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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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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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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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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Electronics & Communication Engineering VI-Semester

EC- 601 Digital signal Processing

EC- 601 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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Electronics & Communication Engineering, VI-Semester

EC- 602 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

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,

Unit IV

Aperture and slot Radiation from rectangular apertures, Uniform and Tapered aperture, Horn antenna , Reflector antenna , Aperture blockage , Feeding structures , Slot antennas ,Microstrip antennas – Radiation mechanism – Application ,Numerical tool for antenna analysis

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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Electronics & Communication Engineering, VI-Semester

Departmental Elective EC- 603 (A) DATA COMMUNICATION

Unit-I

Data Communication: Introduction, Components, data representation Serial & Parallel transmission , Modes of data transmission, Line Encoding: Unipolar, Polar, Bipolar, Networks – Protocols and standards – Standards organizations – Line configurations – Topology – Transmission mode – Categories of networks – Inter networks.

Unit-II

OSI model: Functions of the layers.
Transmission media: Guided media – Unguided media – Transmission impairment – Performance.
Switching
Circuit switching , packet switching (virtual circuit and datagram approach), message switching

Unit-III

ERROR CONTROL AND DATA LINK PROTOCOLS

Error detection and correction: Types of errors – Detection – Vertical Redundancy Check (VRC) – Longitudinal Redundancy Check (LRC) – Cyclic Redundancy Check (CRC) – Check sum – Error Correction. Data Link Layer Protocols: Framing , HDLC, ARQ: Stop and Wait, Sliding Window. Efficiency

Unit-IV NETWORKS
LAN: Project 802 – Ethernet – Token bus – Token ring – FDDI.
MAN: IEEE 802.6 (DQDB) – SMDS.
X.25, FRAME RELAY, ATM AND SONET/, SDH

Unit-V. NETWORKING DEVICES AND TCP / IP PROTOCOL SUITE
Networking and internetworking devices: Repeaters – Bridges – Gateways – Other devices – Routing algorithms – Distance vector routing – Link state routing.
TCP / IP protocol suite: Overview of TCP/IP.

REFERENCE BOOKS

1. Data and Computer Communication – W. Stallings, Pearson
2. LANs – Keiser, Tata Mc-Graw Hill
3. Data Communication & Networking – B.A. Forouzan, Tata Mc-Graw Hill
4. Internetworking with TCP/IP – VOL-I – D.E. Comer, PHI
5. ISDN and Broad band ISDN with Frame Relay & ATM – W. Stallings, Pearson

Textbooks:

1. Computer Networks by Tanenbum/PHI.

2. Data Networks: Bertsekas & Gallager.

3. Shay, William A. / “Understanding Data communications & Networks” / Vikas Publishing HousePvt. Ltd.

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Electronics & Communication Engineering, VI-Semester

Departmental Elective EC- 603 (B) CMOS DESIGN

Unit I

Introduction

Introduction to CMOS VLSI circuit, VLSI design flow, Design strategies ,Hierarchy, 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

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 V

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.

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. Geiger, Allen and Strader: VLSI Design Techniques for Analog and Digital Circuits, TMH.
5 Sorab Gandhi: VLSI Fabrication Principles, Wiley India.
6. Weste and Eshraghian: Principles of CMOS VLSI design, Addison-Wesley

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Electronics & Communication Engineering, VI-Semester

Departmental Elective EC- 603 (C) Satellite Communication

Unit-I

Overview of satellite systems: Introduction, Frequency allocations for satellite systems.

Orbits and launching methods: Kepler's three laws of planetary motion, terms used for earth orbiting satellites, orbital elements, apogee and perigee heights, orbit perturbations, inclined orbits, local mean solar point and sun-synchronous orbits, standard time.

Unit-II

The Geostationary orbit: Introduction, antenna look angles, polar mount antenna, limits of visibility, near geostationary orbits, earth eclipse of satellite, sun transit outage, launching orbits.

Polarization: antenna polarization, polarization of satellite signals, cross polarization discrimination.

Depolarization: ionospheric, rain, ice.

Unit-III

The Space segment: introduction, power supply, attitude control, station keeping, thermal control, TT&C subsystem, transponders, antenna subsystem, Morelos and Satmex 5, Anik-satellites, Advanced Tiros-N spacecraft.

The Earth segment: introduction, receive-only home TV systems, master antenna TV system, Community antenna TV system, transmit-receive earth station.

Unit-IV

The space link: Introduction, Equivalent isotropic radiated power (EIPR), transmission losses, the link power budget equation, system noise, carrier-to-noise ratio (C/N), the uplink, the downlink, effects of rain, combined uplink and downlink C/N ratio, inter modulation noise, inter-satellite links. Interference between satellite circuits.

Unit-V

Satellite services

VSAT (very small aperture terminal) systems: overview, network architecture, access control protocols, basic techniques, VSAT earth station, calculation of link margins for a VSAT star network.

Direct broadcast satellite (DBS) Television and radio: digital DBS TV, BDS TV system design and link budget, error control in digital DBS-TV, installation of DBS-TV antennas, satellite radio broadcasting.

References:

1. Roddy: Satellite Communications, TMH.
2. Timothy Prattt: Satellite Communications, Wiley India.
3. Pritchard, Suyderhoud and Nelson: Satellite Communication Systems Engineering, Pearson Education.
4. Agarwal: Satellite Communications, Khanna Publishers.
5. Gangliardi: Satellite Communications, CBS Publishers.
6. Chartrand: Satellite Communication, Cengage Learning.
7. Raja Rao: Fundamentals of Satellite communications, PHI Learning.

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Electronics & Communication Engineering, VI-Semester

Open Elective EC- 604 (A) Microcontroller & Embedded system

UNIT-I

8051 Interfacing, Applications and serial communication

8051 interfacing to ADC and DAC, Stepper motor interfacing, Timer/ counter functions, 8051 based data acquisition system 8051 connections to RS-232, 8051 Serial communication , Serial communication modes, Serial communication programming, Serial port programming in C.

UNIT II:

Microcontroller 8096 Introduction to 16-bit Microcontroller, functional block-diagram, memory status, complete 8096 instruction set, classification of instruction set, addressing modes, programming examples using 8096, hardware features of 8096,parallel ports, control &status Registers, Introduction to 16/32 bit PIC microcontrollers and DSPIC.

UNIT-III

Introduction to Embedded Systems:

Definition of embedded system, embedded systems vs. general computing systems, history of embedded systems, classification, major application areas, purpose of embedded systems, characteristics and quality attributes of embedded systems, common design metrics, and processor technology: general purpose processor, application specific processor, single purpose processor.

UNIT-IV

Embedded System Architecture:

Von Neumann v/s Harvard architecture, instruction set architecture, CISC and RISC instructions set architecture, basic embedded processor, microcontroller architecture, CISC & RISC examples: 8051, ARM, DSP processors.

UNIT-V

Input Output and Peripheral Devices

Timers and counters, watchdog timers, interrupt controllers, PWM, keyboard controller, analog to digital converters, real time clock.

Reference Books:

1. Muhammad Ali Mazidi and Janice Gillespie Mazidi, The 8051 Microcontroller and Embedded Systems, Pearson education, 2005.

2. Kenneth J. Ayala, The 8051 Microcontroller Architecture, III edition, CENGAGE Learning.

3. V. Udayashankara and M.S. Mallikarjunaswamy, 8051 Microcontroller: Hardware, Software & Applications, Tata McGraw - Hill, 2009.

4. McKinlay, The 8051 Microcontroller and Embedded Systems - using assembly and C, PHI, 2006 / Pearson, 2006.

5. Tim Wilmshurst, Designing embedded system with PIC microcontrollers Principles and applications. 2nd ed. 2011 Bsp books pvt lt

6. Shibu K V, “Introduction to Embedded System”, TMH.

7. David E Simon, “An Embedded Software Primer”, Pearson education Asia, 2001.

8. Steven F. Barett, Daniel J. Pack, “Embedded Systems” Pearson education, First Impression2008.

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New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering, VI-Semester

Open Elective EC- 604 (B) BIOMEDICAL ELECTRONICS

UNIT I - PHYSIOLOGY AND TRANSDUCERS

Cell and its structure - Resting and Action Potential - Nervous system: Functional organization of the nervous system - Structure of nervous system, neurons - synapse -transmitters and neural communication - Cardiovascular system - respiratory system - Basic components of a biomedical system - Transducers - selection criteria - Piezo electric, ultrasonic transducers – Temperature measurements - Fiber optic temperature sensors.

UNIT II - ELECTRO - PHYSIOLOGICAL MEASUREMENTS

Electrodes -Limb electrodes -floating electrodes - propelled disposable electrodes - Micro, needle and surface electrodes - Amplifiers: Preamplifiers, differential amplifiers, chopper amplifiers -Isolation amplifier. ECG - EEG - EMG - ERG - Lead systems and recording methods – Typical waveforms. Electrical safety in medical environment: shock hazards - leakage current- Instruments for checking safety parameters of biomedical equipments

UNIT III - NON-ELECTRICAL PARAMETER MEASUREMENTS

Measurement of blood pressure - Cardiac output - Heart rate - Heart sound -Pulmonary function measurements - Spiro meter - Photo Plethysmography, Body Plethysmography - Blood Gas analyzers : pH of blood -measurement of blood pCO2, pO2, finger-tip oxymeter - ESR, GSR measurements .

UNIT IV - MEDICAL IMAGING

Radio graphic and fluoroscopic techniques - Computer tomography - MRI - Ultrasonography - Endoscopy - Thermography - Different types of biotelemetry systems and patient monitoring - Introduction to Biometric systems

UNIT V- ASSISTING AND THERAPEUTIC EQUIPMENTS

Pacemakers - Defibrillators - Ventilators - Nerve and muscle stimulators - Diathermy - Heart - Lung machine - Audio meters - Dialysers - Lithotripsy

REFERENCES

1. M.Arumugam, ‘Bio-Medical Instrumentation’, Anuradha Agencies, 2003.
2. L.A. Geddes and L.E.Baker, ‘Principles of Applied Bio-Medical Instrumentation’, John Wiley & Sons, 1975.
3. J.Webster, ‘Medical Instrumentation’, John Wiley & Sons, 1995.
4. C.Rajarao and S.K. Guha, ‘Principles of Medical Electronics and Bio-medical Instrumentation’,Universities press (India) Ltd, Orient Longman ltd, 2000.

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New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering, VI-Semester

Open Elective EC- 604 (C) POWER ELECTRONICS

Unit-1

Power Semiconductor Switches

Power diodes - Basic structure and V-I characteristics - various types - **DIACs** – Basic structure and V-I characteristics – **TRIACs** - Basic structure and V-I characteristics

Power BJT: Construction and working principle, quasisaturation, primary breakdown, secondary breakdown.

IGBTs - Basic structure and V-I characteristics.

Power MOSFETs - Basic structure and V-I characteristics

Thyristors - basic structure - static and dynamic characteristics - device specifications and ratings - methods of turning on - gate triggering circuit using UJT

Unit 2:

Rectifiers

Thyristors- series and parallel operation, methods of turning off - commutation circuits.

Line frequency phase controlled rectifiers using SCR

Single Phase – Half wave rectifier with R and RL loads – Full wave half controlled and fully controlled converters with continuous and constant currents - Input side harmonics and power factor - Effect of source inductance

Three Phase - Half wave rectifier with R and RL loads - Full wave fully controlled converters with continuous and constant currents

Unit 3: Inverters & Cycloconverters Inverters – Single phase inverters – series, parallel and bridge inverters. Single Phase Pulse Width Modulated (PWM) inverters – Basic circuit and operation.

Single phase series resonant inverter, Single phase bridge inverters,Three phase bridge inverters, Voltage control of inverters, Harmonics reduction techniques, Single phase and three phase current source inverters

Unit-IV

AC Voltage Controllers

Principle of On-Off and phase controls, Single phase ac voltage controller with resistive and inductive loads Three phase ac voltage controllers (various configurations and comparison only), Single phase transformer taps changer. Cyclo Converters-Basic principle of operation, single phase to single phase, three phase to single phase and three phase to three phase cyclo converters, output voltage equation

Unit V: DC – DC Converters

Choppers - Principle of operation - step-up and step-down choppers.

Switching regulators - Buck regulators - Boost regulators - Buck-boost regulators - Switched mode power supply - principle of operation and analysis

Text/Reference Books:

1. Ned Mohan, Power Electronics., John Wiley and Sons, 2nd edition, 1995.

2. Rashid, Power Electronics, Circuits Devices and Applications, Pearson Education, 3rd edition, 2004.

3. G.K.Dubey, Thyristorised Power Controllers, Wiley Eastern Ltd, 1993.

4. Dewan & Straughen, Power Semiconductor Circuits, John Wiley & Sons, 1975.

5. Cyril W Lander, Power Electronics, Mc Graw Hill, 3rd edition, 1993.

6. M.D. Singh and K.B.Khanchandani, "Power Electronics"Tata MC Graw Hill, 2005

7. P.C Sen, "Principles of Electric Machines and Power Electronics", John Wiley & Sons, 2nd Edition.

8. P.S Bhimbhra , " Power Electronics", Khanna Publishers, 2012

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New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering VI-Semester

EC- 605 DATA COMMUNICATION LAB

1	TO STUDY VARIOUS MULTIPLEXING TECHNIQUES
2	TO STUDY OF NETWORK INTERFACE CARD (NIC)
3	TO STUDY OF PARALLEL AND SERIAL TRANSMISSION
4	TO STUDY OF NRZ AND RZ CODES
5	TO STUDY OF DIFFERENT TYPES OF MODEM.
6	TO STUDY OF INTEGRATED SERVICES DIGITAL NETWORK.
7	TO STUDY OF TWISTED PAIR, COAXIAL CABLE AND FIBRE OPTIC CABLE.
8	TO STUDY OF DIGITAL INTERFACE RS-232.
9	TO STUDY DIFFERENT TOPLOGIES.
10	TO STUDY LAN USING STAR TOPOLOGY

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New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering VI-Semester

EC- 606 MICROCONTROLLER & EMBEDDED SYSTEM LAB

- 1. Programming using arithmetic, logical and bit manipulation instructions of 8051.
- 2. Program and verify Timer/Counter in 8051.
- 3. Communication between 8051 kit and PC.
- 4. To study development tools/environment for ATMEL/PIC microcontroller program and Architecture.
- 5. Write an ALP to generate square of 10Khz using Timer 0.
- 6. Write an ALP to display a string on LCD.
- 7. Write an ALP to interface seven segment with 8051 and display 0-9 on it.
- 8. Write an ALP to interface DC Motor with 8051
- 9 Write an ALP to transmit the data using P1 of 8051
- 10. Write an ALP to interface 4x4 keyboard with 8051.
- 11. Write an ALP to interface temperature sensor using 8051
- 12. Write an ALP to interface the lcd 16x2 to P16f877A

- **As per Keil software available in department.**

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Electronics & Communication Engineering, VIII-Semester

EC801- Optical Fibre Communication

PREREQUISITE:-Engineering Physics, Communication Engineering

COURSE OUTCOME:-

Students should be able to:

1. Understand Optical Fiber Communication System and itsparameters.
2. Analyze transmission characteristics of optical fiber
3. Understand the construction and operation of various optical sources anddetectors.
4. Performance analysis of opticalreceivers and study of fiber joints
5. Brief introduction of optical fibernetworks and amplifiers

Unit 1. Introduction to vector nature of light, propagation of light, propagation of light in a cylindrical dielectric rod, Ray model, wave model. Different types of optical fibers, Modal analysis of fiber. Optical fibres : Structure & wave guiding fundamentals, basic optical laws.

Unit 2. Signal degradation in Optical Fibre : Signal degradation on optical fiber due to dispersion and attenuation, intermodal and intramodal dispersion, Fabrication of fibers and measurement techniques like OTDR

Unit 3. Optical sources and detectors: LEDs, LASER diodes, Basic concepts of optical Sourcesvarious laser and LED structures, Optical detectors: basic principle of photo detection, PIN and avalanche photo diode, phototransistor, photo detector noise, detector response time.

Unit 4. Optical transceivers; Direct detection and coherent receivers, noise in detection process, digital receiver performance calculation, BER, System design, power budgeting, rise time budgeting; fibre joints, and splicing techniques, Optical fibre connectors.

Unit 5.Optical networks and amplifiers- Optical networks : Topologies, networks SONET and SDH. Optical amplifiers - EDFA, Raman amplifier, and WDM systemsPassive Optical Networks.

TEXT BOOKS RECOMMENDED:-

1. Senior J.M., Optical Fibre Communications: Principles & Practice, 2nd ed. 2001,PHI.
2. Agrawal Govind P., Fibre Optic Communication Systems, 5th ed. 2001, John Wiley & Sons, studentsed.
3. Black Uyless, Optical Networks and 3rd Genration Transport Systems, 3rd ed. 1998,Pearson.

REFERENCE BOOKS RECOMMENDED:-

1. Keiser G, Optical Fibre Communication, 5th ed. 2006, McGrawHill.
2. Mynbanv and Scheiner, Fibre Optic Communication Technology, 2n^{d} ed 2010, PearsonEdu.
3. Djfar K Mynbaev &Scheiner, Fibre Optic Communication Technology, 5th ed. 2005,Pearson

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New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering, VIII-Semester

Departmental Elective EC 802 (A) AI & Signal Processing

Course Objective:
To impart knowledge about Artificial Intelligence and to give understanding of the main abstractions and reasoning for intelligent systems and signal processing.

Course Outcomes:
1. Ability to develop a basic understanding of AI building blocks presented in intelligent agents.
2. Ability to choose an appropriate problem-solving method and knowledge representation technique.
3. Ability to analyze the strength and weaknesses of AI approaches to knowledge-intensive problem-solving.

4. Understand real time applications of Fourier transform.

5. Describe discrete time systems in terms of difference equations.

UNIT-I

Introduction of AI

What is AI? Foundations of AI, History of AI, Agents and environments, The nature of the Environment, Problem solving Agents, Problem Formulation, Search Strategies

UNIT-II

Knowledge and Reasoning

Knowledge-based Agents, Representation, Reasoning and Logic, Prepositional logic, First-order logic, Using First-order logic, Inference in First-order logic, forward and Backward Chaining

UNIT-III
Learning
Learning from observations, Forms of Learning, Inductive Learning, Learning decision trees, why learning works, Learning in Neural and Belief networks.

Unit IV
Orthogonal transforms
DFT, DCT and Haar; Properties of DFT; Computation of DFT: FFT and structures, Decimation in time, Decimation in frequency; Linear convolution using DFT; Digital filter structures: Basic FIR/IIR filter structures, FIR/IIR Cascaded lattice structures, Parallel allpass realization of IIR transfer functions.

Unit V

Multirate signal processing

Basic structures for sampling rate conversion, Decimators and Interpolators; Multistage design of interpolators and decimators; Polyphase decomposition and FIR structures; Computationally efficient sampling rate converters, Lagrange interpolation, Spline interpolation; Quadrature mirror filter banks; Applications in subband coding;

References:

1. Stuart Russell, Peter Norvig: "Artificial Intelligence: A Modern Approach",2nd Edition, Pearson Education, 2007

2. Artificial Neural Networks B. Yagna Narayana, PHI

3. Artificial Intelligence , 2nd Edition, E.Rich and K.Knight (TMH).

4. Artificial Intelligence and Expert Systems – Patterson PHI.

5.. S K Mitra: "Digital Signal Processing: A Computer-Based Approach" (McGraw Hill)

6. E C Ifeacthor and B W Jervis "Digital Signal Processing A Practical Approach" (Pearson)

7.R. Chassaing and D. Reay, Digital signal processing and applications with TMS320C6713 and TMS320C6416, Wiley, 2008.

8.J. G. Proakis and D. G. Manolakis, Digital Signal Processing:

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New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering, VIII-Semester

Departmental Elective EC 802 (B) Wireless Communication

Course Objective:
Understand the functioning of wireless communication system and evolution of different wireless communication systems and standards, comparison of recent technologies used for wireless communication, explanation of architecture, functioning, protocols, capabilities and application of various wireless communication networks.

Course Outcomes:

1. Explain and compare the various cellular systems and its components
2. Apply and analyze mobile communication concepts
3. Describe network and system architecture, channel concept and system Operations in TDMA and CDMA systems
4. Apply and analyze radio propagation models, coding and modulation Techniques in Wireless Communication systems.
5. Analyze improved data services in cellular communication

Unit-I
Introduction
Applications and requirements of wireless services: history, types of services, requirements for the services, economic and social aspects.
Technical challenges in wireless communications: multipath propagation, spectrum limitations, limited energy, user mobility, noise and interference-limited systems.
Propagation mechanism: free space loss, reflection and transmission, diffraction, scattering by rough surfaces, wave guiding.

Unit-II
Wireless Propagation channels
Statistical description of the wireless channel: time invariant and variant two path models, small-scale fading with and without a dominant component, Doppler spectra, temporal dependence of fading, large scale fading.
Wideband and directional channel characteristics: causes of delay dispersion, system theoretic description of wireless channels, WSSUS model, condensed parameters, ultra wideband channels, directional description.

Unit-III
Channel models: Narrowband, wideband and directional models, deterministic channel-modeling methods.
Channel sounding: Introduction, time domain measurements, frequency domain analysis, modified measurement methods, directionally resolved measurements.
Antennas: Introduction, antennas for mobile stations, antennas for base stations.

Unit-IV

Transceivers and signal processing: Structure of a wireless communication link: transceiver block structure, simplified models. Modulation formats, demodulator structure, error probability in AWGN channels, error probability in flat-fading channels, error probability in delay and frequency-dispersive fading channels.

Unit V

Diversity: Introduction, microdiversity, macrodiversity and simulcast, combination of signals, error probability in fading channels with diversity reception, transmit diversity.
Equalizers: Introduction, linear equalizers, decision feedback equalizers, maximum likelihood sequence estimation (Viterbi detector), comparison of equalizer structures, fractional spaced equalizers, blind equalizers.

References:

1. Molisch: Wireless Communications, Wiley India.
2. Taub and Schilling: Principles of Communication Systems, TMH.
3. Haykin: Mordern Wireless Communication, Pearson Education.
4. Upena Dalal: Wireless Communication, Oxford University Press.
5. Rappaport: Wireless Communication, Pearson Education.
6. Price: Wireless Communication and Networks, TMH.

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Electronics & Communication Engineering, VIII-Semester

Departmental Elective EC 802 (C) 5G Technology

Course Outcomes

1. Describe 5G Technology advances and their benefits
2. Distinguish the key RF, PHY, MAC and air interface changes required to support 5G
3. Demonstrate Device to device communication and millimeter wave communication
4. Implementation options for 5G
5. Modeling of MIMO system

Unit I : Overview of 5G Broadband Wireless Communications: Evaluation of mobile technologies 1G to 4G (LTE, LTEA, LTEA Pro) , An Overview of 5G requirements, Regulations for 5G,Spectrum Analysis and Sharing for 5G.

Unit II : The 5G wireless Propagation Channels: Channel modeling requirements, propagation scenarios and challenges in the 5G modeling, Channel Models for mmWave MIMO Systems.

Unit III : Transmission and Design Techniques for 5G: Basic requirements of transmission over 5G, Modulation Techniques – Orthogonal frequency division multiplexing (OFDM), generalized frequency division multiplexing (GFDM), filter bank multi-carriers (FBMC) and universal filtered multi-carrier (UFMC), Multiple Accesses Techniques – orthogonal frequency division multiple accesses (OFDMA), generalized frequency division multiple accesses (GFDMA), non-orthogonal multiple accesses (NOMA).

Unit IV : Device-to-device (D2D) and machine-to-machine (M2M) type communications – Extension of 4G D2D standardization to 5G, radio resource management for mobile broadband D2D, multi-hop and multi-operator D2D communications.

Unit V : Millimeter-wave Communications – spectrum regulations, deployment scenarios, beam-forming, physical layer techniques, interference and mobility management, Massive MIMO propagation channel models, Channel Estimation in Massive MIMO, Massive MIMO with Imperfect CSI, Multi-Cell Massive MIMO, Pilot Contamination, Spatial Modulation (SM).

Textbooks:

1. Martin Sauter “From GSM From GSM to LTE–Advanced Pro and 5G: An Introduction to Mobile Networks and Mobile Broadband”, Wiley-Blackwell.
2. Afif Osseiran, Jose.F.Monserrat, Patrick Marsch, “Fundamentals of 5G Mobile Networks” , Cambridge University Press.
3. Athanasios G.Kanatos, Konstantina S.Nikita, Panagiotis Mathiopoulos, “New Directions in Wireless Communication Systems from Mobile to 5G”, CRC Press.
4. Theodore S.Rappaport, Robert W.Heath, Robert C.Danials, James N.Murdock “Millimeter Wave Wireless Communications”, Prentice Hall Communications.

References

1. Jonathan Rodriguez, “Fundamentals of 5G Mobile Networks”, John Wiley & Sons.
2. Amitabha Ghosh and Rapeepat Ratasuk “Essentials of LTE and LTE-A”, Cambridge University Press.

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Electronics & Communication Engineering, VIII-Semester

Open Elective EC 803 (A) Wireless Network

PREREQUISITES: - Communication systems, Digital Communication, Telecommunication switching system, Computer Networks, Mobile and Wireless Communication

COURSE OUTCOMES:-

1. Review the concepts of wireless and mobilecommunication
2. Understand LTE and OFDM technologies for mobile telephony
3. Understand the basic concepts of wireless sensor network
4. Understand mobile networking and compare transport layer protocols for mobile and traditionalnetworks
5. Understand the technology and standards of IoT, ZigBee

Unit 1 Review of Cellular Networks

Mobile telephony, GSM, CDMA/CD, Universal Mobile Telecommunication System (UMTS). Advancement and migrations. WLAN- PHY Layer and MAC Layer-IEEE 802.11 (a, b, g, ac), HIPERLAN, Wireless ATM, WiMAX- PHY Layer and MAC Layer-IEEE 802.16 (fixed and mobile).

Unit 2 LTE systems

Introduction to 3GPP, LTE & LTE-A standards, LTE uplink/downlink, E-UTRAN architecture-Mobility and resource management, services, UTRAN- Architecture , HSDPA, HSUPA, OFDM, OFDMA, SISO system, MIMO system, OFDM-MIMO.

Unit 3 Wireless Sensor Networks

Introduction to wireless sensor network (WSN), WSN-Architecture, Coverage and placement, Topology management in WSN, Applications, Mobile WSN, Technologies for sensor nodes & networks, operating environment, Under water WSN, Security of WSN, MAC, Routing and Transport protocols for WSN

Unit 4 Wireless routing Protocols

Medium access problems in wireless networks, Traditional routing, Mobile network layer-Mobile IP, Introduction to IPv4 and IPv6, Data forwarding procedure in Mobile IP (IPv4 and IPv6), Mobility management, Protocol trade-offs, Congestion window management, Mobile transport layer- Traditional TCP, mobile TCP, Indirect TCP, Reno, New-Reno, Tahoe, Vegas. UDP.

Unit 5 Internet of things (IoT) and GPS systems

IoT architecture, Main design principles and needed capabilities, IoT Devices and gateways, Case studies: Sensor body area network, Control of a smart home, Smart vehicles, Smart manufacturing and smart factory. Emerging IoT standards, IoT-protocols, IoT Local and wide area networking, IEEE 802.15 WPAN, Bluetooth-pico net, scatter net, Protocol stack, Interface between 802.11 and Bluetooth. Geolocation service techniques and standards. Introduction to GPS-aided GEO augmented navigation (GAGAN), E.911, ZigBee, UWB and RFID.

Text Books:

1. Kaveh Pahlavan, Prashant Krishnamoorthy – *Principle of wireless networks- A unitedapproach*- Pearson Education,2002
2. Vijay K. Garg – *Wireless communication and networking* – Morgan-Kaufmann series in networking- Elsevierpublication
3. Feng Zhao and Leonidas Guibas – *Wireless Sensor Networks, An informationprocessing approach* - Morgan Kaufmannpublication

Reference Books:

1. Kazem Sohraby, Daniel Minoli and TaiebZnati- *Wireless Sensor Networks: Technology, Protocols and Applications* -Wileypublication
2. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos,David Boyle, "*From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence*", 1st Edition, Academic Press,2014.
3. Ramji Prasad "*OFDM for wirelesscommunication*"
4. Steve Rackley "*Wireless NetworkingTechnology.*

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New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering, VIII-Semester

Open Elective EC 803 (B) Digital Image Processing

Course Objectives

To study the image fundamentals and mathematical transforms necessary for image processing, image enhancement techniques, image restoration procedures, and image compression.

Course Outcomes:

1. Understand the basic elements of digital image processing
2. Develop and analyse the algorithm for discrete fourier transformations.
3. Understand the concept of Image enhancement by analyzing different filtering techniques.
4. Applying different models and techniques to understand the concept of image restoration
5. Analyze and implement different image encoding methods

Unit-I
Digital Image Processing (DIP)
Introduction, examples of fields that use DIP, fundamental steps in DIP, components of an image processing system.
Digital Image Fundamentals: elements of visual perception, image sensing and acquisition, image sampling and quantization, basic relationships between pixels.

Unit-II
Image Transforms
Two-dimensional (2D) impulse and its shifting properties, 2D continuous Fourier Transform pair, 2D sampling and sampling theorem, 2D Discrete Fourier Transform (DFT), properties of 2D DFT.
Other transforms and their properties: Cosine transform, Sine transform, Walsh transform, Hadamard transform, Haar transform, Slant transform, KL transform.

Unit-III
Image Enhancement
Spatial domain methods: basic intensity transformation functions, fundamentals of spatial filtering, smoothing spatial filters (linear and non-linear), sharpening spatial filters (unsharp masking and high boost filters), combined spatial enhancement method.
Frequency domain methods: basics of filtering in frequency domain, image smoothing filters
(Butterworth and Gaussian low pass filters), image sharpening filters (Butterworth and Gaussian high pass filters), selective filtering.

Unit-IV

Image Restoration

Image degradation/restoration, noise models, restoration by spatial filtering, noise reduction by frequency domain filtering, linear position invariant degradations, estimation of degradation function, inverse filtering, Wiener filtering, image reconstruction from projection.

Unit-V

Image Compression

Fundamentals of data compression: basic compression methods: Huffman coding, Golomb coding, LZW coding, Run-Length coding, Symbol based coding.

Digital image watermarking, representation and description- minimum perimeter polygons algorithm (MPP).

References:

1. Gonzalez and Woods: Digital Image Processing, Pearson Education.
2. Anil Jain: Fundamentals of Digital Image Processing, PHI Learning.
3. Annadurai: Fundamentals of Digital Image Processing, Pearson Education.
4. Sonka, Hlavac and Boyle: Digital Image Processing and Computer Vision, Cengage Learning.
5. Chanda and Majumder: Digital Image Processing and Analysis, PHI Learning.
6. Jayaraman, Esakkirajan and Veerakumar: Digital Image Processing, TMH.
7. William K. Pratt, Digital Image Processing, Wiley India.

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New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering, VIII-Semester

Open Elective EC 803 (C) Speech Processing

Course Objectives

To study speech production and related parameters of speech and to understand different speech modeling procedures such as Markov and their implementation issues.

Course Outcomes:

1. Model speech production system and describe the fundamentals of speech.
2. Extract and compare different speech parameters.
3. Choose an appropriate statistical speech model for a given application.
4. Design a speech recognition system.
5. Use different speech synthesis techniques.

Unit-I

Basic Concepts of Speech Processing

Speech Fundamentals: Articulatory Phonetics – Production and Classification of Speech Sounds; Acoustic Phonetics – acoustics of speech production; Review of Digital Signal Processing concepts; Short-Time Fourier Transform, Filter-Bank and LPC Methods.

Unit-II

Speech Analysis

Features, Feature Extraction and Pattern Comparison Techniques: Speech distortion measures – mathematical and perceptual – Log Spectral Distance, Cepstral Distances, Weighted Cepstral Distances and Filtering, Likelihood Distortions, Spectral Distortion using a Warped Frequency Scale, LPC, PLP and MFCC Coefficients, Time Alignment and Normalization – Dynamic Time Warping, Multiple Time – Alignment Paths.

Unit-III

Speech Modeling

Hidden Markov Models: Markov Processes, HMMs – Evaluation, Optimal State Sequence – Viterbi Search, Baum-Welch Parameter Re-estimation, Implementation issues.

Unit-IV

Speech Recognition

Large Vocabulary Continuous Speech Recognition: Architecture of a large vocabulary continuous speech recognition system – acoustics and language models – ngrams, context dependent sub-word units; Applications and present status.

Unit-V
Speech Synthesis

Text-to-Speech Synthesis: Concatenative and waveform synthesis methods, subword units for TTS, intelligibility and naturalness – role of prosody, Applications and present status.

References:

2.Lawrence Rabinerand Biing-Hwang Juang, "Fundamentals of Speech Recognition", Pearson Education, 2003.

3.Daniel Jurafsky and James H Martin, "Speech and Language Processing – An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", Pearson Education.

4.Steven W. Smith, "The Scientist and Engineer's Guide to Digital Signal Processing", California Technical Publishing.

5.Thomas F Quatieri, "Discrete-Time Speech Signal Processing – Principles and Practice", Pearson Education.

6.Claudio Becchetti and Lucio Prina Ricotti, "Speech Recognition", John Wiley and Sons, 1999.

7.Ben gold and Nelson Morgan, "Speech and audio signal processing", processing and perception of speech and music, Wiley- India Edition, 2006 Edition.

8.Frederick Jelinek, "Statistical Methods of Speech Recognition", MIT Press.

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Electronics & Communication Engineering VIII-Semester

EC 804- Advanced Communication Engg. Lab

1. Amplitude Shift Keying Modulation and Demodulation
2. Frequency shift keying Modulation and Demodulation
3. BPSK Generation and Detection
4. DPSK Generation and detection.
5. QPSK Generation and detection
6. Time Division Multiplexing of 2 Bandlimited Signals
7. Analog and Digital Communication Link Using Optical Fiber
8. Study of Manchaster Coding & Decoding
9. Measurement of frequency ,guided wavelength,power,VSWR and attenuation in a microwave test bench
10. Study Of Dipole Antenna Radiation Pattern (Simple Dipole and Folded Dipole antenna)
11. To find the Gain and Directivity of Yagi-Uda Antenna, Dipole antenna and Patch antenna
12. Determination of coupling and isolation characteristics of a stripline directional coupler.
13. Power Division and Isolation characteristics of a microstrip 3dB power divider