship strategies and resources," 3rd edition Pearson Education New Delhi.
2. Panda, Shiba charan "Entrepreneurship development", Anmol publication New Delhi.
3. Richard Blundel & Nigel locket, "Exploring Entrepreneurship : practices & perspectives Oxford.
4. Charles E. Banford & Garry D. Bruton, "Entrepreneurship – A small business Approach, Mcgrawhill Education.
5. P. Narayana Reddy, "Entrepreneurship" : Text and cases, Cengage learning
6. Rajeev Roy, "Entrepreneurship" Oxford.

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Credit Based Grading System

Electronics & Communication Engineering, VIII-Semester

EC- 8001 VLSI Design

UNIT I

Introduction, Size and complexity of Integrated Circuits, The Microelectronics Field, IC Production Process, Processing Steps, Packaging and Testing, MOS Processes, NMOS Process, CMOS Process, Bipolar Technology, Hybrid Technology, Design Rules and Process Parameters.

UNIT II

Dc Models, Small Signal Models, MOS Models, MOSFET Models in High Frequency and small signal, Short channel devices, Sub threshold Operations, Modeling Noise Sources in MOSFET's, Diode Models, Bipolar Models, Passive component Models.

UNIT III

Introduction, Circuit Simulation Using Spice, MOSFET Model, Level 1 Large signal model, Level 2 Large Signal Model, High Frequency Model, Noise Model of MOSFET, Large signal Diode Current, High Frequency BJT Model, BJT Noise Model, Temperature Dependence of BJT.

UNIT IV

Random Logic and Structured Logic Forms, Register Storage Circuits, Quasi Static Register Cells, A Static Register Cell, Micro coded Controllers, Microprocessor Design, Systolic Arrays, Bit-Serial Processing Elements, Algotronix.

UNIT V

Basic CMOS Technology, A Basic n-well CMOS Process, Twin Tub Processes, CMOS Process Enhancement, Interconnects and Circuit Elements, Layout Design Rules, Latch up, Physical Origin, Latch up Triggering, Latch up Prevention, Internal Latch up Prevention Techniques.

List of Practicals:

1. Introduction to Simulation tools ie Microwind/Synopsis/Tanner Tool etc.
2. Simulation and analysis of basic logic and circuits.
3. Familiarization with MOS model parameters in PSPICE software.
4. Simulation of MOS Inverter with different loads using PSPICE software.

5. Simulation of CMOS Inverter for different parameters *Kn*, *Kp* as a design variable in PSPICE software.
6. Study of the switching characteristics of CMOS Inverter and find out noise margins.
7. Simulate CMOS amplifier using PSPICE software.
8. Layout design of a CMOS Inverter using any layout design tool. Layout design of a 2-input CMOS NAND/NOR gate using any layout design tool.
9. Simulate 1-bit full adder following behavioral and structural modeling using VHDL\Verilog.

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.
6. Botkar: Integrated Circuits, Khanna Publishers.
7. Sze: VLSI Technology, TMH.

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Credit Based Grading System

Electronics & Communication Engineering, VIII-Semester

EC- 8002 ADVANCED COMMUNICATION SYSTEM

Unit-I

Spread Spectrum Modulation: Introduction, frequency hopping multiple access, CDMA, cellular CDMA systems, multi user detection, time hopping impulse radio.

Unit-II

Introduction, principle of OFDM, implementation of transceivers, frequency-selective channels, channel estimation, peak to average power ratio, inter carrier interference, adaptive modulation and capacity, multiple access, multi carrier code division multiple access, single carrier modulation with frequency-domain equalization.

Unit-III

Multi antenna system: smart antennas, multiple input multiple output systems, multi user MIMO.

Unit-IV

Problem description, cognitive transceiver architecture, principle of interweaving, spectrum sensing, spectrum management, spectrum sharing, overlay, underlay.

Unit V

Introduction and motivation, fundamentals of relaying, relaying with multiple parallel relays, routing and resource allocation in multi hop networks, routing and resource allocation in collaborative networks, applications, network coding.

List of Practicals:

1. Study and analysis of direct sequence spread spectrum communication system.
2. Study and analysis of frequency hppping spread spectrum communication system.
3. Study and analysis of acquisition and tracking system.
4. Study and analysis of OFDM architecture.
5. Study and analysis of cognitive trans-receiver.
6. Study and simulation of distance vector routing.
7. Study and simulation of Link state routing.

References:

1. Molisch: Wireless Communications, Wiley India.
2. Upena Dalal: Wireless Communications, Oxford University Press.
3. Kamilo Feher: Wireless Digital Communications, PHI Learning.
4. Zeimer, Peterson and Borth: Introduction to Spread Spectrum Communication, Pearson Education.
5. Mullet: Introduction to Wireless Telecommunication Systems and Networks, Cengage Learning.

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Credit Based Grading System

Electronics & Communication Engineering, VIII-Semester

Elective-V EC-8003 (1) Principles Management & Economics

Unit I

Management Concept: Management, Administration and Organization Difference and Relationship between Organization Management and Administration. Importance of Management, Characteristics of Management.

Unit II

Management: Scientific Management, Principles of Management, Process of Management, Functions of Management, Levels of Management, Project Management.

Unit III

Decision Making: Introduction and Definition, Types of Decisions, Techniques of Decision Making, Decision making under certainty Decision making under uncertainty, Decision Making under risk.

Unit IV

Managerial Economics: Introduction, Factors Influencing Manager, Micro and Macro-economics, Theory of the Cost, Theory of the Firm, Theory of Production Function.

Unit V

Productivity: Input-Output Analysis, Micro-economics Applied to Plants and Industrial Undertakings, Production and Production system, Productivity, Factors affecting Productivity, Increasing Productivity of Resources.

References:

1. Peter Drucker, Harper and Row: The Practice of Management.
2. Koontz: Essentials of Management, TMH.
3. Staner: Management, PHI Learning.
4. Daft: Principles of Management, Cengage Learning.
5. T. N. Chhabra: Principle and Practice of Management, Dhanpat Rai, New Delhi.
6. Hirschey: Managerial Economics, Cengage Learning.
7. T. R. Banga and S.C. Sharma: Industrial Organisation and Engineering Economics, Khanna Publishers.

8. O.P. Khanna: Industrial Engineering and Management, Dhanpat Rai.
9. Joel Dean: Managerial Economics, PHI learning.
10. V. L. Mote, Samuel Paul and G.S. Gupta: Managerial Economics Concepts & Cases, TMH, New Delhi.
11. V. L. Mote: Managerial Economics, TMH, New Delhi.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

Credit Based Grading System

Electronics & Communication Engineering, VIII-Semester

Elective-V EC-8003 (2) Mobile Computing

Unit I:

Antenna , radiation pattern, antenna types, antenna gain, propagation modes, types of fading. Model for wireless digital communication, multiple access technique-SDMA, TDMA, FDMA, CDMA, DAMA, PRMA, MAC/CA, Cellular network organization, operations of cellular system, mobile radio propogation effects, , handoff, power control, sectorization, traffic engineering, Infinite sources, lost calls cleared, grade of service, poison arrival process.

Unit II:

GSM- Services, system architecture, radio interface, logical channels, protocols, localization and calling, handover, security, HSCSD, GPRS-architecture, Interfaces, Channels, mobility management DECT, TETRA, UMTS.

Unit III:

IEEE 802.11: LAN-architecture, 802.11 a, b and g, protocol architecture, physical layer, MAC layer , MAC management, HIPERLAN-protocol architecture, physical layer, access control sub layer, MAC sub layer. Bluetooth-user scenarios- physical layer, MAC layer.

Unit IV:

Mobile IP, DHCP, Ad hoc networks: Characteristics, performance issue, routing in mobile host. Wireless sensor network, Mobile transport layer: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing, Selective retransmission, transaction oriented TCP. Introduction to WAP.

Unit V:

Intruders, Intrusion detection, password management, viruses and related threads, worms, trojan horse defense, difference biometrics and authentication system, firewall design principle.

References:-

1 J. Schiller, "Mobile Communication", Addision , Wiley

2 William C.Y Lee, "Mobile Communication Design Fundamental", John Wiley.

3 Upena Dalal," Wireless Communication", Oxford Higher Education

4 Dr. Kamilo Feher, "Wireless Digital communication", PHI

5 William Stalling, "Wireless Communication and Network", Pearson Education

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Credit Based Grading System

Electronics & Communication Engineering, VIII-Semester

Elective-V EC-8003 (3) Digital Control System

UNIT I

Basic element of discrete data control system, advantages of discrete data control system, introduction to Z-transform, Z-transform of elementary function, their properties and theorems, inverse Z-transform, Z-transform method for solving difference equations, limitations of Z-transform method.

UNIT II

sampling theorem, Impulse sampling and data hold, reconstructing original signals from sampled signals, the pulse transfer function, pulse transfer function of zero order hold and the relation between G(S) and G(Z), closed loop systems, the sampled signal flow graph.

UNIT III

Mapping between the S plane and the Z plane, stability analysis of closed loop systems in Z-plane, Jury stability test, transient and steady state response analysis, design based on root locus method.

UNIT IV

Introduction to State space analysis, state space representation of discrete time system, solving discrete time state space equation, pulse transfer function matrix, discretization of continuous time state space equation, Liaqpunov stability analysis.

UNIT V

Controllability, Observeability, Useful transformations in state space analysis and design, design via pole placement, state observers.

Reference Books :

- Digital Control -B.C. Kuo
- Control System Engineering – Nagrath Gopal
- Discrete time control systems – Katsuhiko ogata
- Control systems, principles and design – M Gopal

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Credit Based Grading System

Electronics & Communication Engineering, VIII-Semester

Elective-VI EC-8004 (1) Advanced Digital Signal Processing

Unit I

Introduction: Introduction of signals, systems and signal processing, discrete time systems, Discrete Time Fourier Transform, Z Transform.

Unit II

Discrete Random Signals: Discrete Time random process, Average spectrum representation of infinite energy signals, response of linear system to random signals.

Power Spectrum Estimation:

Basic principles of spectrum estimation, estimates of the auto covariance, power spectrum, cross covariance and cross spectrum.

Unit III

Discrete Fourier Transform: Discrete Fourier series, Discrete Fourier Transform (DFT), properties of DFT, linear convolution using the DFT, two dimensional DFT, FFT algorithms, Radix-2 , Radix-4 and split – Radix calculation.

Unit IV

Digital Filter Design Techniques: design of IIR and FIR digital filters , computer aided design of IIR and FIR, design of digital filter based on least square method , comparison of IIR and FIR design of digital filter based on least square method , comparison of IIR and FIR digital filters.

Unit V

Linear Predictors And Optimum Linear Filters: Relationship between filter parameter and auto correlation sequence, forward and backward linear prediction.

Multi Rate Digital Signal Processing: decimation by a factor D , interpolation by factor I, sampling rate conversion by a rational factor I/D , filter design and implementation for sampling rate conversion.

Reference Books:

- Discrete time signal processing by Oppenheim Schafer.
- Digital signal processing by S.K.Mitra.
- Digital signal processing by J. G. Proakis.

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Credit Based Grading System

Electronics & Communication Engineering, VIII-Semester

Elective-VI EC-8004 (2) Cyber Security & IOT

Unit I

Introduction, Classifications of Cybercrimes: E-Mail Spoofing, Spamming, Cyber defamation, Industrial Spying/Industrial Espionage, Hacking, Software Piracy, Password Sniffing, Credit Card Frauds, Cyberstalking, Botnets, Phishing, Pharming, Man-in-the-Middle attack, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Malware, Ransomware, Types of Identity Theft, Techniques of ID Theft, Cyber terrorism, Browser Attacks, Reverse Engineering, Cross site scripting

Unit II

Introduction to Cyber Security, Cyber Security Goals, Cyber Security policy, Domain of Cyber Security Policy, Elements, Cyber Security Evolution, Implementing Hardware Based Security, Software Based Firewalls, Security Standards, Assessing Threat Levels, Forming an Incident Response Team, Reporting Cybercrime, Difference between cyber forensics and cyber security.

Unit – III

The Internet of Things: An Overview, The "Internet" of "Things", The Technology of the Internet of Things, Importance of Internet of Things, Understanding Smart Devices, Design Principles for Connected Device, Network Connections, Traditional Network, Transferring Data Over a Network, Understanding IP Address, Wireless Technologies, Wi-Fi, Bluetooth, Cellular Networks, Mesh Networks.

Unit – IV

Internet Principles, Internet Communications, IP, TCP, The IP Protocol Suite (TCP/IP), UDP, IP addresses, DNS, Static IP address Assignment, Dynamic IP Address Assignment, IPv6, MAC Address, TCP and UDP Ports, HTTP Ports other Common Ports, Application Layer Protocols.

Unit – V

Prototyping: Sketching, Familiarity, Cost versus Ease of Prototyping, Prototypes and Production, Embedded Platform, Physical Prototypes and Mass Personalization, Introduction to Cloud, Climbing into the Cloud, Open Source, Closed Source, Mixing Open and Closed Source.

Reference Books

1. Nina Godbole and Sunit Belpure , Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley
2. Jennifer L. Bayuk, J. Healey, P. Rohmeyer, Marcus Sachs, Jeffrey Schmidt, Joseph Weiss Cyber Security Policy Guidebook, John Wiley & Sons 2012.
3. McEwen Adrian and Cassimally Hakim, "Designing the Internet of Things" Wiley India Pvt. Ltd., 2016.
4. Miller Michael, "The Internet of Things", Pearson India Education Services Pvt. Ltd., 2015.

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Credit Based Grading System

Electronics & Communication Engineering, VIII-Semester

Elective-VI EC-8004 (3) RADAR ENGINEERING

Unit-I

Radar block diagram and operation, radar range equation, application of radar, pre diction of range performance, receiver, integration of radar pulses, radar cross section, PRF, Doppler effects, CW radar, FMCW radar, FM CW altimeter, multiple frequency radar.

Unit-II

MTI radar, delay line canceller, multiple or staggered pulse repetition, Doppler filter, MTI radar processor, limitations to MTI performance.

Unit-III

Radar cross section, Scattering cross section, effect of polarization on cross section, target scattering matrixes.

Unit-IV

Radar signal and networks, real radar signals, complex radar signals, analytical radar signals,duration frequency and bandwidth of signals, transmission of signals through networks, matched filter, ambiguity function, uncertainty function.

Unit-V

Radar receiver, display, duplexer, radar antenna, radar resolution, noise figure, mixers, low noise front ends, displays- type A and PPI representations, receiver protectors.

Reference Books:

1. Skolnik: Introduction to Radar Systems, TMH.
2. Toomay and Hannen: Principles of Radar, PHI Learing.
3. Edde: Radar- Principles, Technology Applications, Pearson Education.
4. Peebles: Radar Principles, Wiley India.