PRAGATI ENGINEERING COLLEGE:: SURAMPALEM

(Autonomous)

ELECTRONICS AND COMMUNICATION ENGINEERING

IV Year I Semester Course Structure

Sub Code	Subjects	L	T	P	Credits
16CS7T15	Computer Networks	3	1		3
16EC7T22	Digital Image Processing	3	1		3
16EC7T23	Micro Wave Engineering	3	1		3
16EC7T24	Optical Communications	3	1		3
16EC7D01 16EC7D02 16EC7D03	**Elective I** 1. Digital TV Engineering 2. Radar Engineering 3. System Design through Verilog	3	1		3
16EC7D04 16EC7D05 16EC7D06	**Elective II** 1.Embedded Systems 2. Analog IC Design 3.Network security and Cryptography	3	1		3
16EC7L10	Micro Wave Engineering and Optical Lab			2	2
16EC7L11	Digital Signal Processing Lab			2	2
Total credits					**22**

PRAGATI ENGINEERING COLLEGE:: SURAMPALEM

(Autonomous)

ELECTRONICS AND COMMUNICATION ENGINEERING

IV YEAR – I SEMESTER **L T P C**

3 1 0 3

Computer Networks (16CS7T15)

Course objectives:

The Student will

1. Understand the basic taxonomy, terminology and architectures of the computer networks.
2. Analyze the services, protocols and features of the various layers of computer networks.
3. Understand the requirements for a given organizational structure and select the most appropriate networking architecture and technologies.

Course Outcomes:

At the end of this course student will be able to -

1. Conceptualize the data communication models using OSI/ISO and TCP/IP protocol architectures. (Evaluate)
2. Analyze protocols implemented in data link layer for error and flow control. (Analyze)
3. Analyze the features and operations of different MAC mechanisms. (Analyze)
4. Build the skills of subnetting and routing mechanisms. (Apply)
5. Choose network protocols by elucidate the way protocols currently in use in the Internet like IPv4, IPv6, ICMP, ARP, RARP, DHCP operate.(Apply)
6. Develop client/server based applications using TCP and UDP protocols.(Apply)

UNIT - I:

Overview of the Internet: Protocol, Layering Scenario, TCP/IP Protocol Suite: The OSI Model, Internet history standards and administration; Comparison of the OSI and TCP/IP reference model.

Physical Layer: Guided transmission media, wireless transmission media.

UNIT - II:

Data Link Layer - design issues, Error Detection and error correction codes, CRC codes, Elementary Data Link Layer Protocols, Flow control -sliding window protocols: stop-and-wait ARQ, Go-back-n ARQ, Selective Repeat ARQ, HDLC

UNIT - III:

Multi Access Protocols - ALOHA, CSMA – CSMA/CD, CSMA/CA, Collision free protocols, data link layer switching & use of bridges, learning bridges, spanning tree bridges, repeaters, hubs, bridges, switches, routers and gateways

UNIT - IV:

Network Layer: Network Layer Design issues, store and forward packet switching connection less and connection-oriented networks-routing algorithms-optimality principle, shortest path, flooding, Distance Vector Routing, Count- to -Infinity Problem, Hierarchical Routing.

UNIT - V:

Internetworking: Tunneling, Internetwork Routing, Packet fragmentation, IPv4, introduction to IPv6 Protocol, IP addresses, ICMP, ARP, RARP, DHCP.

UNIT - VI:

Transport Layer: Services provided to the upper layers elements of transport protocol-addressing connection establishment, connection release, Connection Release, Crash Recovery.

The internet transport protocols – UDP, TCP.

Application Layer- Introduction, providing services, Applications layer paradigms, Client server model, Standard client-server application-HTTP, FTP, electronic mail, TELNET, DNS, SSH

TEXT BOOKS:

1. Data Communications and Networking - Behrouz A.Forouzan, Fifth Edition TMH, 2013.
2. Computer Networks - Andrew S Tanenbaum, Pearson Education, 4th Edition 2003.

REFERENCE BOOKS:

1. An Engineering Approach to Computer Networks - S. Keshav, Pearson Education, 2nd Edition,1997.
2. Understanding communications and Networks, W. A. Shay, Cengage Learning, 3rd Edition,2004.

Web resources

1. http://nptel.ac.in/courses/106105081/1
2. http://epgp.inflibnet.ac.in/view_f.php?category=1736
3. http://media.pearsoncmg.com/ph/streaming/esm/tanenbaum5e_videonotes/tanenbaum_videoNotes.html

PRAGATI ENGINEERING COLLEGE:: SURAMPALEM

(Autonomous)

ELECTRONICS AND COMMUNICATION ENGINEERING

IV YEAR – I SEMESTER **L T P C**

3 1 0 3

DIGITAL IMAGE PROCESSING (16EC7T22)

Course objectives:

The Student will

1. Learn basic concepts of digital image processing and image transforms.
2. Familiarize with histogram processing, image enhancement, spatial filtering for image smoothing and sharpening.
3. Learn various image noise models and restoration techniques.
4. Understand various image compression methods using coding techniques.
5. Learn fundamentals in image segmentation and various morphological operations.
6. Understand color image fundamentals and color models.

UNIT-I

INTRODUCTION: Introduction to image processing, fundamental steps in digital image processing, components of an image processing system, image sensing and acquisition, image sampling and quantization, some basic relationships between pixels, an introduction to the mathematical tools used in digital image processing.

IMAGE TRANSFORMS: Need for image transforms, Discrete Fourier transform (DFT) of one variable and two variables, some properties of the 2-D Discrete Fourier transform, Importance of Walsh Transform. Hadamard transform, Haar transform, Slant transform, Discrete Cosine transform.

UNIT-II

INTENSITY TRANSFORMATIONS AND SPATIAL FILTERING: Background, some basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing spatial filters , sharpening spatial filters, combining spatial enhancement methods.

FILTERING IN THE FREQUENCY DOMAIN: Preliminary concepts, the basics of filtering in the frequency domain, image smoothing using frequency domain filters, image sharpening using frequency domain filters, selective filtering.

UNIT-III

IMAGE RESTORATION: A model of the image degradation / restoration process, noise models, restoration in the presence of noise –only spatial filtering, periodic noise reduction by frequency domain filtering, linear, position –invariant degradations, estimating the degradation function, inverse filtering, minimum mean square error (Wiener) filtering, constrained least squares filtering, geometric mean filter.

UNIT-IV

IMAGE COMPRESSION: Fundamentals, Basic compression methods- Huffman coding, arithmetic coding, LZW coding, run-length coding, bit-plane coding, block transform coding, Predictive coding.

WAVELETS: Image pyramids, sub band coding, wavelet transforms in one dimensions and two dimensions, wavelet coding.

UNIT-V

IMAGE SEGMENTATION: Fundamentals, point, line, edge detection, thresholding, region based segmentation.

MORPHOLOGICAL IMAGE PROCESSING: Preliminaries, erosion and dilation, opening and closing, basic morphological algorithms for boundary extraction, thinning, gray-scale morphology, segmentation using morphological watersheds.

UNIT-VI

COLOR IMAGE PROCESSING: color fundamentals, color models, pseudo color image processing, basics of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color, noise in color images, color image compression.

Text books

1. Digital Image Processing --R. C. Gonzalez and R. E. Woods, 3rd edition, Prentice Hall of India, 2008.
2. Digital Image Processing --S.Sridhar,4th edition, Oxford higher education,2013.

Reference books

1. Fundamentals of Digital Image Processing-- Anil K.Jain, 9th Edition, Prentice Hall of India, Indian Reprint, 2002.
2. Digital Image Processing --Jayaraman, S. Esakkirajan, and T. Veerakumar, 8th Reprint, Tata McGraw-Hill Education, 2012.
3. Digital Image Processing and Analysis-- B.Chanda, D.Dutta Majumder, Prentice Hall of India, 2009.

Web links

http://nptel.ac.in/courses/106105032/

Course Outcomes:

On successful completion of the course, students will be able to:

1. Know the basic steps in image processing, relation between pixels in spatial and frequency domain for image processing operations.
2. Implement filtering operations for image enhancement, smoothing and sharpening.
3. Interpret filtering operations in image restoration.
4. Analyze image compression methods with coding techniques like Huffman, LZW etc.
5. Extend the concepts of morphological operations in image segmentation.
6. Categorize pseudo and full color image processing techniques.

PRAGATI ENGINEERING COLLEGE:: SURAMPALEM

(Autonomous)

ELECTRONICS AND COMMUNICATION ENGINEERING

IV YEAR – I SEMESTER **L T P C**

3 1 0 3

MICROWAVE ENGINEERING (16EC7T23)

Course objectives:

The student will study

1. Electromagnetic wave propagation in rectangular wave guide.
2. Different microwave junctions and components.
3. Scattering matrix of different 2-port, 3-port junctions.
4. Classifications of microwave tubes and working principles of klystron tubes.
5. Slow wave structures and M-type tubes.
6. Microwave solid state devices and measurement of microwave parameters.

UNIT-I

MICROWAVE TRANSMISSION LINES: Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguides– TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Dominant and Degenerate Modes, Sketches of TE and TM mode fields in the cross-section, Mode Characteristics – Phase and Group Velocities, Wavelengths and Impedance Relations; Power Transmission and Power Losses in Rectangular Guide, Impossibility of TEM mode, Cavity Resonators– Introduction, Rectangular and Cylindrical Cavities Related Problems.

UNIT-II

WAVEGUIDE COMPONENTS AND APPLICATIONS: Coupling Mechanisms – Probe, Loop, Aperture types. Waveguide Discontinuities –Waveguide irises, Tuning Screws and Posts, Matched Loads. Waveguide Attenuators – Resistive Card, Rotary Vane types; Waveguide Phase Shifters– Dielectric, Rotary Vane types.

UNIT-III

SCATTERING MATRIX: Significance, Formulation and Properties. S-Matrix Calculations for – 2 port Junction, E-plane and H-plane Tees, Magic Tee, Hybrid Ring; Directional Couplers – 2Hole, Bethe Hole types, Ferrite Components– Faraday Rotation, S-Matrix Calculations for Isolator, Circulator, Related Problems.

UNIT-IV

MICROWAVE TUBES: Limitations and Losses of conventional tubes at microwave frequencies. Microwave tubes – O type and M type classifications. O-type tubes : 2 Cavity Klystrons – Structure, Reentrant Cavities, Velocity Modulation Process and Applegate Diagram, Bunching Process

REFLEX KLYSTRONS : Structure, Applegate Diagram and Principle of working, Oscillating Modes and output Characteristics, Electronic and Mechanical Tuning, Related Problems.

UNIT-V

HELIX TWTS: Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT and Suppression of Oscillations, Nature of the four Propagation Constants.

M-TYPE TUBES: Introduction, Cross-field effects, Magnetrons – Different Types, 8-Cavity Cylindrical Travelling Wave. Magnetron – Hull Cut-off and Hartree Conditions, Modes of Resonance and PI-Mode Operation, Separation of PI-Mode, output characteristics.

UNIT-VI

MICROWAVE SOLID STATE DEVICES: Introduction, Classification, Applications.

TEDs – Introduction, Gunn Diode – Principle, RWH Theory, Characteristics, Basic Modes of Operation, Oscillation Modes. Avalanche Transit Time Devices – Introduction, IMPATT and TRAPATT Diodes – Principle of Operation and Characteristics, PIN diode and its applications.

MICROWAVE MEASUREMENTS: Description of Microwave Bench –Different Blocks and their Features, Precautions, Microwave Power Measurement – Calorimetric Method, Bolometer Method. Measurement of Attenuation, Frequency, VSWR, Cavity Q, Impedance Measurements.

Text books

1. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.
2. Microwave Circuits and Passive Devices – M.L. Sisodia and G.S.Raghuvanshi, Wiley Eastern Ltd., New Age International Publishers Ltd., 1995.

References

1. Microwave Devices and Circuits - Samuel Y.Liao, PHI,2009.
2. Microwave and Radar Engineering-Dr.M. Kulkarni,2nd edition, umesh publications,2008.
3. Microwave Engineering by Annapurna Das and Sisir Das by Mc Graw Hill

Web Link

http://nptel.ac.in/courses/117105130/
https://onlinecourses.nptel.ac.in/noc16_ec09

Course Outcomes:

After completion of this course student will be able to:

1. Determine dominant modes and cut off frequencies of rectangular wave guides.
2. Analyze different microwave junctions and components.
3. Determine the S-matrix for microwave junctions like E-plane, H-plane and Magic Tee etc.
4. Compute power and efficiency of klystron tubes.
5. Apply the knowledge of cross field tubes in microwave applications.
6. Measure microwave parameters like phase, attenuation, impedance, frequency and VSWR.

PRAGATI ENGINEERING COLLEGE:: SURAMPALEM

(Autonomous)

ELECTRONICS AND COMMUNICATION ENGINEERING

IV YEAR – I SEMESTER **L T P C**

3 1 0 3

OPTICAL COMMUNICATIONS (16EC7T24)

Course objectives:

The student will study

1. The functionality of each of the components that comprise a fiber- optic communication system.
2. The properties of optical fiber that affect the performance of a communication link and types of fiber materials with their properties and the losses occur in fibers.
3. The principles of single and multi-mode optical fibers and their characteristics.
4. The working of optical sources and detectors.
5. The methods of source to fiber power launching.
6. The optical links for optical communication system.

UNIT- I

OVERVIEW OF OPTICAL FIBER COMMUNICATION AND FIBER MATERIALS : Historical development, The general system, advantages of optical fiber communications. Optical fiber wave guides- Introduction, Ray theory transmission, Total Internal Reflection, Acceptance angle, Numerical Aperture, Skew rays, Cylindrical fibers- Modes, V-number, Mode coupling, Step Index fibers, Graded Index fibers, Single mode fibers- Cut off wavelength, Mode Field Diameter, Effective Refractive Index, Related problems, Glass halide, chalcogenide fibers, plastic optic fibers, active glass fibers.

UNIT- II

LOSES AND DISPERSION: Signal distortion in optical fibers-Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses, Group delay, Types of Dispersion:- Material dispersion, Wave-guide dispersion, Polarization-Mode dispersion, Intermodal dispersion, Pulse broadening in Graded index fiber, CNR, Related problems.

UNIT- III

OPTICAL FIBER COMPONENTS: Connector types, Single mode fiber connectors, Connector return loss, Fiber Splicing- Splicing techniques, Splicing single mode fibers, Fiber alignment and joint loss- Multimode fiber joints, single mode fiber joints.

UNIT -IV

OPTICAL SOURCES: LEDs, Structures, Materials, Quantum efficiency, Power, Modulation, Power bandwidth product. Injection Laser Diodes- Modes, Threshold conditions, External

quantum efficiency, Laser diode rate equations, Resonant frequencies, Reliability of LED and ILD.

OPTICAL DETECTORS- Physical principles of PIN and APD, Detector response time, Temperature effect on Avalanche gain, Comparison of Photo detectors, Related problems.

UNIT- V

SOURCE TO FIBER POWER LAUNCHING : Output patterns, Power coupling, Power launching, Equilibrium Numerical Aperture, Optical Amplifiers ,Optical network concepts, Topologies, Laser diode to fiber coupling, Optical receiver operation- Fundamental receiver operation, Digital signal transmission, error sources.

UNIT- VI

OPTICAL SYSTEM DESIGN : Point-to- point links- Component choice and considerations, Link power budget, Rise time budget with examples, Line coding in Optical links, WDM, Necessity, Principles, Measurement of Attenuation and Dispersion, Eye pattern, Analog links.

Text books

1. Optical Fiber Communications – Gerd Keiser, Mc Graw-Hill International edition, 3rd Edition, 2000.
2. Optical Fiber Communications – John M. Senior, PHI, 2nd Edition, 2002.

References

1. Fiber Optic Communications – D.K. Mynbaev , S.C. Gupta and Lowell L. Scheiner, Pearson Education,2005.
2. Text Book on Optical Fiber Communication and its Applications – S.C.Gupta, PHI, 2005.
3. Fiber Optic Communication Systems – Govind P. Agarwal , John Wiley, 3rd Ediition, 2004.

Web links

1. http://www.nptel.ac.in/syllabus/117101054/

Course Outcomes

After completion of this course the student will be able to:

1. Comprehend fiber optic communications and fiber materials.
2. Calculate Power loss based on dispersions and distortions.
3. Analyze the fiber optic connectors and splicers to minimize the losses.
4. Analyze the characteristics of various optical sources and detectors.
5. Design of optical networks with the help of optical topology.
6. Design optical links for analog and digital communication systems .

PRAGATI ENGINEERING COLLEGE:: SURAMPALEM

(Autonomous)

ELECTRONICS AND COMMUNICATION ENGINEERING

IV YEAR – I SEMESTER **L T P C**

3 1 0 3

DIGITAL TELEVISION ENGINEERING (16EC7D01)
(Elective- I)

Course objective:

The student will

1. Study transmission standards and performance parameters of Digital TV.
2. Study channel coding and modulation techniques of Digital TV .
3. Study Transmitter and RF systems of television engineering.
4. Study transmission line parameters.
5. Acquire knowledge in Transmitting antennas.
6. Study testing and measurement of a Digital TV Transmission.

UNIT- I

DIGITAL TELEVISION TRANSMISSION STANDARDS: ATSC terrestrial transmission standard, vestigial sideband modulation, DVB-T transmission standard, ISDB-T transmission standard, channel allocations, antenna height and power, MPEG-2.

PERFORMANCE OBJECTIVES FOR DIGITAL TELEVISION: System noise, external noise sources, transmission errors, error vector magnitude, eye pattern, interference, cochannel interference, adjacent channel interference, analog to digital TV, transmitter requirements.

UNIT-II

CHANNEL CODING AND MODULATION FOR DIGITAL TELEVISION: Data synchronization, randomization/scrambling, forward error correction, interleaving, inner code, frame sync insertion, quadrature modulation, 8 VSB, bandwidth, error rate, COFDM, flexibility, bandwidth.

UNIT- III

TRANSMITTERS FOR DIGITAL TELEVISION: Precorrection and equalization, up conversion, precise frequency control, RF amplifiers, solid-state transmitters, RF amplifier modules, power supplies, power combiners, Wilkinson combiner, ring combiner, starpoint combiner, cooling, automatic gain or level control, ac distribution, transmitter control, tube transmitters, tube or solid-state transmitters, performance quality, retrofit of analog transmitters for DTV.

RADIO-FREQUENCY SYSTEMS FOR DIGITAL TELEVISION: Constant-impedance filter, output filters, elliptic function filters, cavities, channel combiners.

UNIT-IV:

TRANSMISSION LINE FOR DIGITAL TELEVISION: Fundamental parameters, efficiency, effect of VSWR, system AERP, rigid coaxial transmission lines, dissipation, attenuation, and power handling, higher order modes, peak power rating, frequency response, standard lengths, corrugated coaxial cables, wind load, waveguide, bandwidth, waveguide attenuation, power rating, frequency response, size trade-offs, waveguide or coax pressurization.

UNIT-V

TRANSMITTING ANTENNAS FOR DIGITAL TELEVISION : Antenna patterns, elevation pattern, mechanical stability, null fill, azimuth pattern, slotted cylinder antennas, gain and directivity, power handling, antenna impedance, bandwidth and frequency response, multiple-channel operation, types of digital television broadcast antennas, antenna mounting.

UNIT-VI

TEST AND MEASUREMENT FOR DIGITAL TELEVISION: Power measurements, average power measurement, calorimetry, power meters, peak power measurement, measurement uncertainty, testing digital television transmitters.

Text books

1. Modern Television Practice – Principles, Technology and Service – R.R. Gulati, New Age International Publication, 2002.
2. Fundamentals of Digital television Transmission- Gerald w. Collins, Wilcy 2001

References

1. Colour Television Theory and Practice – S.P. Bali, TMH, 1994.
2. Television and Video Engineering - A.M. Dhake, 2nd Edition Mc Graw Hill, 1999.
3. Basic Television and Video Systems – B. Grob and C.E. Herndon, McGraw Hill, 1999.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Compare Digital TV transmission standards and performance parameters for high Quality Transmission.
2. Apply channel coding and modulation techniques to increase the performance of Digital TV .
3. Analyze RF amplifiers, modules and systems for Digital TV.
4. Identify Transmission lines suitable for Digital TV.
5. Know types of antennas suitable for Digital TV for better transmission Quality.
6. Test a Digital TV Transmitter and receiver for better broadcasting .

PRAGATI ENGINEERING COLLEGE:: SURAMPALEM

(Autonomous)

ELECTRONICS AND COMMUNICATION ENGINEERING

IV YEAR – I SEMESTER **L T P C**

3 1 0 3

RADAR ENGINEERING (16EC7D02)
(Elective- I)

Course Objectives:

The student will study:

1. The Basic Principle of radar and radar range equation.
2. Different types of radars; CW, FM-CW.
3. MTI and pulse Doppler radars performance.
4. Different tracking techniques for radar.
5. The characteristics of a matched filter receiver and its performance.
6. Different types of displays, duplexers and antennas used in radar systems**.**

UNIT–I

BASICS OF RADAR : Introduction, Maximum Unambiguous Range, simple Radar range Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications. Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Illustrative Problems.

Radar Equation : Modified Radar Range Equation, SNR, probability of detection, probability of False Alarm, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets - sphere, cone-sphere), Creeping Wave, Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment), Illustrative Problems.

UNIT–II

CW AND FREQUENCY MODULATED RADAR : Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar. Illustrative Problems .

FM-CW Radar: Range and Doppler Measurement, Block Diagram and Characteristics, FM-CW altimeter, Multiple Frequency CW Radar.

UNIT-III

MTI AND PULSE DOPPLER RADAR: Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, Nth Cancellation Staggered PRFs. Range Gated Doppler Filters. MTI Radar Parameters, Limitations to MTI Performance, MTI versus Pulse Doppler Radar.

UNIT –IV

TRACKING RADAR: Tracking with Radar, Sequential Lobing, Conical Scan, Mono pulse Tracking Radar – Amplitude Comparison Mono pulse (one- and two- coordinates), Phase Comparison Mono pulse, Tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers.

UNIT –V

DETECTION OF RADAR SIGNALS IN NOISE : Introduction, Matched Filter Receiver – Response Characteristics and Derivation, Correlation detection and Cross-correlation Receiver, Efficiency of Non-matched Filters, Matched Filter with Non-white Noise, Noise Figure and Noise Temperature.

UNIT –VI

RADAR RECEIVERS : Duplexers – Branch type and Balanced type, Circulators as Duplexers, Radar Displays.

PHASED ARRAY RADAR -Introduction to Basic Concepts, Radiation Pattern, Beam Steering and Beam Width changes, Series versus parallel feeds, Applications, Advantages and Limitations. Radomes.

Text books

1. Introduction to Radar Systems -M.I. Skolnik, , 2nd Edition, Mc Graw Hill Book,1981.
2. Understanding of RADAR Systems - Simon Kingsley and Shaun Quegan, , McGraw Hill Book , 1993.

References

1. Radar Engineering and Fundamentals of Navigational Aids -G S N Raju, IK International Publishers, 2008.
2. Microwave and Radar Engineering , G.Sasi Bhushana Rao, , Pearson education, 2013.

Course Outcomes:

On successful completion of the course, students will be able to

1. Familiarize the fundamentals of basic radar.
2. Apply Doppler Effect to detect moving targets.
3. Analyze the MTI radar performance.
4. Analyze the performance of radar tracking methods.
5. Apply the concepts of matched filter and ambiguity functions in detection of radar signals in noise.
6. Design radar receiver based on characteristics of duplexer and antennas.

PRAGATI ENGINEERING COLLEGE:: SURAMPALEM

(Autonomous)

ELECTRONICS AND COMMUNICATION ENGINEERING

IV YEAR – I SEMESTER **L T P C**

3 1 0 3

SYSTEM DESIGN THROUGH VERILOG (16EC7D03)

(Elective- I)

Course objectives:

Students undergoing this course are expected:

1. To understand the constructs and conventions of the Verilog HDL programming.
2. To understand the structural level of abstraction for modeling digital hardware systems.
3. To Learn functional Bifurcation, various construct models, design using behavioral level.
4. To Understand continuous assignment structures, delays in data flow level and bidirectional gates and time delays with switch primitives.
5. To Understand synthesis of combinational logic and sequential logic circuits.
6. To study advanced features of verilog HDL and apply them to design complex real time digital systems.

UNIT-I

INTRODUCTION TO VERILOG: Verilog as HDL, Levels of design description, concurrency, simulation and synthesis, functional verification, system tasks, programming language interface(PLI), module.

LANGUAGE CONSTRUCTS AND CONVENTIONS: Introduction, keywords, identifiers, whitespace characters, comments, numbers, strings, logic values, data types, scalars and vectors, parameters, memory, operators, system tasks.

UNIT-II

GATE LEVEL MODELLING: Introduction, AND gate primitive, module structure, other gate primitives, illustrative examples, tristate gates, array of instances of primitives, design of Flip flops with gate primitives, delays, strengths and contention resolution, net types, design of basic circuits.

UNIT-III

BEHAVIORAL MODELLING: Introduction, operations and assignments, functional Bifurcation, initial construct, always construct, examples, assignments with delays, wait construct, multiple always blocks, designs at behavioral level, blocking and non blocking assignments, the case statement, simulation flow, if and if else constructs, assign-Deassign construct, repeat construct, FOR loop, the disable construct, While loop, Forever loop, parallel blocks, force-release construct, event.

UNIT-IV

DATAFLOW LEVEL AND SWITCH LEVEL MODELLING: Introduction, continuous assignment structures, delays and continuous assignments, assignment to vectors, basic transistor switches, CMOS switch, Bidirectional gates and time delays with switch primitives, instantiations with strengths and delays, strength contention with trireg nets.

UNIT-V

SYNTHESIS OF COMBINATIONAL AND SEQUENTIAL LOGIC USING VERILOG: Synthesis of combinational logic: Net list of structured primitives, a set of continuous assignment statements and level sensitive cyclic behavior with examples, Synthesis of priority structures, Exploiting logic don't care conditions. Synthesis of sequential logic with latches: Accidental synthesis of latches and Intentional synthesis of latches, Synthesis of sequential logic with flip-flops, Synthesis of explicit state machines.

UNIT-VI

VERILOG MODELS: Static RAM Memory, A simplified 486 Bus Model, Interfacing Memory to a Microprocessor Bus, UART Design and Design of Microcontroller CPU.

Text books

1. Fundamentals of Logic Design with Verilog – Stephen. Brown and Zvonko Vranesic, TMH, 2005.
2. A Verilog Primier – J. Bhasker, BSP, 2003.

References

1. Advanced Digital Design with Verilog HDL – Michael D. Ciletti, PHI, 2005.
2. Design through Verilog HDL – T.R. Padmanabhan and B. Bala Tripura Sundari, WSE, IEEE Press, 2004.

Course Outcomes:

After undergoing the course students will be able to

1. Use VLSI design methodologies to understand and design complex digital systems.
2. Apply pre-defined Primitive gates to Create System Design .
3. create circuits that realize specified Logic functions using behavioral Modelling.
4. Identify logic and technology-specific parameters to control the functionality and timing.
5. Extract a Logic Circuit through Verilog HDL for Combinational and sequential Circuits .
6. Design a significant VLSI project having a set of objective criteria and design constraints.

PRAGATI ENGINEERING COLLEGE:: SURAMPALEM

(Autonomous)

ELECTRONICS AND COMMUNICATION ENGINEERING

IV YEAR – I SEMESTER **L T P C**

3 1 0 3

EMBEDDED SYSTEMS (16EC7D04)

(Elective- II)

Course objectives:

The student will

1. Study the basic concepts of an embedded system are introduced.
2. Know the various elements of embedded hardware and their design principles are explained.
3. Learn different steps involved in the design and development of firmware for embedded systems is elaborated.
4. Study the Internals of Real-Time operating system and the Fundamental issues in hardware software co-design were presented and explained.
5. Familiarize with the different IDEs for firmware development for different family of processors/controllers and embedded operating systems.
6. Discuss Embedded system implementation and testing tools.

UNIT-I

INTRODUCTION: Embedded system-Definition, history of embedded systems, classification of embedded systems, major application areas of embedded systems, purpose of embedded systems, the typical embedded system-core of the embedded system, Memory, Sensors and Actuators, Communication Interface, Embedded firmware, Characteristics of an embedded system, Quality attributes of embedded systems, Application-specific and Domain-Specific examples of an embedded system, Introduction to IOT Devices.

UNIT-II

EMBEDDED HARDWARE DESIGN: Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock.

UNIT-III

EMBEDDED FIRMWARE DESIGN AND PROGRAMING CONCEPTS: Embedded Firmware design approaches, Embedded Firmware development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA, Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross-compiler.

UNIT-IV

REAL TIME OPERATING SYSTEM: Operating system basics, Types of operating systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling, Threads, Processes and Scheduling, Task communication, Task synchronization, Device Drivers.

HARDWARE SOFTWARE CO-DESIGN: Fundamental Issues in Hardware Software Co-Design, Middle ware, Computational models in embedded design, Hardware software Trade-offs, Integration of Hardware and Firmware, ICE.

UNIT-V

EMBEDDED SYSTEM DEVELOPMENT: The integrated development environment, Types of files generated on cross-compilation, Deassembler/Decompiler, Simulators, Emulators and Debugging, Target hardware debugging, Boundary Scan, Embedded Software development process and tools.

UNIT-VI

EMBEDDED SYSTEM IMPLEMENTATION AND TESTING: The main software utility tool, CAD and the hardware, Translation tools-Pre-processors, Interpreters, Compilers and Linkers, Debugging tools, Quality assurance and testing of the design, Testing on host machine, Simulators, Laboratory Tools.

Text Books

1. Embedded Systems Architecture- By Tammy Noergard, Elsevier Publications, 2013.
2. Embedded Systems-By Shibu.K.V-Tata McGraw Hill Education Private Limited, 2013.

References

1. Embedded Systems-Lyla B.Das-Pearson Publications, 2013.
2. An Embedded Software Primer -David E.Simon, Pearson Education Asia, First Indian Reprint 2000.

Course Outcomes:

At the end of this course the student can able to:

1. Understand the basic concepts of an embedded system.
2. Know an embedded system design approach to perform a specific function.
3. Familiarize with embedded firmware design approaches to control the functions of various hardware devices on embedded environment.
4. Identify the unique characteristics of real-time operating systems and evaluate the need for real-time operating system.
5. Understand how to integrate hardware and firmware of an embedded system using real time operating system.
6. Test a Embedded system design using Testing tools for Quality of design.

PRAGATI ENGINEERING COLLEGE:: SURAMPALEM

(Autonomous)

ELECTRONICS AND COMMUNICATION ENGINEERING

IV YEAR – I SEMESTER **L T P C**

3 1 0 3

ANALOG IC DESIGN (16EC7D05)

(Elective- II)

Course objectives:

The student will:

1. Study the concepts of MOS Devices, Small-Signal and Large-Signal Modeling of MOS Transistor .
2. Learn the MOS elements and Analog Sub-Circuits.
3. Study the CMOS Amplifiers like Differential Amplifiers, Cascode Amplifiers, Output Amplifiers and Operational Amplifiers with design considerations.
4. Distinguish the Analog CMOS Circuits for Analog operations.
5. Construct Comparator circuits improving the Performance of Open-Loop Comparators.
6. Design comparators and PLL's.

UNIT -I

MOS DEVICES AND MODELING: The MOS Transistor, Passive Components- Capacitor and Resistor, Integrated circuit Layout, CMOS Device Modeling – Simple MOS Large-Signal Model, Other Model Parameters, Small-Signal Model for the MOS Transistor, Computer Simulation, Models, Sub-threshold MOS Model.

UNIT -II

ANALOG CMOS SUB-CIRCUITS: MOS Switch, MOS Diode, MOS Active Resistor, Current Sinks and Sources, Current Mirrors-Current mirror with Beta Helper, Degeneration, Cascode current Mirror and Wilson Current Mirror, Current and Voltage References, Band gap Reference.

UNIT -III

CMOS AMPLIFIERS: Inverters, Differential Amplifiers, Cascode Amplifiers, Current Amplifiers, Output Amplifiers, High Gain Amplifiers Architectures.

UNIT -IV

CMOS OPERATIONAL AMPLIFIERS: Design of CMOS Op -Amps, Compensation of Op-Amps, Design of Two-Stage Op-Amps, Power- Supply Rejection Ratio of Two-Stage Op-Amps, Cascade

Op- Amps, Measurement Techniques of OP-Amp.

UNIT -V

COMPARATORS: Characterization of Comparator, Two-Stage, Open-Loop Comparators, Other Open-Loop Comparators, Improving the Performance of Open-Loop Comparators, Discrete- Time Comparators.

UNIT -VI

OSCILLATORS AND PHASE-LOCKED LOOPS: General Considerations, Ring Oscillators, LC Oscillators, Voltage Controlled Oscillators. Simple PLL, Charge Pump PLLs, Non-Ideal Effects in PLLs, Delay Locked Loops, Applications.

Text Books

1. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH .
2. CMOS Analog Circuit Design – Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.

References

1. Analysis and Design of Analog Integrated Circuits- Paul R. Gray, Paul J. Hurst, S. Lewis and R. G. Meyer, Wiley India, 5^{TH} Edition, 2010.
2. Analog Integrated Circuit Design- David A.Johns, Ken Martin, Wiley Student Edition, 2013.

Course Outcomes:

After completion of this course the student will be able to

1. Apply the concepts of MOS Devices and Modelling involved in IC circuits.
2. Summarize the MOS sub circuits used in CMOS analog circuit design.
3. Analyze amplifiers using CMOS technology used in Analog electronics.
4. Design high-performance operational amplifier combining compensation circuits which are widely used in A/D and D/A Converters.
5. Analyze the Comparators in terms of performance to measure and digitize analog signals.
6. Design Oscillators and PLL'S which has extensive applications in communication systems.

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(Autonomous)

ELECTRONICS AND COMMUNICATION ENGINEERING

IV YEAR – I SEMESTER **L T P C**

3 1 0 3

NETWORK SECURITY AND CRYPTOGRAPHY (16EC7D06)

(Elective- II)

Course Objective:

The student will

1. Understand symmetric block ciphers (DES, AES, other contemporary symmetric ciphers), Public-key cryptography (RSA, discrete logarithms).

Course Outcomes:

At the end of this course student will be able to-

1. Analyze the functional units of security model.(Analyze)
2. Evaluate security mechanisms with Symmetric Key cryptography. (Evaluate)
3. Evaluate security mechanisms with Asymmetric Key cryptography. (Evaluate)
4. Analyze Data Integrity, Digital Signature Schemes & Key Management. (Analyze)
5. Analyze network security models for ensuring security at Application layer and Transport layer. (Analyze)
6. Analyze network security model at Network layer (Analyze)

UNIT- I:

Classical Encryption Techniques

Security attacks, services & mechanisms, Network Security Model, Non-Cryptographic Protocol Vulnerabilities, Cryptography basics, Symmetric Cipher Model, Cryptanalysis and brute force attacks, Substitution and transposition techniques.

UNIT- II:

Block Ciphers & Symmetric Key Cryptography

Stream ciphers & Block ciphers, Feistel Cipher, DES, Triple DES, AES.

UNIT- III:

Number Theory & Asymmetric Key Cryptography

Number Theory: Prime and Relatively Prime Numbers, Modular Arithmetic, Fermat's and Euler's Theorems, The Chinese Remainder theorem, Discrete logarithms.

Public Key Cryptography: Principles, public key cryptosystems, RSA Algorithms, Diffie Hellman Key Exchange, Elgamal encryption & decryption, Elliptic Curve Cryptography.

UNIT- IV:

Cryptographic Hash Functions & Digital Signatures

Application of Cryptographic hash Functions, Requirements & Security, Secure Hash Algorithm(SHA-512), Message Authentication Functions, Requirements & Security, HMAC & CMAC. Digital Signatures, NIST Digital Signature Algorithm. Key management & distribution.

UNIT -V:

Network Security-I (Transport Layer Security & Email Security)

Transport Level Security: Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Shell (SSH)

Electronic Mail Security: Pretty Good Privacy (PGP) and S/MIME.

UNIT -VI:

Network Security-II

IP Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

Intrusion detection: Overview, Approaches for IDS/IPS, Signature based IDS, Host based IDS/IPS.

TEXT BOOKS:

1. Cryptography & Network Security: Principles and Practices, William Stallings, PEA, Sixth edition.2006
2. Introduction to Computer Networks & Cyber Security, Chwan Hwa Wu, J.David Irwin, CRC press.2016

REFERENCE BOOKS:

1. Network Security and Cryptography, Bernard Meneges, Cengage Learning.2012
2. Everyday Cryptography, Keith M.Martin, Oxford,2nd edition,2017
3. Cryptography and Network Security, Behrouz A Forouzan, DebdeepMukhopadhyay, Mc Graw Hill,3rd edition,2008

URLs

1. http://nptel.ac.in/courses/106105031/
2. http://williamstallings.com/Extras/Security-Notes/

PRAGATI ENGINEERING COLLEGE:: SURAMPALEM

(Autonomous)

ELECTRONICS AND COMMUNICATION ENGINEERING

IV YEAR – I SEMESTER

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MICROWAVE ENGINEERING AND OPTICAL LAB (16EC7L10)

List of Experiments to be conducted:

Part – A

1. To verify Reflex Klystron Characteristics and to determine the frequency and tuning range of reflex klystron.
2. To verify Gunn Diode Characteristics.
3. To determine crystal index of the detector diode.
4. To draw the calibration curve of the attenuator.
5. To determine the coupling factors and directivity of directional coupler.
6. To measure the power distribution of various wave guide Tee i.e. E plane, H plane.
7. To measure the power distribution of various wave guide Magic Tee
8. VSWR Measurement and load impedance calculations using smith chart.
9. Scattering parameters of Circulator.
10. To measure the radiation pattern of antennas.
11. Characterization of Microstrip components.

Part – B

12. Characterization of LED.
13. Characterization of Laser Diode.
14. Intensity modulation of Laser output through an optical fiber.
15. Measurement of Data rate for Digital Optical link.
16. Measurement of Numerical Aperture of fiber cable.
17. Measurement of losses for Analog Optical link.

Add on experiment: (As a mini project)

18. Design of micro strip antenna.

Equipment required for Laboratories:

1. Regulated Klystron Power Supply
2. VSWR Meter -
3. Micro Ammeter - 0 – 500 μA

4. Multi meter
5. CRO
6. GUNN Power Supply, Pin Modulator
7. Reflex Klystron
8. Crystal Diodes
9. Micro wave components (Attenuation)
10. Frequency Meter
11. Slotted line carriage
12. Probe detector
13. wave guide shorts
14. Pyramidal Horn Antennas
15. Directional Coupler
16. E, H, Magic Tees
17. Circulators, Isolator
18. Matched Loads
19. Fiber Optic Analog Trainer based LED
20. Fiber Optic Analog Trainer based laser
21. Fiber Optic Digital Trainer
22. Fiber cables - (Plastic, Glass)

PRAGATI ENGINEERING COLLEGE:: SURAMPALEM

(Autonomous)

ELECTRONICS AND COMMUNICATION ENGINEERING

IV YEAR – I SEMESTER **L T P C**

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DIGITAL SIGNAL PROCESSING LABORATORY (16EC7L10)

LIST OF EXPERIMENTS:

1. To verify linear convolution, circular convolution.
2. To design FIR filter (LP/HP) using windowing technique
    a) Using rectangular window
    b) Using triangular window
3. To Implement IIR filter (LP/HP) on DSP Processors
4. N-point FFT algorithm.
5. MATLAB program to find frequency response of analog LP/HP filters.
6. Peform Basic operations on image (shrinking, zooming and cropping)
7. Implement smoothing and sharpening of image using low pass and high pass filter.
8. Perform image restoration using special filters.
9. Implement edge, line detection using operators.
10. Implement image compression bit plane coding.
11. Perform morphological operations on image.

ADD ON EXPERIMENTS:

1. To verify linear convolution using MATLAB
2. To verify circular convolution using MATLAB

IV Year **II**

Semester

Sub Code	Subjects	L	T	P	Credits
16EC8T25	Cellular Mobile Communications	3	1		3
16EC8T26	Electronic Measurements and Instrumentation	3	1		3
16EC8T27	Satellite Communications	3	1		3
16EC8D07 16EC8D08 16IT8D19 16IT8D20	**Elective III** 1.Wireless sensors & Actuator Networks 2. Digital IC Design 3. Web Technologies 4. Python	3	1		3
16EC8S01	Seminar		3		2
16EC8P02	Project				10
Total credits					**24**

PRAGATI ENGINEERING COLLEGE:: SURAMPALEM

(Autonomous)

ELECTRONICS AND COMMUNICATION ENGINEERING

IV YEAR – II SEMESTER **L T P C**

3 1 0 3

CELLULAR AND MOBILE COMMUNICATION (16EC8T25)

Course Objective:

The student will Study

1. The cellular systems and its Operation.
2. Various types of interferences and frequency management techniques.
3. The antennas used cell sites.
4. The concept of signal reflectors and cell coverage.
5. The concept of handoff techniques and cell site.
6. The Architecture of GSM and OFDM.

UNIT-I

INTRODUCTION TO CELLULAR MOBILE SYSTEMS: A basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, Hexagonal shaped cells, Consideration of the components of cellular systems, Analog and digital cellular systems, General Description of Cellular Radio System design problem and concept of frequency reuse channels.

UNIT-II

CHANNEL INTERFERENCE AND CHANNEL ASSIGNMENT: Introduction to Co-Channel Interference, Real-Time Co-channel Interference, Co-channel interference reduction factor, Desired C/I from a normal case in a Omni Directional Antenna System, Non Co-Channel Interference-different types.

FREQUENCY MANAGEMENT AND CHANNEL ASSIGNMENT: Frequency Management, Set-up channels and Paging Channels, Channel assignment to the cell sites and mobile units, Channel sharing and borrowing, Sectorization and Overlaid Cells, Non-fixed channel assignment.

UNIT-III

CELL SITE AND MOBILE ANTENNAS: Design of Antenna System, Antenna Parameters and their Effects, Equivalent Circuits of Antennas, Sum and difference patterns and their synthesis, For Coverage use – Omni directional Antennas, For interference reduction use – Directional antennas, Space diversity antennas and Umbrella pattern antennas, Unique Situations of Cell site antennas, Mobile Antennas.

UNIT-IV

CELL COVERAGE FOR SIGNAL AND TRAFFIC: Signal reflections in flat and hilly terrain, Effect of Human made Structures, Phase difference between direct and reflected paths, Constant standard deviation and straight line path loss slope, General formula for mobile radio propagation over water or Flat open area, Near and long distance propagation Antenna height gain, Form of a Point-to-point Model.

UNIT-V

HANDOFFS AND CELL SPLITTING: Types of Handoffs, Initiation of Handoff, Delayed Handoff and Forced Handoffs, Mobile Assigned Handoff, Inter-system Handoff, Cell splitting, micro cells, Vehicle locating methods, Dropped Call Rates and their evaluation.

UNIT-VI

DIGITAL CELLULAR NETWORKS: GSM-Introduction to GSM, GSM Architecture, GSM Channel Types and Frame Structure of GSM.

OFDM: Introduction to OFDM, Multicarrier Modulation and Cyclic Prefix, Channel model and SNR performance. Introduction to Network Technology such as 2G,3G,4G and VoLTE and their advantages.

Text Books

1. Mobile Cellular Telecommunications- William C. Y. Lee , 2nd Edition, Tata McGraw Hill. 2006.
2. Wireless Communication Principles and Practice -Theodore S Rappaport, 2nd Edition, Pearson Education. 2002.

References

1. Wireless and Cellular Communications – William C. Y. Lee , 3rd Edition, Tata McGraw Hill. 2005.
2. Mobile Cellular Communication – G Sasibhushana Rao, Pearson

Course outcomes:

On successful completion of the course, student will be able to

1. Know cellular system components and its performance.
2. Analyze the frequency management and channel assignments to reduce interference.
3. Identify suitable antennas for cell sites.
4. Analyze the problems in cell coverage's in terrains like flat, hill area and on water etc.
5. Apply the concept of handoff to reduce dropped call rates.
6. Understand the architectures of GSM and OFDM used in network technologies like 2G, 3G etc.

PRAGATI ENGINEERING COLLEGE:: SURAMPALEM

(Autonomous)

ELECTRONICS AND COMMUNICATION ENGINEERING

IV YEAR – II SEMESTER **L T P C**

3 1 0 3

ELECTRONIC MESUREMENTS AND INSTRUMENTATION (16EC8T26)

Course objectives:

The student will study

1. Different types of electronic measuring instruments' working principle, errors, specifications etc.
2. Various types of signal generators, wave analyzers and their working principle.
3. The working principles of different types of CRO's.
4. Working principles of various bridges and the measurement of inductance, capacitance and frequency.
5. Active and passive transducers.
6. Measuring physical parameters using transducers.

UNIT-I

PERFORMANCE CHARACTERISTICS OF INSTRUMENTS: Static characteristics, Accuracy, Resolution, Precision, Expected value, Error, Sensitivity. Errors in Measurement, Dynamic Characteristics-speed of response, Fidelity, Lag and Dynamic error. DC Voltmeters- Multi-range, Range extension/Solid state and differential voltmeters, AC voltmeters- AC Voltmeters Using Rectifiers, True RMS voltmeter multi range, range extension, Thermocouple type RF ammeter, Ohm meters series type, shunt type, Multimeter for Voltage, Current and resistance measurements.

UNIT-II

SIGNAL GENERATORS: Fixed and variable AF oscillators, AF sine and square wave signal generators, Function Generators, Pulse generator, Random noise generator, Sweep generator.

Wave Analyzers: Frequency selective wave analyzer, Harmonic Distortion Analyzers, Spectrum Analyzers, Digital Fourier Analyzers.

UNIT-III

OSCILLOSCOPES: CRT features, Vertical amplifiers, Horizontal deflection system, sweep, trigger pulse, delay line, sync selector circuits, simple CRO, triggered sweep CRO, Dual beam CRO, Dual trace oscilloscope, sampling oscilloscope, storage oscilloscope, digital readout oscilloscope, digital storage oscilloscope, Lissajous method of frequency measurement, standard specifications of CRO, probes for CRO- Active and Passive, attenuator type.

UNIT-IV

AC BRIDGES: Measurement of inductance- Maxwell's bridge, Anderson bridge. Measurement of capacitance -Schearing Bridge. Wheatstone bridge, Wien Bridge. Errors and precautions in using bridges, Q-meter.

UNIT-V

TRANSDUCERS: Active and passive transducers - Resistance, Capacitance, Inductance, Strain gauges, LVDT, Piezo Electric transducers, Resistance Thermometers, Thermocouples, Thermistors, Sensistors.

UNIT-VI

MEASUREMENT OF PHYSICAL PARAMETERS: Strain, Load, Force, Pressure, Velocity, humidity, moisture, speed, proximity and displacement, Data acquisition systems.

Text books

1. Electronic instrumentation - H.S.Kalsi, 2nd Edition, Tata McGraw Hill, 2004.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, 5th Edition, PHI, 2002.

References

1. Electronic Instrumentation and Measurements - David A. Bell, 2nd Edition PHI, 2003.
2. Electronic Test Instruments, Analog and Digital Measurements - Robert A.Witte, 2nd Edition, Pearson Education., 2004.
3. Electrical Measurements and Measuring Instruments- R.K.Rajput, S.Chand publications, 2008

Web links

1. www.nptel.ac.in/courses/108105064

Course Outcomes:

On successful completion of the course, student will be able to

1. Identify the instrument for specific measurements and also understand, estimate errors in measurements.
2. Acquire the knowledge on signal generators and wave analyzers for communication applications.
3. Understand the operation of different oscilloscopes.
4. Estimate the values of R, L, C and frequency employing suitable bridges.
5. Know the basic principles of transducers for measurement of displacement, velocity, temperature and pressure.
6. Measure the physical parameters and to Identify data acquisition system for a specific application.

PRAGATI ENGINEERING COLLEGE:: SURAMPALEM

(Autonomous)

ELECTRONICS AND COMMUNICATION ENGINEERING

IV YEAR – II SEMESTER **L T P C**

3 1 0 3

SATELLITE COMMUNICATIONS (16EC8T27)

Course Objectives

The student will study

1. The basic concepts, applications, frequencies used in satellite communications.
2. The various satellite subsystems and its functionality.
3. The concepts of satellite link design and calculation of C/N ratio.
4. The concepts of multiple access and various types of multiple access techniques in satellite systems.
5. The transmitters, receivers, antennas, tracking systems of satellite.
6. The concepts of satellite navigation, architecture and applications of GPS.

UNIT-I

INTRODUCTION : Origin of Satellite Communications, Historical Back-ground, Basic Concepts of Satellite Communications, Frequency allocations for Satellite Services, Applications, Future Trends of Satellite Communications.

ORBITAL MECHANICS AND LAUNCHERS: Orbital Mechanics, Look Angle determination, Orbital perturbations, Orbit determination, launches and launch vehicles, Orbital effects in communication systems performance.

UNIT-II

SATELLITE SUBSYSTEMS: Attitude and orbit control system, telemetry, tracking, Command and monitoring, power systems, communication subsystems, Satellite antenna Equipment reliability and Space qualification.

UNIT-III

SATELLITE LINK DESIGN: Basic transmission theory, system noise temperature and G/T ratio, Design of down links, up link design, Design of satellite links for specified C/N, System design example.

UNIT-IV

MULTIPLE ACCESS: Frequency division multiple access (FDMA) Intermediation, Calculation of C/N, Time division Multiple Access (TDMA) , Frame structure, Examples. Satellite Switched TDMA Onboard processing, DAMA, Code Division Multiple access (CDMA), Spread spectrum transmission and reception, PN Sequence, Direct Sequence and Frequency Hopped Spread Spectrum System.

UNIT-V

EARTH STATION TECHNOLOGY : Introduction, Transmitters, Receivers, Antennas, Tracking systems, Terrestrial interface, Primary power test methods.

Low earth orbit and geo-stationary satellite systems: Orbit consideration, coverage and frequency considerations, Delay and Throughput considerations, System considerations, Operational NGSO constellation Designs.

UNIT-VI

SATELLITE NAVIGATION AND THE GLOBAL POSITIONING SYSTEM: Radio and Satellite Navigation, GPS Position Location principles, GPS Receivers and codes, Satellite signal acquisition, GPS Navigation Message, GPS signal levels, GPS receiver operation, GPS C/A code accuracy, Differential GPS.

Text books

1 Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2nd Edition, 2003.

2 Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G.Suyderhoud, 2nd Edition, Pearson Publications, 2003.

References

1.Fundamentals of Satellite Communications – K.N. Raja Rao, PHI, 2004

2. Satellite Communications : Design Principles – M. Richharia, BS Publications, 2nd Edition, 2003.

3. Satellite Communication - D.C Agarwal, Khanna Publications, 5th Edition.

Web links

www.nptelvideos.in/2012/12/ Satellite Communications.html

Course Outcomes:

On successful completion of the course, student will be able to

1. Understand the basic principles of satellite systems.
2. Analyze Satellite subsystems.
3. Design the link budget of a satellite for specified C/N ratios.
4. Configure the satellite multiple access techniques.
5. Know the concepts of satellite earth station technologies.
6. Analyze the satellite navigation and GPS.

PRAGATI ENGINEERING COLLEGE:: SURAMPALEM

(Autonomous)

ELECTRONICS AND COMMUNICATION ENGINEERING

IV YEAR – II SEMESTER **L T P C**

3 1 0 3

WIRELESS SENSORS AND ACTUATOR NETWORKS (16EC8D07)

(Elective III)

Course objectives

The student will study

1. Mobile Ad Hoc Networks, Implementation Issues and available Solutions.
2. Routing Mechanism approaches in network technology.
3. Clustering Mechanisms and different schemes.
4. 802.11 Wireless LAN (Wi-Fi) and Bluetooth Standards.
5. Sensor Networks and Their Characteristics.
6. The security in Ad Hoc wireless networks and applications of WSN.

UNIT-I

OVERVIEW OF WIRELESS SENSOR NETWORKS: Definitions of sensor networks, Advantages of sensor Networks, Unique constraints an challenges, Driving Applications, Enabling Technologies for Wireless Sensor Networks.

ARCHITECTURES: Single-Node Architecture - Hardware Components, Energy Consumption of Sensor nodes, operating systems and Execution Environments Network Architecture -Sensor Network Scenarios, Optimization goals and Figures of Merit, Gateway Concepts.

UNIT-II

NETWORKING TECHNOLOGIES- Physical Layer and Transceiver Design Considerations, Personal area networks (PANs), hidden node and exposed node problem, Topologies of PANs, MANETs, WANETs.

UNIT-III

MAC PROTOCOLS FOR WIRELESS SENSOR NETWORKS: Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC protocol for Ad-hoc network Wireless Networks, Classifications of MAC Protocols, Contention – Based protocols,

Contention- Based protocols with reservation Mechanisms, Contention – Based MAC Protocols with Scheduling Mechanisms, MAC protocol that use Directional Antennas, Other MAC Protocols.

UNIT-IV

ROUTING PROTOCOLS: Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless networks, Classification of routing Protocols, Table –Driven Routing Protocols, On – Demand Routing protocols, Hybrid Routing protocols, Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing protocols, Power-Aware Routing protocols, Proactive Routing.

UNIT-V

TRANSPORT LAYER AND SECURITY PROTOCOLS: Introduction, Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks, Design goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer solutions, TCP over Ad Hoc Wireless Networks, Other Transport Layer Protocol for Ad Hoc Wireless Networks.

UNIT-VI

SECURITY IN WSNs: Security in Ad Hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad Hoc Wireless Networks.

SENSOR NETWORK PLATFORMS AND TOOLS: Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming.

APPLICATIONS of WSN: S Ultra wide band radio communication Wireless fidelity systems Future directions, Home automation, smart metering Applications

Textbooks

1. Protocols And Architectures for Wireless Sensor networks -Holger Karl and Andreas Willig, John Wiley,2005.
2. Ad Hoc Wireless Networks: Architectures and Protocols - C. Siva Ram Murthy and B.S.Manoj, PHI, 2004.

3. Wireless Ad- hoc and Sensor Networks: Protocols, Performance and Control – Jagannathan Sarangapani,CRC Press.

References

1. Wireless Sensor Networks- Technology, Protocols, and, Applications - Kazem Sohraby, Daniel Minoli, and Taieb Znati, , John Wiley,2007.
2. Wireless Sensor Networks- An Information processing Approach-Feng Zhao and Leonidas
   J. Guibas, , Elsevier,2007.
3. Ad- Hoc Mobile Wireless Networks: Protocols and Systems- C.K. Toh ,1st edition, Pearson education.

Course Outcomes:

After completion of this course the student will be able to

1. Understand the principles and characteristics of wireless sensor networks.
2. Distinguish among networks like PANs, MANETs, WANETs.
3. Analyze the network architecture, MAC protocol and clustering algorithm.
4. Illustrate routing protocols and their implications on data transmission delay, bandwidth consumption.
5. Comprehend the design issues in transport layer protocol.
6. Design wireless sensor network for different applications.

PRAGATI ENGINEERING COLLEGE:: SURAMPALEM

(Autonomous)

ELECTRONICS AND COMMUNICATION ENGINEERING

IV YEAR – II SEMESTER **L T P C**

3 1 0 3

DIGITAL IC DESIGN (16EC8D08)

(Elective III)

Course objectives

The student will

1. Study the static and dynamic characteristics of inverter using NMOS and CMOS.
2. Study Logic gates and design Combinational logic circuits (i.e) AOI, OAI etc.
3. Implement Sequential logic Circuits like latches and flip-flops using CMOS transmission gates.
4. Study dynamic logic circuits.
5. Study about interconnect parameters of MOS circuits.
6. Study concept of Semiconductor Memories, Flash Memory and RAM array organization.

UNIT-I

MOS DESIGN: Pseudo NMOS Logic – Inverter, Inverter threshold voltage, Output high voltage, Output Low voltage, Gain at gate threshold voltage, Transient response, Rise time, Fall time, Pseudo NMOS logic gates, Transistor equivalency, CMOS Inverter logic.

UNIT-II

COMBINATIONAL MOS LOGIC CIRCUITS: MOS logic circuits with NMOS loads, Primitive CMOS logic gates – NOR and NAND gate, Complex Logic circuits design – Realizing Boolean expressions using NMOS gates and CMOS gates, AOI and OIA gates, CMOS full adder, CMOS transmission gates, Designing with Transmission gates.

UNIT-III

SEQUENTIAL MOS LOGIC CIRCUITS: Behavior of bistable elements, SR Latch, Clocked latch and flip flop circuits, CMOS D latch and edge triggered flip-flop.

UNIT-IV

DYNAMIC LOGIC CIRCUITS: Basic principle, Voltage Bootstrapping, Synchronous dynamic pass transistor circuits, Dynamic CMOS transmission gate logic, High performance Dynamic CMOS circuits.

UNIT-V

INTERCONNECT: Capacitive Parasitics, Resistive Parasitics, Inductive Parasitics, Advanced Interconnect Techniques.

UNIT-VI

SEMICONDUCTOR MEMORIES: Memory Types, RAM array organization, DRAM – Types, Operation, Leakage currents in DRAM cell and refresh operation, SRAM operation Leakage currents in SRAM cells, Flash Memory NOR flash and NAND flash.

Text Books

1. Digital Integrated Circuits – A Design Perspective- Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, PHI ,2nd Edition.
2. Digital Integrated Circuit Design – Ken Martin, Oxford University Press, 2011.

References

1. CMOS Digital Integrated Circuits Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 3rd Edition, 2011.
2. CMOS VLSI Design – Neil H.E Weste, David harris, Ayan Banerjee, Pearson, 3rd Edition.

Web links

1. http://www.nptelvideos.in/2012/12/digital-vlsi-system-design.html

Course Outcomes:

After completion of this course the student will be able to

1. Acquire the design principles of inverter using NMOS and CMOS.
2. Design Combinational logic Circuits using CMOS transmission gates.
3. Design Sequential logic Circuits like latches and flip-flops using CMOS transmission gates.
4. Design Dynamic CMOS logic Circuits.
5. Know the basic parameters of Interconnect system for design aspects.
6. Acquire the knowledge of Semiconductor Memories and organization RAM array.

PRAGATI ENGINEERING COLLEGE:: SURAMPALEM

(Autonomous)

ELECTRONICS AND COMMUNICATION ENGINEERING

IV YEAR – II SEMESTER **L T P C**

3 1 0 3

WEB TECHNOLOGIES (16IT8D19)

(Elective III)

COURSE OBJECTIVES:

1. This course is designed to introduce students with no programming experience to the programming languages and techniques associated with the World Wide Web.
2. The course will introduce web-based media-rich programming tools for creating interactive web pages.

COURSE OUTCOMES:

The Student will

1. Analyze a web page and identify its elements and attributes.
2. Develop client side manipulations in web pages using Java Script.
3. Write simple scripts using AJAX and compare DOM & SAX XML Parsers.
4. Build web applications using PHP.
5. Implement programming through PERL.
6. Create applications by using Ruby.

UNIT-I: HTML, CSS

Basic Syntax, Standard HTML Document Structure, Basic Text Markup, Images, Hypertext Links, Lists, Tables, Forms, HTML5

CSS: Levels of Style Sheets, Style Specification Formats, Selector Forms, the Box Model

UNIT-II:

JavaScript

The Basic of Javascript: Objects, Primitives Operations and Expressions, Screen Output and Keyboard Input, Control Statements, Object Creation and Modification, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions.

UNIT-III:

XML: Document type Definition, XML schemas, Document object model, XSLT, DOM and SAX Approaches,

AJAX A New Approach: Introduction to AJAX, Integrating PHP and AJAX.

WebSerivces: SOAP, WSDL

UNIT-IV:

PHP Programming: Introducing PHP: Creating PHP script, Running PHP script.

Working with variables and constants: Using variables, Using constants, Data types, Operators. Controlling program flow: Conditional statements, Control statements, Arrays, functions. Working with forms and Databases such as MySQL.

UNIT-V:

Introduction to PERL, Operators and if statements, Program design and control structures, Arrays, Hashes and File handling, Regular expressions, Subroutines, Retrieving documents from the web with Perl.

UNIT-VI:

Introduction to Ruby, Variables, types, simple I/O, Control, Arrays, Hashes, Methods, Classes, Iterators, Pattern Matching. Overview of Rails.

TEXT BOOKS:

1. Programming the World Wide Web, Robet W Sebesta, 7ed, Pearson.
2. Web Technologies, Uttam K Roy, Oxford
3. The Web Warrior Guide to Web Programming, Bai, Ekedahl, Farrelll, Gosselin, Zak, Karparhi, Maclntyre, Morrissey, Cengage

REFERENCE BOOKS:

1. Ruby on Rails Up and Running, Lightning fast Web development, Bruce Tate, Curt Hibbs, Oreilly (2006)
2. Programming Perl, 4ed, Tom Christiansen, Jonathan Orwant, Oreilly (2012)

3. Web Technologies, HTML< JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.
4. 4. An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage Learning

WEB LINKS:

1. https://www.w3schools.com/html/html_lists.asp
2. https://www.w3schools.com/xml/
3. www.tutorialspoint.com/ajax/
4. http://www.upriss.org.uk/perl/PerlCourse.html

PRAGATI ENGINEERING COLLEGE:: SURAMPALEM

(Autonomous)

ELECTRONICS AND COMMUNICATION ENGINEERING

IV YEAR – II SEMESTER **L T P C**

3 1 0 3

PYTHON(16IT8D20)

(Elective III)

COURSE OBJECTIVES:

- To make the students understand the fundamentals of python programming.
- To expose the students to object oriented concepts.
- To make the students to develop applications using python.
- To make students to use python for automation.

COURSE OUTCOMES:

The Student will

1. Understand various data types, operators in Python.
2. Write programs using loop and branch statements to manipulate data in files.
3. Perform string manipulations.
4. Perform list and dictionaries operations in python.
5. Understand the concept of modular programming using functions.
6. Realize the ease of developing complex programs with smaller sized programs.

UNIT I:

Introduction to Python, Installing Python: Basic syntax, interactive shell, editing, saving, and running a script. The concept of data types variables, assignments immutable variables numerical types; arithmetic operators and expressions comments in the program understanding error messages.

UNIT II:

Conditions, Boolean logic, logical operators; ranges: Control statements: If-else, loops (for, while) short-circuit (lazy) evaluation, Strings and text files manipulating files and directories, os

and sys modules; text files: reading/writing text and numbers from/to a file creating and reading a formatted file (csv or tab-separated).

UNIT III:

String manipulations: Subscript operator, indexing, slicing a string; strings and number system: converting strings to numbers and vice versa. Binary, octal, hexadecimal numbers, Lists, tuples, and dictionaries.

UNIT IV:

Basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries.

UNIT V:

Design with functions: Hiding redundancy, complexity; arguments and return values; formal vs. Actual arguments, named arguments, Program structure and design, Recursive functions.

UNIT VI:

Classes and OOP: Classes, objects, attributes and methods; defining classes; design with classes, data modeling; persistent storage of objects, inheritance, polymorphism, operator overloading (eq_, _str_, etc) abstract classes; exception handling, try block, Multithreading, Automation using Python.

TEXT BOOK:

1. Think Python, How to Think Like a Computer Scientist, Version 2.0.17, Allen Downey, Green Tea Press.

REFERENCE BOOKS:

1. Python Essential Reference, David M. Beazley , Pearson Education, Inc.
2. Fluent Python, Luciano Ramalho by O'Reilly Media

3. Python Cookbook, David Beazley and Brian K. Jones, O'Reilly Atlas.3e

4. Fundamentals of Python: First Programs, Kenneth Lambert, Course Technology, Cengage Learning, 2012. ISBN-13: 978-1-111-82270-5.

WEB LINKS:

1. Think Python: How to Think Like a Computer Scientist by Allen B. Downey
2. http://www.greenteapress.com/thinkpython/thinkpython.html
3. Dive into Python by Mark Pilgrim-
   http://www.diveintopython.nethttp://staff.washington.edu/jon/python-course/
   https://wiki.python.org/moin/PythonBooks