DR. A P J ABDUL KALAM UNIVERSITY, INDORE

SYLLABUS

of

BACHELOR OF ENGINEERING

(Fourth Year, Grading System)

Dr. A P J Abdul Kalam University, Indore

DR. A P J ABDUL KALAM UNIVERSITY, INDORE

Syllabus for BE-Electronics & Communication Engineering

List of Subject (Fourth Year, Grading System)

Sub Code: EC7011T **Sub Name:** Wireless Communication **4 Credits**

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.
7. Palanivelu and Nakkereeran : Wireless and Mobile Communication, PHI Learning.
8. Chidambara Nathan: Wireless Communication, PHI Learning.

Sub Code: EC7012T **Sub Name:** Digital Image Processing **4 Credits**

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.

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 linknpower budget equation, system noise, carrier-to-noise ratio (C/N), the uplink, the downlink, effects of rain,ncombined uplink and downlink C/N ratio, inter modulation noise, inter-satellite links.nInterference 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 Educ.
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.
8. Monojit Mitra: Satellite Communication: PHI Learning.

Unit-I

Overview of Optical Fiber Communications (OFC): Motivation, optical spectral bands, key elements of optical fiber systems. **Optical fibers**: basic optical laws and definitions, optical fiber modes and configurations, mode theory for circular waveguides, single mode fibers, graded-index fiber structure, fiber materials, photonic crystal fibers, fiber fabrication, fiber optic cables.

Unit-II

Optical sources: Light emitting diodes (LED): structures, materials, quantum efficiency, LED power, modulation of an LED. Laser diodes: modes, threshold conditions, laser diode rate equations, external quantum efficiency, resonant frequencies, structure and radiation patterns, single mode lasers, modulation of laser diodes. **Power launching and coupling**: source to fiber power launching, fiber to fiber joints, LED coupling to single mode fibers, fiber splicing, optical fiber connectors.

Unit-III

Photo detectors: pin photo detector, avalanche photodiodes, photo detector noise, detector response time, avalanche multiplication noise. **Signal degradation in optical fibers:** Attenuation: units, absorption, scattering losses, bending losses, core and cladding losses. Signal distortion in fibers: overview of distortion origins, modal delay, factors contributing to delay, group delay, material dispersion, waveguide dispersion, polarization-mode dispersion. Characteristics of single mode fibers: refractive index profiles, cutoff wavelength, dispersion calculations, mode field diameter, bending loss calculation. Specialty fibers.

Unit-IV

Optical receivers: fundamental receiver operation, digital receiver performance, eye diagrams, coherent detection: homodyne and heterodyne, burst mode receiver, analog receivers. **Digital links**: point to point links, link power budget, rise time budget, power penalties. **Analog links**: overview of analog links, carrier to noise ratio, multi channel transmission techniques.

Unit-V

Optical technologies: Wavelength division multiplexing (WDM) concepts: operational principles of WDM, passive optical star coupler, isolators, circulators, active optical components: MEMS technology, variable optical attenuators, tunable optical filters, dynamic gain equalizers, polarization controller, chromatic dispersion compensators. **Optical amplifiers**: basic applications and types of optical amplifiers, Erbium Doped Fiber Amplifiers (EDFA): amplification mechanism, architecture, power conversion efficiency and gain. Amplifier noise,optical SNR, system applications. **Performance Measurement and monitoring**: measurement standards, basic test equipment, optical power measurements, optical fiber characterization, eye diagram tests, optical time-domain reflectometer, optical performance monitoring.

References

1. Keiser: Optical Fiber Communications, TMH.
2. Senior: Optical Fiber Communication- Principles and Practices, Pearson Education.
3. Agarwal: Fiber Optic Communication Systems, Wiley India.
4. Palais: Fiber Optics Communications, Pearson Education.
5. Satish Kumar: Fundamentals of optical Communications, PHI Learning.
6. Khare: Fiber Optics and Optoelectronics, Oxford University Press.
7. Ghatak and Thyagrajan: Fiber Optics and Lasers, Macmillan India Ltd.
8. Gupta: Optoelectronic Devices and Systems, PHI Learning.
9. Sterling: Introduction to Fiber Optics, Cengage Learning.

Unit-I

Microwave Transmission System: General representation of EM field in terms of TEM, TE and TM components, Uniform guide structures, rectangular wave guides, Circular Wave guides, Solution in terms of various modes, Properties of propagating and evanescent modes, Dominant modes, Normalized model voltages and currents, Power flow and energy storage in modes frequency range of operation for single mode working, effect of higher order modes, Strip line and micro strip lines general properties, Comparison of coaxial, Micro strip and rectangular wave guides in terms of band width, power handling capacity, economical consideration etc.

Unit-II

Microwave Networks and Component: Transmission line ports of microwave network, Scattering matrix, Properties of scattering matrix of reciprocal, Non reciprocal, loss less, Passive networks, Examples of two, three and four port networks, wave guide components like attenuator, Phase shifters and couplers, Flanges, Bends, Irises, Posts, Loads, Principle of operation and properties of E-plane, H-plane Tee junctions of wave guides, Hybrid T, Multi-hole directional coupler, Directional couplers, Microwave resonators- rectangular. Excitation of wave guide and resonators by couplers. Principles of operation of non reciprocal devices, properties of ferrites, Isolators and phase shifters.

Unit-III

Microwave Solid State Devices and Application: PIN diodes, Properties and applications, Microwave detector diodes, detection characteristics, Varactor diodes, parametric amplifier fundamentals, Manley-Rowe power relation MASER, LASER , Amplifiers, Frequency converters and harmonic generators using varactor diodes, Transferred electron devices, Gunn effect, Various modes of operation of Gunn oscillator, IMPATT, TRAPATT and BARITT.

Unit-IV

Microwave Vacuum Tube Devices: Interaction of electron beam with electromagnetic field, power transfer condition. Principles of working of two cavity and Reflex Klystrons, arrival time curve and oscillation conditions in reflex klystrons, mode frequency characteristics. Effect of repeller voltage variation on power and frequency of output. Principle of working of magnetrons. Electron dynamics in planar and cylindrical magnetrons, Cutoff magnetic field, Resonant cavities in magnetron, Π-mode operation Mode separation techniques, Rising sun cavity and strapping. Principle of working of TWT amplifier. Slow wave structures, Approximate gain relationship in forward wave TWT.

Unit-V

Microwave Measurements: Square law detection, Broadband and tuned detectors. Wave-guide probes, Probe and detector mounts, Slotted line arrangement and VSWR meter, Measurement of wave-guide impedance at load port by slotted line, Microwave bench components and source modulation. Measurement of scattering matrix parameters, High, Medium and low-level power measurement techniques, Characteristics of bolometers, bolometer mounts, Power measurement bridges, Microwave frequency measurement techniques, calibrated resonators (transmission and absorption type). Network Analyzer and its use in measurements.

References:

1. Liao: Microwave Devices and Circuits, Pearson Education.
2. Das: Microwave Engineering, TMH.
3. Rao: Microwave Engineering, PHI Learning.
4. Collins: Foundations of Microwave Engineering, Wiley India.
5. Srivastava and Gupta: Microwave Devices and Circuits, PHI Learning.
6. Reich: Microwave Principles, East West Press.
7. Pozar: Microwave Engineering, Wiley India.
8. Roy and Mitra: Microwave Semiconductor Devices, PHI learning.

Unit I

Computer Networks

Introduction, applications, types of networks, network software, reference models- OSI model, TCP/IP model, comparison of OSI and TCP/IP models, example networks. **The Physical layer:** Design Issues, review of data communication concepts (configuration, topology, transmission mode, media guided and unguided, types of switching etc).

Unit II

The Data Link layer: Design issues, error detection and correction, data link protocols- stop and wait and sliding window ARQ, utilization of ARQ techniques, example of data link protocol- HDLC. **The Medium Access Control Layer:** Static and dynamic channel allocation, multiple access protocols- Pure and slotted ALOHA, CSMA, Collision free protocols, limited contention protocols, CSMA/CD (ETHERNET), fast Ethernet, Gigabit Ethernet.

Unit III

Wireless Protocols: The 802.11, the 802.16, Bluetooth, RFID, Data link layer switching- uses of repeaters, hubs, bridges, switches, routers and gateways. **The Network Layer:** Design Issues, Virtual Circuit and datagram networks, routing algorithms- adaptive and non-adaptive algorithms, congestion control algorithms, quality of service, internetworking, Network layer in the Internet- IPv4 protocol, IP addresses, IPv6 protocol, Internet control protocols, Mobile IP.

Unit IV

The Transport Layer: Design issues and services, Transport protocols, congestion control, UDP and TCP protocols, performance issues.

Unit V

The Application Layer: The Domain Name System, E-mail, World Wide Web, streaming audio and video, content delivery.

References:

1. Tanenbaum: Computer Networks, Pearson Education.
2. Bertsekas and Gallager: Data Networks, PHI Learning.
3. Black: Computer Networks, PHI Learning.
4. Forouzan: Computer Networks, TMH.
5. Stallings: Computer Networking and Internet Protocol, Pearson Education.
6. Keiser: Local Area Network, TMH.
7. Forouzan: Data Communication and Networking, TMH.
8. Gupta: Data Communications and Computer Networks, PHI Learning.

EXPERIMENTS LIST:

1. Launching of light into the optical fiber and calculate the numerical aperture and V-number.
2. Observing Holograms and their study.
3. Measurement of attenuation loss in an optical fiber.
4. Diffraction using gratings.
5. Construction of Michelson interferometer.
6. Setting up a fiber optic analog link and study of PAM.
7. Setting up a fiber optic digital link and study of TDM and Manchester coding.
8. Measurement of various misalignment losses in an optical fiber.

EXPERIMENTS LIST:

Following illustrative practical should be simulated with the help of any RF simulation software:-

1. Study the characteristics of Klystron Tube and to determine its electronic tuning range.
2. To determine the frequency and wavelength in a rectangular wave-guide working on TE10 mode.
3. To determine the Standing Wave-Ratio and reflection coefficient.
4. To measure an unknown impedance with Smith Chart.
5. To study the V-I characteristics of Gunn Diode.
6. To study the following characteristics of Gunn Diode.
    (a) Output power and frequency as a function of voltage.
    (b) Square wave modulation through PIN diode.
7. Study the function of Magic Tee by measuring the following parameters.
    (a) Measurement of VSWR at different ports and
    (b) Measurement of isolation and coupling coefficient.
8. Study the function of Isolator / Circulator by measuring the following parameters.
    (a) Input VSWR measurement of Isolator / Circulator.
    (b) Measurement of insertion loss and isolation.
9. Study the function of Attenuator (Fixed and Variable type) by measuring the following parameters.
    (a) Input VSWR measurement.
    (b) Measurement of insertion loss and attenuation.
10. Study the function of Multi Hole Directional Coupler by measuring the following parameters.
    (a) To measure main line and auxiliary line VSWR.
    (b) To measure the coupling factor and directivity.
11. Study of a network analyzer and measurements using it.

EXPERIMENTS LIST:

Practical should be performed using Scilab/ Matlab simulation software based on the syllabus of subject contents.

VHDL
Hardware abstraction, Basic language elements: identifiers, data objects, data types, operators, behavioural modeling, data flow modeling, structural modeling, simulation and analysis.

VERILOG
Overview of digital design with Verilog, Hierarchical Modeling: basic concepts, models and ports, gate level modeling, data flow modeling, behavioral modeling, logic synthesis with Verilog HDL, simulation.

Experiments:

Design and simulation of following using Verilog/ VHDL .

Logic gates: NAND, NOR, XOR, XNOR.

Half adder, full adder, subtractor, latches, multiplexers- 2:1, 4:1, 8:1, comparators, decoders- 2:4, 3:8, 4:16.

4-bit ripple carry full adder,4-bit Ripple carry counter, parity generator, up/down counters.

References

1. Samir palnitkar: Verilog HDL- A Guide to Digital Design and Synthesis, Pearson Education.
2. Bhasker: A Verilog HDL Primer –synthesis, Pearson Education
3. Pedroni: Circuit Design with VHDL, PHI Learning.
4. Perry: VHDL- Programming by example, TMH.

The student should select a topic (from the subjects he has studied so far or any topic related to real life problem). He should do the literature survey, analyze the problem and propose some solution for the same.

He should prepare a detailed (typed) report regarding the topic and should present the same with the help of power point presentation at the end of the semester. The analysis of the problem may be done with the help of some software or any hardware (which may be made by the student).

Sub Code EC708P	Sub Name: Industrial Training	1 Credits

Duration: 4 weeks after the VI semester in the summer break. Assessment in VII semester.

SCHEME OF EXAMINATION

For the assessment of industrial training undertaken by the students, following components are considered with respective weightage.

A) **Term work In Industry**	**Marks allotted**
1. Attendance and General Discipline	05
2. Daily diary Maintenance	05
3. Initiative and Participative attitude during training	05
4. Assessment of training by Industrial Supervisor/s	15

Total 30

(B) **Practical/Oral Examination (Viva-voce In Institution)**	**Marks allotted**
1. Training Report	20
2. Seminar and cross questioning (defense)	30

Total 50

Marks of various components in industry should be awarded to the student, in consultation with the Training and Placement Officer (TPO)/ Faculty of the institute, who must establish contact with the supervisor/ authorities of the organization where, students have taken training, to award the marks for term work. During training, students will prepare a first draft of the training report in consultation with the section incharge. After training they will prepare final draft with the help of the TPO/ faculty of the institute. Then, they will present a seminar on their training and will face viva-voce on training in the institute.

Unit I

Transmission lines: Impedance matching and transformation

Plane Electromagnetic waves, Transmission Lines: Line Equations and analysis, Smith Chart, Impedance Matching and transformation single stub, double stub matching, triple –stub tuner, impedance mismatch factor, quarter wave transformer, theory of small reflections, binomial and Chebyshev transformer, tapered transmission lines, triangular, exponential and Klopfenstein taper.

Unit II

Field analysis of transmission lines:

Analysis of general transmission line and terminated transmission line circuits, Planar Transmission lines, Micro strip lines. Strip lines: Characteristic Impedance, conductor losses, Dielectric losses, Radiation Losses, Higher order modes and dispersion, Micro strip attenuation ,high frequency properties , suspended and inverted micro strip lines, coplanar lines, slot lines, Fin-lines, Coupled Lines. Substrates for microwave printed circuits

Unit III

Microwave (solid state) Amplifiers:

BJT and FET, Power gains: definitions, Stability: stability circles, tests for unconditional stability, Constant Power Gain Circles, Constant Mismatch Circles, Single stage and multi stage transistor Amplifier design, Broadband transistor Amplifier Design, Power amplifiers. Basic Noise theory, Low noise amplifier designs, Microwave amplifier designs using S-parameters.

Unit IV

Microwave oscillators and mixers:

RF oscillators, Microwave oscillators, Oscillators Phase Noise, Frequency Multipliers, Gunn oscillators and circuits, Transistor oscillators, Oscillator circuits and design. **Mixers:** Mixer characteristics, linear and non-linear mixer operation, Mixer noise figure, Balanced mixers, Single ended diode mixer, single ended FET mixer, image reject mixers, other mixers, Mixer analysis using Harmonic Balancing.

Unit V

Microwave Filters:

Periodic structures: analysis, Filter design: image parameter and insertion loss method. specification of power loss ratio, Filter transformations, Filter Implementations, Stepped-Impedance low –pass filters, coupled line filters, Filters using coupled resonators, Impedance and Admittance inverters, micro strip half-wave filter, Quarter –wave coupled cavity filters, direct –coupled cavity filters, Low Pass filter designs, Frequency transformations and expansions, Narrowband and wideband microwave filters.

References

1. Collin: Foundations for Microwave Engineering, Wiley India.
2. Rizzi: Microwave Engineering- Passive Circuits, PHI Learning.
3. Pozar: Microwave Engineering, Wiley India.
4. Vendelin, Pavid and Rohde, Microwave Circuit Design, Wiley India.
5. Srivastava and Gupta: Microwave Devices and Circuit Design, PHI

UNIT-I:

Introduction to Embedded systems

Embedded system overview and applications, features and architecture considerations-ROM, RAM, timers, data and address bus, Memory and I/O interfacing concepts, memory mapped I/O. CISC Vs RISC design philosophy, Von-Neumann Vs Harvard architecture, instruction set, instruction formats, and various addressing modes of 32-bit. Fixed point and floating point arithmetic operations. Introduction ARM architecture and Cortex – M series, Introduction to the Tiva family viz. TM4C123x & TM4C129x and its targeted applications, Tiva block diagram, address space, on-chip peripherals (analog and digital) Register sets, Addressing modes and instruction set basics.

UNIT-II:

Microcontroller Fundamentals for Basic Programming

I/O pin multiplexing, pull up/down registers, GPIO control, Memory Mapped Peripherals, programming System registers, Watchdog Timer, need of low power for embedded systems, System Clocks and control, Hibernation Module on Tiva, Active vs Standby current consumption. Introduction to Interrupts, Interrupt vector table, interrupt programming.

Case Study: Tiva based embedded system application bringing up the salient features of GPIO, Watchdog timer, etc.

UNIT- III

Timers, PWM and Mixed Signals Processing

Timer, Basic Timer, Real Time Clock (RTC), Timing generation and measurements, Analog interfacing and data acquisition: ADC, Analog Comparators, DMA, Motion Control Peripherals: PWM Module & Quadrature Encoder Interface (QEI).

Case Study: Tiva based embedded system application using ADC & PWM.

UNIT-IV

Communication protocols and Interfacing with external devices

Synchronous/Asynchronous interfaces (like UART, SPI, I2C, USB), serial communication basics, baud rate concepts, Interfacing digital and analog external device, I2C protocol, SPI protocol & UART protocol. Implementing and programming I2C, SPI & UART interface using Tiva. CAN & USB interfaces on Tiva platform.

Case Study: Tiva based embedded system application using the interface protocols for communication with external devices “Sensor Hub BoosterPack”

UNIT V

Embedded networking and Internet of Things

Embedded Networking fundamentals, Ethernet, TCP/IP introduction IoT overview and architecture, Overview of wireless sensor networks and design examples. Various wireless protocols and its applications: NFC, ZigBee , Bluetooth, Bluetooth Low Energy, Wi-Fi. Adding Wi-Fi capability to the Microcontroller, Embedded Wi-Fi, User APIs for Wireless and Networking applications Building IoT applications using CC3100 user API: connecting sensor devices using Tivaware sensor library.

Case Study: Tiva based Embedded Networking Application: “Smart Plug with Remote Disconnect and Wi- Fi Connectivity”

References

1. John Davies, “MSP430 Microcontroller Basics”, Newnes, 1st Edition
2. Ajit Pal, “Microcontrollers Principles and applications”, PHI
3. B. Kanta Rao, “Embedded Systems”, PHI
4. Rajkamal, “Embedded Systems Architecture Programming and design”, McGraw Hill,

Unit-I

Principles of Wireless Networks

Network Planning: Introduction, wireless network topologies, cellular topology. Wireless network operation: introduction, mobility management, radio resources and power management, security in wireless networks.

Unit-II

Mobile Data Networks

Introduction, the data-oriented CDPD network, GPRS and higher data rates, short messaging services in GSM, mobile application protocols. **Wireless LANs (WLAN)**: Introduction, historical overview of the LAN industry, evolution of the WLAN industry, new interest from military and service providers, a new explosion of market and technology, wireless home networking.

Unit-III

IEEE 802.11 WLANs: Introduction, what is IEEE 802.11? The PHY layer, MAC sublayer, MAC management sublayer. **HIPERLAN:** Introduction HIPERLAN, HIPERLAN-2**, Wireless Geolocation Systems:** Introduction, Wireless geo location system architecture, technologies for wireless geolocation, geolocation standards for E-911 services, performance measures for geo location systems.

Unit-IV

Wireless Personal Area Network (WPAN): Introduction- IEEE 802.15 WPAN, Home RF, Bluetooth? Interference between Bluetooth and 802.11. **Satellite Networks:** Satellite navigation and global positioning system: Introduction, radio and satellite navigation, GPS position location principles, GPS time, GPS receivers and codes, the C/A code, Satellite signal acquisition, GPS signal levels, timing accuracy, GPS receiver operation, GPS C/A code accuracy, differential GPS.

Unit-V

Optical Networks: Network Concepts: terminology, categories, layers. Network topologies: performance of passive linear buses, performance of star architectures. SONET/SDH: transmission formats and speeds, optical interfaces, SONET/SDH rings, SONET/SDH networks. **High speed light-wave links**: links operating at 10, 40 and 160 Gbps. Optical add/drop multiplexing (OADM): OADM configurations, reconfigurable OADM. **Optical switching**: optical cross-connect, wavelength conversion, wavelength routing, optical packet switching, optical burst switching. WDM network examples: wideband long-haul WDM networks, narrowband metro WDM networks, passive optical network. Mitigation of transmission impairments: chromatic dispersion compensating fiber, bragg grating dispersion compensators, polarization mode dispersion compensation, optical amplifier gain transients.

References

1. Pahlavan and Krishnamurthy: Principles of Wireless Networks, PHI Learning.
2. Stallings: Wireless Communications and Networks, Pearson Education.
3. Keiser: Optical Fiber Communications, TMH.
4. Pratt, Bostian and Allnut: Satellite Communications, Wiley India.
5. Upena Dalal: Wireless Communications, Oxford University Press.

Unit-I
Spread Spectrum Modulation
Introduction, frequency hopping multiple access, CDMA, cellular CDMA systems, multi user detection, time hopping impulse radio

Unit-II
Orthogonal Frequency Division Multiplexing (OFDM)
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
Cognitive Radio
Problem description, cognitive transceiver architecture, principle of interweaving, spectrum sensing, spectrum management, spectrum sharing, overlay, underlay.

Unit V
Cooperative Communication
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.

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 Educati.
5. Mullet: Introduction to Wireless Telecommunication Systems and Networks, Cengage Learning.
6. Dixon: Spread Spectrum Systems, Wiley India.

UNIT I

Practical Consideration and Technology in VLSI Design

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

Device Modeling

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

Circuit Simulation

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

Structured Digital Circuits and Systems

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

CMOS Processing Technology

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.

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. Sze: VLSI Technology, TMH.

Unit I

Basic Television System: Introduction: Scanning principles: sound and picture transmission, scanning process, camera pick-up devices, video signal, transmission and reception of video signals, brightness perception and photometric quantities, aspect ratio and rectangular scanning, persistence of vision and flicker, vertical resolution, the Kell factor, horizontal resolution and video bandwidth, interlaced scanning. **Composite Video Signal:** Lines and scanning, video signal components, horizontal sync and blanking standards, vertical sync and blanking standards, video modulation and vestigial side band signal, sound modulation and inter-carrier system. **Television Standards**: Standard channel characteristics, reception of the vestigial side band signals, television broadcast channel, consolidated CCIR system-B standard, various television broadcast systems. **Television Pick-up devices and Cameras:** Camera lenses, auto-focus systems, television camera pick-ups, Silicon Vidicon, CCD image sensors, video processing of camera pick-up signal.

Unit II

Colour Television: Colour fundamentals: mixing of colours and colour perception, chromaticity diagram, colour television camera, colour TV signals and transmission, NTSC, SECAM and PAL system, Trinitron picture tube, automatic degaussing, plasma, LCD displays. **Television transmission and reception**: requirement of TV broadcast transmission, design principle of TV transmitters, IF modulation, power output stages, block diagram of TV transmitter, co-channel interference and ghost images during propagation of television signals, antenna requirements for television system, block schematic and function requirements for television receivers, trends in circuit design, colour television receiver.

Unit III

Digital Television Technology: Merits of digital technology, fully digital television system, digital television signals, digitized video parameters, digital video hardware, transmission of digital TV signals, bit rate reduction, digital TV receivers, video processor unit, audio processor unit. **Other television systems:** Closed Circuit television system (CCTV), Cable television system (CATV), multiplexed analog component encoding television system (MAC TV), High definition television system (HDTV), High definition multiplexed analog component television (HD-MAC TV), High Performance Computer Controlled TV (HPCC TV), 3-D stereoscopic television techniques..

Unit IV

RADAR: The Radar range equation, block diagram and operation, performance factors: prediction of range performance, minimum detectable signal, receiver noise, probability density functions, signal to noise ratios. Radar cross section of targets, transmitter power, pulse repetition frequency and range ambiguities, antenna parameters. **The CW radar**: the Doppler effect, FM-CW radar. **The Moving Target Indicator (MTI) Radar**: delay line cancellers.

Unit V

Radar Receivers: The radar receiver, noise figure, mixers, low noise front ends, displays- type A and PPI representations, duplexer and receiver protectors. **Other Radar systems**: Synthetic aperture radar, HF over the horizon radar, Air Surveillance Radar (ASR), Bistatic radar.

References

1. Dhake: Television and Video Engineering, TMH.
2. Skolnik: Introduction to Radar Systems, TMH, New Delhi.
3. Gupta: Television Engineering and Video Systems, TMH, New Delhi.
4. Gulati: Monochrome and Colour Television, New Age International.
5. Grob and Herndon: Basic Television and Video Systems, McGraw Hill International.
6. Peebles, Jr.: Radar Principles, Wiley India Pvt. LTD.
7. Edde: Radar- Principles, Technology Applications, Pearson Education.

List of Experiments:

1. Design and implementation of an inverter
2. Design and implementation of universal gates
3. Design and implementation of full adder
4. Design and implementation of full subtractor
5. Design and implementation of RS-latch
6. Design and implementation of D-latch
7. Design and implementation asynchronous counter
8. Design and Implementation of static RAM cell
9. Design and Implementation of differential amplifier
10. Design and Implementation of ring oscillator

List of Experiments:

Section A: Television Engineering

1. (a) To Study the Circuit Description of RF Tuner Section.
   (b) To Study the RF Section by Measuring Voltages at Various Test Points.
   (c) To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for RF Section.
2. (a) To Study the Circuit Description of VIF Tuner Section.
   (b) To Study the VIF Section by Measuring Voltages at Various Test Points.
   (c) To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for VIF Section.
3. (a) To Study the Circuit Description of Video and Chroma Section Tuner Section.
   (b) To Study the Video and Chroma Section by Measuring Voltages at Various Test Points
   (c) To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for Video and Chroma Section.
4. (a) To Observe the Horizontal Oscillator and Horizontal Output Section through Various Test Point.
   (b) To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for Horizontal Oscillator and Horizontal Output Section.
5. (a) To Observe the Vertical Oscillator and Vertical Output Section through Various Test Point.
   (b) To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for Vertical Oscillator and Vertical Output Section.
6. To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for Sound Output Section.
7. To Study the Circuit Description of Audio and Video Section Tuner Section.
8. (a) To Study the System Control Section by Measuring Voltages at Various Test Points.
   (b) To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for System Control Section.

Section B: RADAR

1. Study of Doppler Effect.
2. To Measure Speed of a fan and various Other Objects (Pendulum, Tuning Fork, Plate etc.)
3. To Simulate the Variable Speed of Moving Objects using Velocity Simulator.

Sub Code EC805P	Sub Name: Major Project	4 Credits

The student should prepare a working system or some design or understanding of a complex system that he has selected from the previous semesters using system analysis tools and submit the same in the form of a write-up i.e. detail project report. The student should maintain proper documentation of different stages of project such as need analysis, market analysis, concept evaluation, requirement specification, objectives, work plan, analysis, design, implementation and test plan wherever applicable. Each student is required to prepare a project report based on the above points and present the same at the final examination with a demonstration of the working system.

Objective of GD and seminar is to improve the MASS COMMUNICATION and CONVINCING/ understanding skills of students and it is to give student an opportunity to exercise their rights to express themselves.

Evaluation will be done by assigned faculty based on group discussion and power point presentation.